

**FORMULATION OF AN OUTLINE STRATEGY
FOR MAPUTO CITY
CITYWIDE SANITATION PLANNING**



FINAL REPORT

15 September 2010

Submitted by:

SEED, Sociedade de Engenharia e Desenvolvimento Lda.

Rua de Kassuende No: 118, 8º Andar, Maputo
Republic of Mozambique

Tel: +258 21 485917/8 • Fax: +258 21 485923 • E-mail: seed@seed.co.mz



CONTENTS	PAGE
1 INTRODUCTION	1
1.1 Background	1
1.2 City Characteristics and Location	1
1.3 Context and Need for Citywide Sanitation Planning in Maputo	2
1.4 Approach and Scope of the Study	2
2 URBAN DEVELOPMENT	4
2.1 Administrative Sub-division and Administrative Boundaries	4
2.2 Current Land Use and Settlement Types	4
2.3 Urban Structure Plan for Maputo City	9
2.3.1 Stakeholders	9
2.3.2 Status and objectives	9
2.3.3 Key elements for spatial and urban development and current development trends	9
2.4 Maputo Municipal Development Program (PROMAPUTO)	10
3 SANITATION GOVERNANCE, DESCRIPTION AND ASSESSMENT OF CURRENT SITUATION	11
3.1 Introduction	11
3.2 The Constitution	11
3.3 Policies	11
3.4 Legislation	13
3.5 Regulations	14
3.6 Municipal Bylaws	14
3.7 Maputo Municipal Council – Municipal Development Program - PROMAPUTO	14
3.8 Institutional Assessment of Sanitation Services in Maputo City	18
3.9 Assessment of Current Sanitation Governance	21
3.9.1 Institutional constraints	21
3.9.2 Influencing Urban Sanitation in Maputo – Lessons learned from the 2000 Floods	21
3.9.3 Summary analysis of legal and institutional framework status	22
4 CURRENT SANITATION AND WATER SUPPLY CONDITIONS	23
4.1 Development status, Sanitation conditions and Options for immediate improvement	23
4.2 Existing Water supply, Drainage and Sewerage Infrastructure	24
4.2.1 Water supply infrastructure and service levels	24
4.2.2 On-site wastewater management systems	25
4.2.3 Off site sanitation: Down-town Maputo – Cidade de Cimento	26
4.2.4 Main Storm Water Drainage Networks	28
4.3 Seven Cities Sanitation Strategy Study, including Maputo (2004)	28
4.4 Best practice, ongoing projects and activities	30
4.4.1 Avenue Dr. Lacerda da Almeida reconstruction	30
4.4.2 Bairro Chamanculo	30
4.4.3 Multi-service Sanitation Block - Q5 (5th quarter) bairro Chamanulo C	30

4.4.4	ADASBU – Community based organization providing integrated sanitation services	32
4.4.5	WaterAid	32
5	SELECTION OF WASTEWATER MANAGEMENT SYSTEMS	33
5.1	The System Concept	33
5.2	Wastewater Management Systems	33
5.2.1	On-site systems	33
5.2.2	Off-site systems	34
5.2.3	Hybrid systems	36
5.3	Ecosan - Ecological or New Sanitation	36
5.4	Selection of Wastewater Management Systems	37
5.4.1	General	37
5.4.2	Wastewater management system selection criteria and considerations	38
6	SECONDARY DATA AND SANITATION DEVELOPMENT PLANNING	43
6.1	Administrative Sub-division and Planning Units	43
6.2	Secondary Data Sources, Availability and Reliability	43
6.3	The Maputo Central Sanitation Data-base and its Data Assessment Procedures	43
6.4	Sanitation and Drainage Zones	44
7	BAIRRO PRIORITY SETTING AND IMPLEMENTATION PHASING	47
7.1	General	47
7.2	Criteria and Indicators for Bairro Priority Setting	47
7.2.1	Population and urban poor	47
7.2.2	Current urban infrastructure and related service levels	47
7.2.3	Urban development	48
7.2.4	Physical conditions	48
7.2.5	Social Indicators	49
7.3	Bairro Priority Setting	49
7.3.1	Scenarios	49
7.3.2	Data assessment and scoring	49
7.4	Proposed Implementation Phasing	50
8	PRE-SELECTED WASTEWATER MANAGEMENT SYSTEMS AND TECHNOLOGIES	52
8.1	Pre-selection of Wastewater Management Systems and Technologies	52
8.2	Proposed Wastewater Management Systems at Bairro Level	55
8.2.1	Sanitation and drainage zone I	55
8.2.2	Sanitation and drainage zone II	56
8.2.3	Sanitation and drainage zone III	57
8.2.4	Sanitation and drainage zone IV	58
8.2.5	Sanitation and drainage zone V	59
8.2.6	Sanitation and drainage zone VI	60

9	MAPUTO OUTLINE CITYWIDE SANITATION STRATEGY	61
9.1	Introduction	61
9.2	Sanitation Governance	61
9.2.1	Strategic view ahead and context for Maputo sanitation	61
9.2.2	Options for the Outline Citywide Sanitation Strategy	63
9.3	Community Empowerment and Participation	64
9.4	Sanitation System and Technology Selection	65
9.5	Private Sector Involvement	65
9.6	Gradual Development and Implementation of Maputo's Citywide Sanitation Strategy	66
9.6.1	Management arrangements for planning, design and implementation	66
9.6.2	Sanitation service provision models	67
9.6.3	Implementation approaches	68
9.6.4	Indicative implementation schedule	69

LIST OF APPENDICES

A	List of Abbreviations and References
B	List of Key Informants
C	CMM's assessment of the current situation in Maputo's critical bairros
D	Key "Bairro Characteristics" as collected and entered in the 'Maputo Central Database, version 1_0
E	Detailed results of the population and poverty scoring
F	Maps <ul style="list-style-type: none"> Map 1 – Maputo Administrative boundaries Map 2 – Proposed Sanitation Zones and Implementation Phasing Map 3 – Sanitation Zone 1 and Proposed Implementation Phasing Map 4 – Sanitation Zone 2 and Proposed Implementation Phasing Map 5 – Sanitation Zone 3 and Proposed Implementation Phasing Map 6 – Sanitation Zone 4 and Proposed Implementation Phasing Map 7 – Sanitation Zone 5 and Proposed Implementation Phasing Map 8 – Sanitation Zone 6 and Proposed Implementation Phasing Map 9 – Current land-use, as per PEUMM 2008
G	Stage 1 <ul style="list-style-type: none"> Stakeholders Workshops 1 and 2 - Results and recommendations - List of participants

LIST OF TABLES

Table 2-1	Land use classification in accordance with PEUMM 2008	4
Table 4-1	Estimated Sanitation Coverage in Down-town Maputo	26
Table 6-1	Proposed Sanitation and Drainage Zones their Characteristics and Assessed Priorities.	45
Table 7-1	Bairro Priority Setting Scenarios	49
Table 7-2	Assessed Bairro Priorities and Implementation Phasing	51
Table 8-1	Overview of Proposed/Potential Wastewater Management Systems for Maputo City	53

LIST OF FIGURES

Figure 1-1	Location of Maputo City	1
Figure 2-1	Administrative sub-division of Maputo City, source PEUMM 2008	4
Figure 2-2	Indicative Location of Typical Settlement Areas in Maputo City.....	6
Figure 2-3	Google Earth Images of the Identified Settlement Types	7
Figure 3-1	Outline of the Restructured Maputo Municipal Council.....	16
Figure 4-1	Greater Maputo Water Supply System - <i>sources FIPAG</i>	25
Figure 5-1	Flow Stream Diagram for On-site Wastewater Management.....	33
Figure 5-2	Condominial Sewerage Networks	35
Figure 5-3	Key Issues for Selection of Sanitation Systems and Technologies.....	38
Figure 5-4	Considerations for Selection of Sanitation Systems and Technologies	38
Figure 9-1	Indicative activity schedule for the completion and implementation of the Maputo-Citywide Sanitation Strategy.....	70

1 INTRODUCTION

1.1 Background

WSUP is currently progressing with the implementation of the WSUP supported Tchemulane Project in Maputo to provide improved water and sanitation services to an urban poor population of about 175,000 inhabitants. This program is being undertaken in partnership with the key local service providers (LSP's) responsible for water supply and sanitation in this city. The improvements required to household sanitation and related services is a particular priority due to the relatively low level of access to satisfactory sanitation services for a majority of the urban population within the city and in the peri urban areas. The achievement of objectives including long term sustainability of the WSUP supported project are also influenced by the medium and long term strategy for citywide sanitation improvements that are planned by the concerned service authorities.

The LSP's and relevant agencies with responsibility for sanitation and related services have a mandate for planning and implementing sanitation improvement programs for the city. The programs would include several components and implementation phases that cover the range of requirements of the urban population. WSUP is offering to assist in the formulation of a citywide sanitation strategy. This enables the development and implementation of the sanitation program for the WSUP supported project to take place within the context of the wider citywide strategy. It also enables the WSUP sanitation program to inform and facilitate the city's wider sanitation program.

WSUP has contracted SEED – Sociedade de Engenharia e Desenvolvimento, to prepare an Outline for the Citywide Sanitation Strategy of Maputo city.

1.2 City Characteristics and Location

According with the 2007 census, Maputo Municipality has a population of 1,099,102 inhabitants. The Urban Structure Plan of 2008 (PEUMM 2008) states that in about 30 to 40 years, the population in the city will double and will tend to stabilize.

The area of Maputo municipality is about 308 square kilometers having 110 square kilometers of urbanized areas. In average the density of the city is about 70 hab per hectare and 14% of the population lives in the urban district 1 – “cement city”.

The Urban Structure Plan of the City (PEUMM 2008) establishes two main categories: i) urbanized areas and ii) areas to be urbanized. Annex F presents a number of key maps, which show the administrative boundaries (map 1) and current land use (map 9, source: PEUMM 2008).

Generally speaking “areas to be urbanized” are characterized by one family houses, poor or a total lack of urban infrastructure, and a lack of formal planning. These areas are in need of legal support to clarify future use, the demarcation and registration of plot boundaries and ownership in the municipal cadastre. This situation makes difficult the access to basic infrastructures such as water supply, sanitation and drainage. About 40% of the “areas to be urbanized” have formally marked plots but are still lacking access to the planned basic urban infrastructure. One of the priority strategic actions indicated in the Urban Structure Plan of the City is the restructuring and development of the informal areas in the “bairros”.

Figure 1-1 Location of Maputo City



1.3 Context and Need for Citywide Sanitation Planning in Maputo

The estimated sanitation coverage in 2004 for Maputo city was about 69%, having 13% of the population being served by off-site systems, 16% by septic tanks and 40% by improved latrines (Lahmeyer 2004). This coverage is far better than the national coverage in urban sanitation estimated in about 47% (2007). In urban areas the minimum level of service accepted is the improved latrine which consists of a 1m to 1,5m lined pit, slab with a strong concrete plate normally concave with 1,2 or 1,5 meters in diameter, and protected by a covered super-structure made from local material (wood, reeds, matting, etc.). However, many families do not yet have access to these minimum services and instead depend on traditional latrines which do not have a lined pit nor a reliable squatting plate.



Commonly used latrine superstructures in underprivileged areas



Locally made squatting plates use for improved latrines

Mozambique has committed itself to achieve Urban Sanitation coverage of 55% by 2009 and 80% by 2015, both at the local and national level. In order to achieve the MDGs and other criteria indicated in the Action Plan for the Reduction of the Absolute Poverty (PARPA II) an integrated focused and well established integrated planning is required. The outline for the Citywide Sanitation Strategy for Maputo City is believed to be an important first step to archive integrated (sanitation) planning and improved sanitation service levels at city level by 2015 and beyond.

1.4 Approach and Scope of the Study

Approach - Sanitation Service level development should be based on a comprehensive and strategic medium to long-term sanitation strategy, the so called Citywide Sanitation Strategy. The CSS is important because it may take years for Maputo to archive the overall sanitation coverage as intended. A citywide sanitation strategy is intended to create synergy among communities, municipal agencies, NGO's and other actors. Once completed and adopted, the citywide sanitation strategy can be translated into recurring annual sanitation action plans which provide more detailed information on the proposed programs and projects, and their funding on a year by year basis.

The citywide sanitation strategy includes the vision, mission, and goals of sanitation development as well as strategies to meet this goals. The strategy is then translated into indicative programs which will cover the technical and non-technical aspects. Non-technical aspects are often crucial for success and include community awareness and participation, social marketing, policy and regulation, institutional setting and capacity, private sector engagement, NGO engagement, financing and tariffs.

The development of the city's sanitation service levels and infrastructure is a continues process that should start with the preparation, discussion and adaptation of the citywide sanitation strategy.

Scope and Results - The first stage of the study consisted of consultations with key stakeholders a literature review, initial data collection and assessment and an initial workshop with all key stakeholders in order to review the information as collected and to assess needs and possibilities for improved sanitation service levels and infrastructure. Stakeholders made recommendations concerning the initial assessments and strategy options. In Annex G-1 the results and recommendations of the Stage 1 – Workshop are presented. The first stage of the study was concluded with the presentation of a draft and final Interim report.

The second stage of the study consisted of additional surveys and consultations, detailed assessments and formulation of the outline citywide sanitation strategy. The additional surveys and consultations resulted in the formulation of general recommendations, an initial general priority setting at “bairro level”, formulation of criteria for sanitation systems and technologies selection, identification of key elements to be considered for the development of the CSS, and identification of starting points and an indicative timing for the implementation of the CSS. The results were presented in the draft Final Report and discussed during a second Stakeholders Workshop. The conclusions and recommendations of the second workshop are summarized in Annex G-1

This final report consolidates the results as presented and discussed during stage 1 and 2 of the study and includes the outline strategy and recommendation for a phased implementation of the proposed CSS. The final report is subdivided into the following sections:

1/ Overall context for sanitation development – chapter 2 and 3

The overall context for any sanitation planning and development strategy is based upon current development trends, typical settlement types, city spatial and development planning and so-called “*sanitation governance*”. Sanitation governance defines at both national and local level the legal and institutional framework as well as objectives, goals and targets for the medium and long-term development of sanitation services and service levels. For the specific situation in Maputo city these issues are discussed in the chapters 2 and 3 of this report.

2/ Water supply and sanitation conditions, infrastructure, ongoing projects, best practice – chapter 4

A concise overview of current water supply and sanitation service levels, coverage and infrastructure is given. A brief overview of the main conclusions and recommendations of the “Seven Cities Sanitation Strategy Study” (2004) as well as highlights of ongoing activities and best practice conclude this chapter.

3/ Approach to and criteria for the selection of wastewater management systems – chapter 5

In line with international practice, in the context of this study wastewater management is considered to be a multi-step process or system. Chapter five provides general and background information related to: i) the system approach, ii) a brief description of the wastewater management systems (on-site- off-site and hybrid) and their characteristics, iv) a brief introduction to *EcoSan or New Sanitation* and v) an introduction to system selection criteria and considerations (including population density, technical, institutional, financial and social criteria and political considerations) to be considered in the context of the Citywide Sanitation Strategy for Maputo. As such chapter five provides some theoretical background for the preparation of the CSS for Maputo city.

4/ Data assessment and management, sanitation zoning and priority setting – chapter 6

This chapter discusses the available secondary data, information sources used, data management tools developed – *the central data sanitation data base for Maputo* - and data assessments made. The initial data assessments are, between others used to define the boundaries of the 6 *Sanitation and Drainage Zones*. At the end of the chapter and overview of key characteristics of all bairros is presented.

5/ Working towards a Citywide Sanitation Strategy for Maputo City – chapters 7, 8 and 9

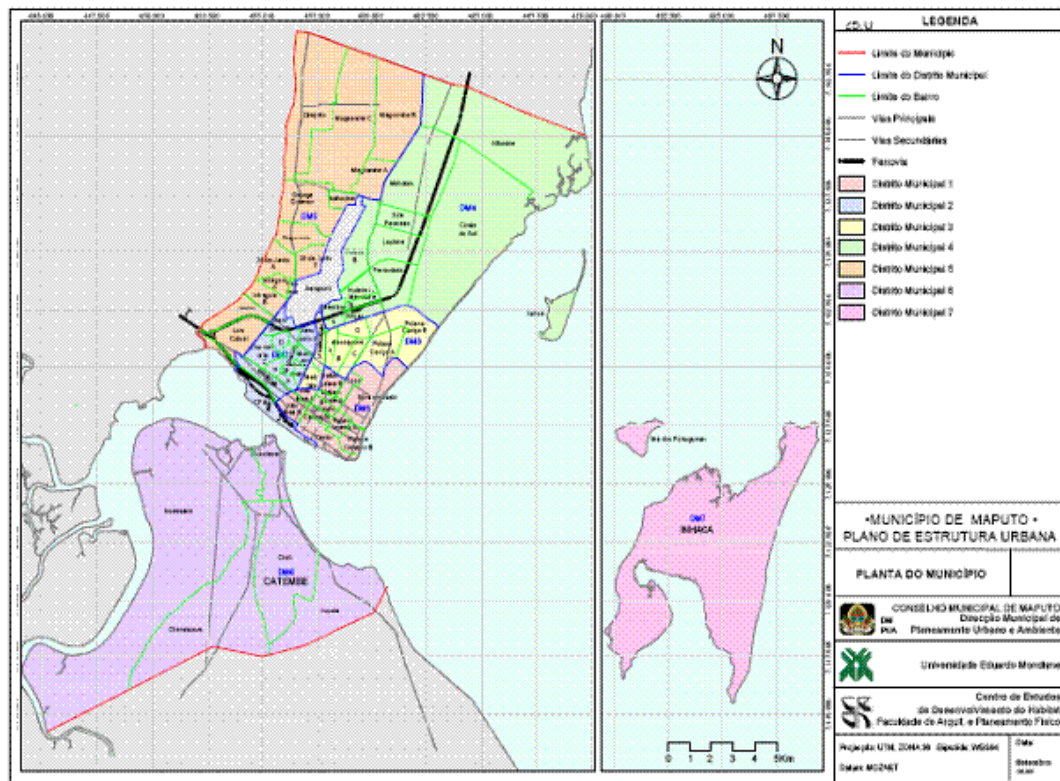
In these chapters all technical and non-technical elements of the outline CSS are presented and discussed. Firstly in chapter 7 the criteria and approach used for *Bairro priority setting* is presented, this chapter is concluded with an overall data assessment and a proposed implementation phasing for each of the bairros. Chapter 8 presents a number of pre-selected wastewater management systems and technologies, which subsequently are linked to the bairros. Finally in chapter 9 the non technical aspects of the outline-CSS are discussed and overall recommendations are made. This chapter is concluded with an indicative activity schedule for further development and implementation of the Maputo-CSS.

2 URBAN DEVELOPMENT

2.1 Administrative Sub-division and Administrative Boundaries

Maputo is administratively subdivided into seven (7) Municipal districts of which only 5 are included in the current study. The municipal districts No. 6 Ka Tembe and No. 7 Inhaca where not included because they do not form a territorial unit with the other 5 municipal districts. The overall administrative subdivision of Maputo City is presented in Figure 2.1 (source PEUMM 2008), a detailed map of the administrative subdivision of the study area is presented in Annex G, map 1.

Figure 2-1 Administrative sub-division of Maputo City, source PEUMM 2008



Each Municipal District is sub-divided in a number of sub-districts (bairros), each sub-district is sub-divided in a number of development blocks (quarteirões).

Both the municipal districts and bairros are headed by an official, who responds to the President of the Municipal Board (Conselho Municipal Maputo – CMM).

2.2 Current Land Use and Settlement Types

The Urban Development Plan for Maputo (PEUMM 2008) identifies 7 main land use categories, see Table 2.1. Map 2 of Appendix F, shows the current land use as assessed in the context of the PEUMM 2008.

Taking into consideration this information a general assessment of more or less typical settlement types has been prepared. Key indicators used for this assessment include: i) population density and population growth over the period 1997 – 2007 (census data), ii) type of development; consolidated, planned or not planned as per PEUMM 2008, iii) physical observation of settlement types on basis of Google Earth images, iv) general knowledge of the study area and v) a general reconnaissance survey in the field.

Table 2-1 Land use classification in accordance with PEUMM 2008

Land use	Classification	Pop density pers/ha	Principle land use, remarks	
A¹ Developed (urbanizados)				
1	Multifunctional		housing, commercial, services	
2	Historic area		housing, commercial, services	
3a	Residential	consolidated, high density	> 300	housing
3b		consolidated, medium density	> 100 < 300	housing
3c		consolidated, low density	< 100	housing
B² To be developed (urbanizáveis)				
1a	Residential	planned, high density	> 300	housing
1b		planned, medium density	> 100 < 300	housing
1c		planned, low density	< 100	housing
2a		not planned, high density	> 300	housing
2b		not planned, medium density	> 100 < 300	housing
2c		not planned, low density	< 100	housing
C Industrial (actividades industrial, de armazenagem e reparação)				
1	Workshops, storage		Industry and business	
2	Mining		salt and sand mining	
D Agriculture				
1	Agriculture		agriculture, animal husbandry	
E Main infrastructure				
1a	Transport	Railways	Railways, stations,	
1b		Roads	Roads, parking, stations	
2a	Services	Water supply	Reservoirs, plants, main lines	
2b		Drainage	Canals, pumping stations, outlets	
2c		Energy	High tension lines	
2d		Telecommunications		
F Ecological, parks				
1	Green areas		Parks, natural vegetation	
2a		Rivers, flood plains		
2b		Flood prone areas		
2c		Low lands		
G Services and special use				
1	Public, social services			
2	Special use			

Source: PEUMM, chapter 6, table 42.

1) mainly residential use with complete infrastructure 2) mainly residential use, infrastructure under development

Based upon the general assessment as described above the following (more or less) typical settlement types have been identified:

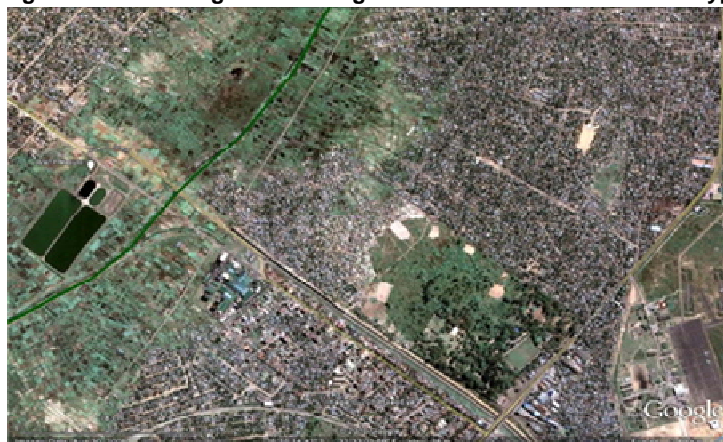
- A/ **Jardim – Inhagóia:** - Planned and semi planned – Low to medium density areas with substantial “urban agriculture”, mainly unpaved roads and poor water and sanitation facilities
- B/ **Chamanculo:** - Not planned – Medium to high density mainly under privileged areas with a mixture of residential, business and industrial areas. The south is developing into a business district
- C/ **Polana Cimento:** - Consolidated - Mixture of low density residential and business districts with paved roads. Wastewater collection via septic tanks and local drainage networks
- D/ **Polana Caniço:** - Planned - Western part, mainly underprivileged areas with unpaved roads. Eastern part, gradually changing into privileged high class settlements
- E/ **Maxaquene:** - Planned - High density under privileged areas with poor urban facilities and mainly unpaved roads. Potential for off-site sanitation to be connected to existing sewerage system.
- F/ **Hulene, 3 de Fevereiro:** - Planned and semi planned - Medium density residential areas in development with tendencies to grow. Limited water supply and poor sanitation facilities.
- G/ **George Dimitrov:** - Planned – Medium density residential areas with strong development along main roads. Limited water supply and on-site sanitation facilities

- H/ **Zimpeto, Magoanine**: - Planned – Fast growing residential areas with very limited water supply and on-site sanitation facilities. Areas used for resettlement of urban population
- I/ **Costa do Sol**: - Planned – Fast growing mainly high class residential areas with very limited water supply and on-site sanitation facilities. This area attracts rich people from settlement type “C Polana Cimento” who desire to live in villas and high class residences. Large areas are covered by mangrove forests.

Figure 2-2 Indicative Location of Typical Settlement Areas in Maputo City



Figure 2-3 Google Earth Images of the Identified Settlement Types



A – Jardim – Inhagóia: - Planned and semi planned – Low to medium density areas with substantial “urban agriculture”, mainly unpaved roads and poor water and sanitation facilities



B – Chamanculo: - Not planned – Medium to high density mainly under privileged areas with a mixture of residential, business and industrial areas. The south is developing into a business district



C - Polana Cimento: - Consolidated - Mixture of low density residential and business districts with paved roads. Wastewater collection via septic tanks and local drainage networks



D – Polana Caniço: - Planned - Western part, mainly underprivileged areas with unpaved roads. Eastern part, gradually changing into privileged high class settlements



E – Maxaquene: - Planned - High density under privileged areas with poor urban facilities and mainly unpaved roads. Potential for off-site sanitation to be connected to existing sewerage system.



F – Hulene, 3 de Fevereiro: - Planned and semi planned - Medium density residential areas in development with tendencies to grow. Limited water supply and poor sanitation facilities.



G – George Dimitrov: - Planned – Medium density residential areas with strong development along main roads. Limited water supply and on-site sanitation facilities



H – Zimpeto, Magoanine C: - Planned – Fast growing residential areas with very limited water supply and on-site sanitation facilities. Areas used for resettlement of urban population

2.3 Urban Structure Plan for Maputo City

2.3.1 Stakeholders

The Urban Structure Plan was produced by the Maputo Municipality, by the Urban Planning and Environmental Council, in partnership with the University Eduardo Mondlane. Its preparation involved more than two dozens of specialists from different areas including Historians, Geographers, Economists, Engineers, Agronomists, Mechanicals, Biologists, Environmentalists, Physical Planners and Architects.

The process of the elaboration of the Urban Plan involved public hearings which also included sessions with specialized groups according with the theme proposed for discussion.

The Plan was submitted to the City Council, and after approval by the Assembly hall (legislative) to the Central Government.

2.3.2 Status and objectives

The framework for spatial and urban planning in Maputo City is defined in the formally approved and endorsed Urban Structure Plan (PEUMM 2008). Key elements and objectives of this plan include:

1. The restructuring and development of 3 750 ha urban slums in the next 10 years;
2. Improvement of accessibility to: all urban areas, the business districts/centres of the city, and links to foreign countries, including the international airport of Maputo;
3. Assurance of the ecological balance and environmental quality;
4. Creation of new social and economical centers; administrative, commercial and recreational;
5. Densification of the urban areas – in order to decrease the cost of infrastructure and services;
6. Phased development of infrastructures and urban services up to acceptable levels;
7. Development of new well planned urban areas, which absorb the increase of the population including areas for social housing;
8. Promotion of the construction of social housing projects.

The costs for the re-development of about 3 750 hectares of existing slums in the next 10 years is estimated at about USD 75 million. The cost for the infrastructure, which will to support this activity (roads, drainage, water supply, sanitation, and public lightning) is estimated at USD 850 million. So far no detailed implementation and funding arrangements have been developed.

2.3.3 Key elements for spatial and urban development and current development trends

The Urban Structure Plan of the City establishes two main categories: i) urbanized areas and ii) areas to be urbanized. Annex F presents a number of key maps, which show the administrative boundaries (map 1) and current land use (map 9, source: PEUMM 2008).

Generally speaking “areas to be urbanized” are characterized by one family houses, poor or a total lack of urban infrastructure, and a lack of formal planning. These areas are in need of legal support to clarify future use, the demarcation and registration of plot boundaries and ownership in the municipal cadastre. This situation makes difficult the access to basic infrastructures such as water supply, sanitation and drainage. About 40% of the “areas to be urbanized” have formally marked plots but are still lacking access to the planned basic urban infrastructure. One of the priority strategic actions indicated in the Urban Structure Plan of the City is the restructuring and development of the informal areas in the “bairros”.

Currently the following types of development can be distinguished within the city:

1/ Consolidates areas (cement city)

Consolidated areas are fully developed from a urban development point of view, however in many areas the urban infrastructure is in a rather poor state of repair due to postponed maintenance. The consolidated areas represent about 5,5% of the total area of the city and are served by a conventional sewer system constructed in the 1980^{ies} in some “bairros” and septic tanks linked to the storm water drainage system in others.

2/ Planned areas, formally demarcated areas

Areas with houses (buildings) but no complete infrastructures, one floor houses, distributed in plots aligned in sand roads. The houses are normally made of masonry with zinc roofs and sometimes there is a mixture with reed houses with zinc roof. Normally, the houses are supplied with piped water on the yard or standpipes. In general, for these areas, the existing sanitation service is septic tanks financed by the owners. This type of development represents about 30% of the total area of the city.

3/ Not planned areas, not-formally demarcated areas

Areas with houses (buildings) but no complete infrastructures. The houses are disorderly distributed and in the densest areas there is no access to motorized vehicles. In general these areas are served with latrines (improved or traditional). The densest areas are the ones with the most sanitation problems and represents about 7% of the total area of the city. The whole non-formally demarcated area represents about 47% of the total area of the city.

Please note that a number of “bairros” are in a stage of transition and have more than one development type, some examples:

- Costa do Sol is composed of 3 different types of development within the same “bairro”, a medium density residential area (similar to the cement city) in the south part. It is also composed by a section with a formally demarcated area (close to Ferroviário) and by non formally demarcated areas with low population densities, these areas are not taken up for high class residential development. Moreover, Costa do Sol includes substantial areas with mangrove forest.
- Jardim has 2 different types of development, a big section of low to medium density residential areas with a substantial amount of “urban agriculture” and a small medium density formally demarcated area (close to Luis Cabral).
- About two thirds of Maxaquene B is composed of non-formally demarcated areas (high/medium density) and the other third of a formally demarcated section (medium density).
- Many “bairros” are composed of a formally demarcated area and a non-formally demarcated area (for eg. George Dimitrov, Bagamoyo, Ferroviário, 25 Junho)

2.4 Maputo Municipal Development Program (PROMAPUTO)

PROMAPUTO is the “*Programa de Desenvolvimento Municipal de Maputo*”. The program’s implementation period is 10 years (2007 to 2016) and it is co-funded by the World Bank and various other donors. Its overall objective is: “to increase the coverage and quality of the municipal services for the all city inhabitants”, through institutional strengthening and an improved financial capacity of the Municipality. Its three components are:

- A/ Institutional development and governance
- B/ Improvement of municipal finance
- C/ Improvement of urban services and service levels

The improvement of the quality and coverage of water supply, sanitation and drainage is included as specific objectives under component C.

The first phase of the program, which officially finishes on the 30th August of 2010, is financed by the World Bank and had a total cost of about USD 30 million. The focus of this phase is institutional capacity building. Further information related to this aspect is presented and discussed in the next chapter.

The second phase is estimated at USD 70 million and will be financed mostly by the World Bank (USD 50 million), USD 15 million will come from the municipal revenues and USD 5 million will be from the Mozambican Government. The main objective of the second phase is: construction and rehabilitation of urban infrastructure, mainly roads, sanitation and drainage systems. One of the major works of the second phase is the extension of the Julius Nyarere Avenue, that is interrupted, since the 2000 floods, exactly in the connection between the urban and the peri-urban areas.

3 **SANITATION GOVERNANCE, DESCRIPTION AND ASSESSMENT OF CURRENT SITUATION**

3.1 **Introduction**

Sanitation is regulated at four different levels and may be understood better through a view of its main contextual components. The legal and institutional contexts are examined initially through this prism to better understand the position of sanitation.

At the highest level the Constitution of the Republic establishes the citizens' and States main entitlements such as rights to a safe and healthy environment.

Adequate sanitation is a key instrument used to meet this entitlement. Key policies such as the Environmental Policy, the Territorial Planning Policy and the National Water Policy build on this constitutional right and provide specific objectives and strategies to achieve it. Each policy is translated into key legislation, such as the Environmental Law, the Territorial Planning Law and the Water Law, which lay down the standards and procedures for the implementation of the policies. Specific items are further elaborated in government decrees.

One particular aspect of sanitation is that it is implemented at the extremities of government administration. Sanitation (and water supply) is generally a local government or municipal service. Specific legislation defines the obligation of a municipality to be responsible for sanitation, making it the key agency responsible for ensuring the service is performed.

Specific policy decrees oblige municipalities to seek institutional and financial sustainability and define tariffs and loan limits within which such sustainability has to be achieved.

Finally, the concepts of the organizational structure of sanitation services has recently been driven by the need for service sustainability resulting in the decision to promote independent sanitation services. Acting as a commercial enterprise but being expected to recognise the limits of capacity to pay at various socio-economic levels, this technical service is proposed as a potentially economically viable management option. In Table 3.1 a schematic overview of the for sanitation relevant policies and legislation is presented.

3.2 **The Constitution**

The Constitution of Mozambique specifies the obligations and rights of the State and the citizen with regard to public health and the environment. Article 89 specifies that each citizen has the right to medical and sanitary services and must promote and protect public health. According to Article 90 every citizen has the right to live in a balanced environment and the obligation to defend it. The State and local government policies will defend the environment and guarantee rational use of all natural resources. Activities must be organised via territorial planning aiming at balanced socioeconomic development (Article 117).

3.3 **Policies**

The most important policies regarding sanitation are the Environmental Policy, the Water Policy, the Territorial Planning Policy and the Ministry for Coordination of Environmental Action's strategic plans covering the Integrated Management of Municipal Solid Waste and the Environment, and the National Directorate of Water's urban sanitation strategy plans.

The **Environmental Policy** (Resolution 5/95) establishes the basis for the incorporation of environmental concerns in human actions. Damage to the environment should be mitigated or avoided. Sanitation is one of the means to achieve this aim. In section 3.7.2, the Policy mentions the need to strengthen sanitation infrastructure and expand urban services to the peripheral areas. In the long run, it is expected that all cities are equipped with residual water treatment plants. The policy is also concerned with the economic sustainability of these services and states that tariffs should be based on the real costs of the service. The same point is also highlighted in the National Tariff Policy (Resolution 60/98) for water supply and sanitation.

Table 3-1: Schematic Overview of for Sanitation Relevant Policies and Legislation

	Rights and entitlements	Environment	Urban planning	Responsibility	Sustainability	Organizational structure
Constitution	Public health, housing	Balanced environment	Housing development with urban services	State and citizen	Sustainable development framework	State, privates sector and non government participants
Policy	Clean water, clean environment, good quality services reflecting the fees paid	Environmental policy aims at WWTPs in all cities	Protection of the rights of the citizens, public participation and polluter pays principle	Municipalities are responsible for sanitation	Tariffs should be based on real costs	Sanitation should be an autonomous entity with an institutional or contractual relationship with the Municipality
Legislation	Determines rules on sanitation responsibilities, services, enforcement and effects of non-compliance	Environmental impact assessment and procedures	Urban structure plans and sector specific master plans	Sector and Municipality responsible for different levels of policy and procedures. Both carry out the services, contractual services and enforce compliance	Cost recovery policies	Aim for separation of responsibilities and roles between rule definers, implementers and enforcers
Bylaw	Determines municipal level rules	Subject to environmental scrutiny	Legalizes approved urban plans	Municipal Assembly approves bylaws	Bylaws outlast changing post holders, though need political will from leadership to ensure implementation	Municipal council directorates and department officers implement bylaws and the council enforces compliance too.
Programme	Provides overall development framework	Subject to environmental scrutiny	Participatory approaches to urban planning plus integrated infrastructure upgrading	Municipal Council team and financing, strategic and implementing partners	Pilot projects test better ways of doing business before scaling up	Maputo Municipal Development Programme is engaged in institutional reform and capacity development

The Ministry for Coordination of Environmental Action (MICOA) produced in 2003 a **National Strategy for Integrated Management of Municipal Solid Waste** with aims of improving the standard of final deposition in Mozambique, the definition of minimum requirements for local conditions of the various municipalities for the construction and operation of landfills as well as the role of various institutions involved, in addition to clarifying licensing procedure for the different classes of landfill. It also outlines the procedures for the deployment and operation of landfills for municipal solid waste, from the selection of suitable sites, environmental impact assessment, construction and operation, land rehabilitation, closure and monitoring.

In 2004 MICOA clarified the strategic steps towards improved municipal management of solid waste in its **Strategic Plan for the Environment 2005-2015**, outlining the steps towards environmentally sustainable solid waste management activities.

The revised **National Water Policy** (2007) aims in the long term to increase sanitation coverage reaching about 67% of the urban population by 2017 so that it can meet the MDGs. It also aims to ensure that water and sanitation are delivered in an integrated fashion to households thereby permitting hygiene improvements. Operation, maintenance and management costs must be covered in urban centres through the application of fees and charges for sanitation and the improvement of the management of sanitation services (via appropriate regulating authorities).

The **Tariff Policy** (Resolution 60/98) states that tariffs and fees related to conventional sanitation systems (wastewater and storm drainage) must cover operating costs, maintenance and management. For low-cost sanitation the policy specifies that the method and manner of cost recovery will be defined locally.

3.4 Legislation

The **Environment Law Nº 20/97** identifies the 'polluter pays' principle in its location of responsibility on the basis of which whoever pollutes or in any way degrades the environment shall always have the obligation to repair or compensate the resulting damage.

The **Territorial Planning Law nº 19/2007** is designed to promote the rational and sustainable use of natural resources and the preservation of the environment through providing instruments for area planning to promote the quality of life in rural and urban areas, improve housing, infrastructure and urban service systems, public safety and reduce vulnerability to natural disasters or accidents. It makes spatial planning mandatory in urban areas and identifies the mechanisms for legalizing the various territorial organization plans.

Principles of public participation, awareness-raising about rights to information and equal access to land, infrastructure and services complement the objective of sustainable resource use. Other relevant objectives of the law are the reclassification of urban areas that have been spontaneously occupied, are degraded, or were occupation as a result of an emergency and, the management of conflicts of interest via agreement between the parties that must always ensure the occupancy rights of local communities are respected.

Where damage or degradation occurs in a territorial area that may affect environmental sustainability, the public or private entity responsible is required to repair such damage and pay compensation for damage to the quality of life of affected citizens. The law clarifies channels for appeal by citizens with justified claims against the use of spatial planning instruments, the rights of all citizens to information including planning cadastre and process details, as well as their rights to participation in production and implementation of plans.

The **Water Law** (Nº 11/97) establishes (Article 25) the powers of local authorities to include sanitation. Article 35 specifies that local authorities may set up autonomous services or public enterprises to meet community needs and when this is most efficient solution.

The **Municipal Framework Law 2 / 97** defines the responsibilities of various municipals organs and gives the City Council the responsibility to set tariffs for public services, including conservation and wastewater treatment. The law makes municipalities responsible for the environment, basic sanitation and quality of life in these urban areas. It provides for the autonomous operation of municipal services or sector and the creation of municipal companies and participation in private companies with demonstrated public interest objectives and for support of NGOs with similar interests. It also provides for the making of bylaws and establishing tariffs for its own sanitation, solid waste and water supply services.

The **Municipal Finance Law nº 11/97** gives municipalities the power to prepare and approve general and detailed land use plans, urban development programs, and land development schemes, in collaboration with relevant central government bodies. Enforcement of such plans is subject to ratification by the government.

Law n.º 8/97, defines the special regulations that guide the **organization and function of Maputo Municipality**.

3.5 Regulations

In 2004, the National Directorate for Municipal Development was created in the Ministry of State Administration with responsibilities to monitor, assist and encourage local authority development among others. Also in 2004 the **Regulations of the Organization and Functioning of the Technical and Administrative Services of Municipalities** were approved through Decree No. 51/2004.

This Regulation provides the principles of good governance and management and stipulates that the municipalities should organize their administrative and technical services in areas of activity, specifically:

- a) Municipal management, legislation, regulations and bylaws;
- b) General administration, finance, property and supervision;
- c) Urban development, infrastructure, housing, sanitation and environment;
- d) Education, culture, leisure and sport;
- e) Documentation and archiving;
- f) Health and social action;

The **Regulation of Public Distribution Systems Water and Wastewater Drainage (Decree 30/03)** is a set of technical provisions for public distribution of water, and public drainage of waste water. The Regulation also includes provisions with reference to the establishment and operation of public systems of water supply and sewerage, and safety, hygiene and health at work during the operation.

The **Urban land use planning decree (77/2006)** regulates urban structure plans, general and partial urbanization plans and detailed land use plans. The various types of urban plans are hierarchically organized and legally regulate land use once approved at local level, ratified by the Minister of Local Government and published in the Government Gazette.

An urbanization plan focuses on urban uses and functions and defines service needs with special attention to the areas of spontaneous occupancy. Planning is participatory and consultative. It uses a social-spatial information baseline drawn from consultation with interested and affected parties in government and in the planning area for decision-making. The results are publicly disclosed prior to approval and a public hearing organized to assemble feedback. Urbanization is a progressive process and the plans reflect this insofar as urbanization services, infrastructure and occupation are improved and upgraded over time.

Decree 15/2000 describes the articulation of local state authorities and community leadership mainly in rural areas through local councils and legitimises community leaders - traditional leaders and neighbourhood (bairros) secretaries. It gives them powers under Art. 24 of the Land Law to participate in conflict resolution, represent community opinions on applications for land, and identify and delimit community land.

3.6 Municipal Bylaws

In 2001 a municipal bylaw concerning cleaning of the city and permitting the participation of the private sector in solid waste collection and management was approved and implementation began on a small scale soon afterwards.

The introduction of a municipal cleaning tax charging in 2004 for solid waste collection services allowed for the scaling up of services and broader participation by the private sector and micro enterprises in service provision.

A municipal bylaw concerning the use of the public sewerage and storm water drainage system that also set the **level of a tax at 10% of the value of water consumed** stipulating collection through water bills was approved in 2001 but has not yet been implemented. This delay is largely due to the delay in finalizing and approving sanitation tax regulations.

3.7 Maputo Municipal Council – Municipal Development Program - PROMAPUTO

In 2007 Maputo Municipality began implementation of a 10 year Municipal Development Program called PROMAPUTO in which improvements to its institutional capacity, service quality and coverage and

infrastructure are planned. The programme is financed by the World Bank and various other banks and governments in a broad programme aiming at long term improvement.

Institutional reforms are being facilitated by PROMAPUTO and mainly financed by the World Bank. These have seen the reorganization of departments and services aiming to achieve better efficiency and effective service provision and integration. Figure 3.1 shows the outline of the restructured Maputo Municipal Council.

The Municipal Directorate of Infrastructure has been restructured and is now responsible for ensuring the overall development, operation and maintenance of infrastructure and services in various fields such as transport, water and sanitation, urban development, construction, parks and gardens.

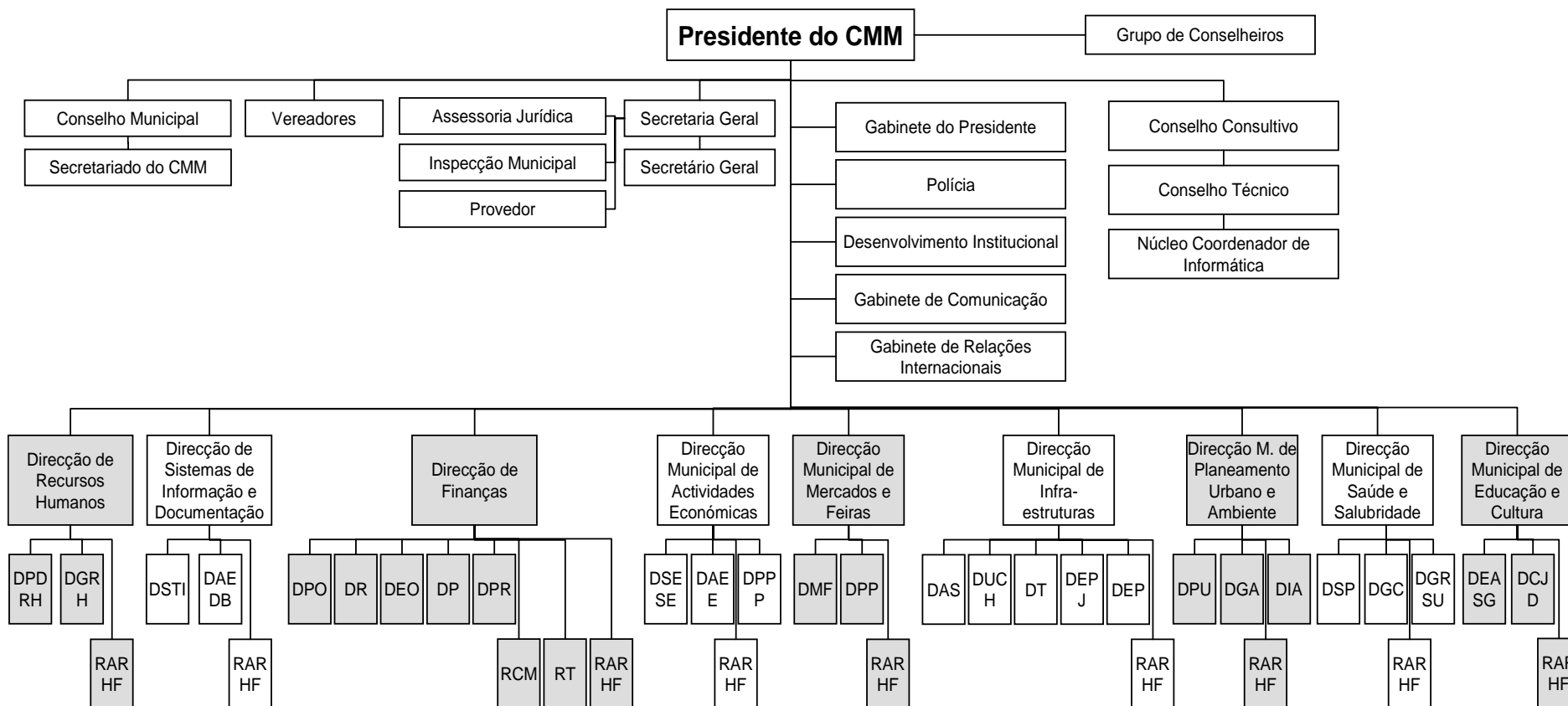
The Water and Sanitation Department is part of the Infrastructure Directorate and is responsible for:

- Ensuring strategic guidance in the provision of water services at the city level, defining rules for coordination with the institutions and operation of the Delegated Management Framework (CRA, FIPAG, and AdeM).
- Ensuring greater coverage of water supply, particularly in suburban areas through the creation of small systems, defining the legal framework and regulation of private water supply providers.
- Developing plans for development of water services and sanitation and ensure their adoption and implementation.
- Managing the operation and maintenance of sanitation systems, ensuring the protection of decentralized and de-concentrated orientation activities.
- Ensuring the sustainability of sanitation services through fees providing cost recovery.

Through PROMAPUTO it is expected that the planning and service delivery of solid waste, water supply and sanitation and drainage are improved through interventions that are part of an overall strategy that will increasingly characterize the Municipal Council's actions over the next seven years:

- Ensuring service delivery in response to citizen demand.
- Improving governance to increasingly align municipal programs and initiatives with the priorities expressed by citizens and civil society.
- Improving efficiency and communication and working conditions for municipal personnel.
- Deconcentration of selected municipal functions and services; strategic planning and monitoring to align resource use with priority policies and objectives; improved communication between the CMM and civil society; increases in the transparency and legality of CMM decisions, activities, and resource use; and promotion of greater private sector investment and of private sector partnerships with CMM for the provision of public infrastructure and services.

Figure 3-1 Outline of the Restructured Maputo Municipal Council



It is expected that municipal residents will increase their role in the sustainable management of municipal resources and in the planning and development of economic activities. The main mechanisms to achieve these goals will be:

1. Development of legal instruments and a Structure Plan which involves development of plans for urban and territorial development, ecological zoning and a sanitation and drainage masterplan via consultative processes, and improving support for a restructured land use allocation process.
2. An integrated approach to development planning focusing spatially at neighbourhood level that will facilitate reordering and upgrading services, housing and infrastructure through a consultative process and voluntary resettlement.
3. A crosscutting communication strategy will guide provision of timely and relevant information aimed to engage people in the management of their urban environment and to enhance their participation in municipal governance. Development and dissemination of accessible messages regarding municipal policies, programmes and regulations as well as the rights and responsibilities of citizens and municipal officials.
4. Improved information flows between the CMM and key local political officials, including members of the Municipal Assembly, Municipal Districts and Neighbourhood Secretaries, expected to improve the consistency and quality of municipal policies and their implementation.
5. The capacity of municipal citizens and community-based institutions to articulate their concerns and to contribute to municipal planning and budgeting will also be strengthened, progressively linked to CMM's decentralization process as the roles of district and neighbourhood structures are gradually enhanced.
6. Cooperation and coordination between the CMM and key public sector actors will be strengthened to support better service delivery.

Key issues aiming to encourage sustainability based on greater involvement of resident of the City in service improvements:

- Focusing on systematic communication to gain greater participation in sub-municipal governance, and broad-based buy-in by municipal stakeholders to help sustain political commitment.
- The use of participatory spatial planning that links governance reform with the gradual deconcentration of selected services to the districts and permits the reordering and upgrading of selected neighbourhoods through a more integrated development approach.
- The decentralization of some very basic functions to the Municipal Districts in order to improve efficiency and accountability as well as build capacity at these levels for more effective collaboration between citizens and their local authorities.

Specific actions and strategic lines are being assumed by the Municipality through its development in terms of PROMAPUTO:

- 1/ To increase the quality and range of solid waste management services, the Programme considers the following assumptions essential to development:
 - The costs must take into consideration improvements in service delivery
 - Revenue from the solid waste tax is retained for use in the service
 - Social equity is considered in the cost / benefit evaluation of public services
 - Flexible administration
 - Political will
 - Availability of equipment and trained personnel
 - The new landfill is financed
 - A strategy is defined civic education and increase civic awareness of the citizens
- 2/ Sustainable and efficient solid waste management development will focus on capacity building and solid waste removal activities. These will include:
 - Implementation of a revenue system that meets the needs of the sector;
 - Reorganization and strengthening institutional capacity of the sector and gradually decentralizing the management of solid waste to the Municipal Districts;
 - Adjusting the human resources to meet the requirements of such decentralization;
 - Acquisition and maintenance of facilities and equipment necessary for the services (eg trucks, tractors with trailers appropriate containers, protective equipment, ...);
 - Private sector management of municipal solid waste;
 - Construction and rehabilitation of the premises of the Directorate.

For the final disposal of solid waste in an environmentally acceptable way a new land fill will be constructed and the management and closure of the old one carefully managed. The role of small scale private operators, CBOs and informal sector is considered in the planned development of a framework for recycling and reuse of solid waste and in awareness raising and education concerning solid waste management.

Regarding the Municipal aim to increase the quality and coverage of sanitation systems and drainage it first requires the existence of a sanitation masterplan, households' willingness and ability to pay for services, community organization and participation and the availability of water supply services. Thus, focusing on the different sanitation systems and services in the city the main activities planned for the next seven years or so will include:

- Latrine construction in peri-urban areas based on agreements with NGOs and beneficiary communities, training communities to implement the activities, construction and maintenance of latrines, monitoring and health education, acquisition of suction equipment for emptying latrines, outsourcing the collection, transport and final deposition of waste.
- In the area covered by or close to the main drainage system, the CMM aims to increase public connections to the main collector (and later to the creation of secondary and tertiary systems in the basins) so that there is enough flow for the operation of the residual water treatment plant will be achieved through consultants' hired to plan projects, inspection carried out through hired services, contracting and realization of works, maintenance and conservation. Accompanying the connections, the wastewater collection network will also be expanded and the waste water treatment plant expanded.

Using the principle of "polluter pays" and assuming that the CMM takes up its responsibilities in the environmental area it is expected that a strategic plan for urban environmental management is developed and implemented, and the legal framework for better control and reduce environmental pollution established. Within this area the CMM also expects to reduce informal settlements, particularly in coastal areas, through environmental mitigation measures and redeveloping areas with spontaneous settlement, rebuilding eroded infrastructure and transferring households and economic activities to new areas.

It is clear that the CMM recognizes the importance of integrating water supply and sanitation, since its water supply coverage goals presuppose a plan for re organization of peri-urban areas and the implementation of a suction system for latrine emptying among other pre-conditions.

3.8 Institutional Assessment of Sanitation Services in Maputo City

Responsibility is institutionally placed in the National Water Directorate (DNA). Leadership and commitment to sanitation sub-sector development are slowly improving as funding becomes available through multilateral institutional support and the MCC for example.

Responsibilities for policy on sanitation in Maputo City are institutionally distributed between the DNA and four other public bodies:

1. Environmental Health Department (Ministry of Health) has a clear policy on water quality and sanitation standards;
2. The Health and Environmental Health Directorate (DMSS) supervises the Urban Solid Waste Management Department – Maputo Municipal Council (CMM) and is responsible for solid waste collection and management, it also developed a bylaw and regulations for city cleaning and a cleaning tax.
3. The Municipal Infrastructure Directorate supervises the Water and Sanitation Department (DAS) - CMM which is responsible for urban water and sanitation management. Storm water drainage, wastewater management and implementing the de-sludging of septic tanks (direct service provision and sub-contracting private sector). The Directorate has developed a bylaw on the use of the public sewerage system.
4. Drainage Office - DNA responsible for regulation of use of the wastewater treatment plant and management of the main drains. The Office is in the process of being transferred to the CMM and has encountered many difficulties that are delaying finalization.

Relations between the water sector, sanitation sub-sector and municipal sanitation directorates are still weak with overlaps and gaps in policy and practice.

Multi-stakeholder working groups established immediately after the 2000 floods to coordinate emergency sanitation and drainage rehabilitation were led by the then Municipal Directorate for Water and Sanitation (DMAS) and the Municipal Directorate for Environmental health and Cemeteries (DMSC) of the Maputo Municipal Council. The groups were initially facilitated by NGOs that continued support through to 2003. After NGO withdrawal the working groups also ceased to operate.

Sanitation services are currently provided by three of the policy setting institutions as well as private sector actors and CBOs. A key actor is the resource-scarce Maputo Municipal Council which implements directly in a limited fashion and at the same time contracts private sector and legalised CBOs (associations and micro-enterprises) to extend its reach to carry out sanitation and solid waste management services. A summary of the responsibilities of the various sectors and agencies within these is shown in Table 3.2

Table 3-2: Urban Sanitation Sector Responsibilities

Responsible Agency	Responsibilities	Coordination	Observations
Environmental Health Department (Ministry of Health)	Sanitation & potable water quality. Law on potable water follows WHO standards.	With DNA and Municipality in response to impending or actual crises, cholera/malaria	Policy is clear on recommended water quality & sanitation standards. Application is not systematic at local level.
Local urban health units (CMM - Maputo Municipal Council)	Primary health care and health education.	Coordinate in emergencies	Carry out some water sector staff training
Drainage Office (DNA)	Regulation of use of the wastewater treatment plant and regulates management of main drains in Maputo. Operation and maintenance of Drainage System Two.	Closest coordination is with DAS but current transfer to CMM is complicated by historical differences.	Should also collect a fee for private operators' use of the wastewater treatment plant, but it does not.
FIPAG Water Assets and Investment Fund (DNA)	Urban water supply investment and water assets management.	Working group includes: DAS, NGOs, regulator -CRA, and operator - AdeM.	Led the working group focus on public water supply for the poor and on strategy development for commissioning the new distribution centre in Laulane in terms of mitigating impacts on small private operators.
Environmental Health Directorate (DMSS - Maputo Municipal Council - CMM)	Solid waste collection and management. Developed a bylaw for city cleaning and a cleaning tax.	Solid waste working group, with NGOs and CBOs. Not met since mid -2004.	Systematic capacity building and institutional support from GTZ with some facilitating support from CARE contributed to improving legal environment. Manages private sector operator contracts & is involved in solid waste management throughout the city
Water and Sanitation Department (DAS) Infrastructure Directorate (CMM)	Urban water and sanitation management. Storm water drainage, wastewater management and de-sludging of septic tanks (direct service provision and sub-contracting private sector).	Sanitation working group, with NGOs. Not met since early 2004.	Approved drainage system, uses bylaw (2001) but no political will to implement it. Expects to finalize a sanitation tax framework soon. Many partners in past. DAS is supposed to authorise the entry of private sector operators into the market for emptying septic tanks, but has little information about the activities of the private sector or its relationships with clients. Little control over emptying of tanker trucks at the WWTP.
State Buildings Administration	De-sludging of septic tanks.	With DAS	Performs task for its own public buildings.
Private sector & community associations.	De-sludging of septic tanks.	With DAS	Coordination is very weak. Community association depends on DAS to empty its holding tanks.
Private sector, Community associations & Micro-enterprises	Solid waste collection.	Contracts with DMSS	Fairly well organised contracted support for DMSS from private sector and CBOs.

3.9 Assessment of Current Sanitation Governance

3.9.1 Institutional constraints

Maputo Municipal Council has few resources and limited implementing capacity. It is in a transitional period where it still implements directly and at the same time contracts private sector and legalised CBOs (associations and micro-enterprises) to extend its reach.

Maputo Municipal Council has a few NGO partners, and although community-based organisations have been operating for some years in the city's neighbourhoods, few are legally recognised or organised efficiently and effectively enough to strengthen Council outreach to the neighbourhoods.

Relations between the water sector : sanitation sub-sector : municipal sanitation are weak.

3.9.2 Influencing Urban Sanitation in Maputo – Lessons learned from the 2000 Floods

Coordination and Policy Development through Working Groups. - Working groups were established immediately after the 2000 floods to coordinate emergency sanitation and drainage rehabilitation inputs from various agencies. These were operated led by Maputo Municipal Council's directorates for Water and Sanitation (DMAS) and for Environmental Health and Cemeteries (DMSC). Their emergence was facilitated by NGOs facilitating rehabilitation at that time, and continued with their support through to 2003. Major achievements included the development of solid waste management and sanitation services bylaws and regulations concerning fees and taxes.

A higher level working group focused on the development of public water supply for the poor. The water supply working group drew participants from the delegated management framework for water supply (the government assets owner and investor FIPAG, the water supply regulator CRA, the private water company Águas de Moçambique - AdeM, and the NGOs operating in the sub-sector).

The working group approach drew together participants from different levels and disciplines to work out viable solutions to the myriad of problems facing them during and after the floods. They also showed their merit by continuing beyond the emergency phase to become means of creating and organising implementation of local policy measures and pilot activities to improve water, drainage, solid waste and on-site sanitation management.

The greatest steps forward seem to have been reactive. Since the floods, cholera outbreaks have been the main instruments to bring the health and water sectors together. In addition, when public health was threatened by accumulated solid waste as a result of poor management of private sector solid waste collection contracts, working groups coordinated mobilization of communities into groups to clear solid waste accumulations and the initiation of local-level house-to-house services.

Between 2001 and 2004 Working Groups permitted coordination and the establishment of:

- a pilot project to institute a new management model for public standpipes,
- introduction of pre-paid technologies for public standpipes,
- a municipal bylaw concerning cleaning of the city and permitting the participation of the private sector in solid waste collection and management,
- the introduction of a municipal cleaning tax charging for solid waste collection services,
- a municipal bylaw concerning use of the public sewerage and stormwater drainage system that also set the level of a tax at 10% of the value of water consumed stipulating collection through water bills,
- operation of authorised private sector companies to participate in the removal of excreta from septic tanks and collection of solid waste from large containers distributed through the city,
- pilot activities to test small-scale initiatives to remove waste from latrines and septic tanks in densely populated neighbourhoods inaccessible to conventional trucks,
- formalisation and operation of micro-scale initiatives contracted by the council to collect solid waste in the densely populated neighbourhoods inaccessible to conventional trucks and,
- the drafting of sanitation tax regulations.

3.9.3 Summary analysis of legal and institutional framework status

Urban sanitation management - The legal and institutional framework for the management of urban sanitation is well established and structured so that it can provide a basis for coordinated action of public, private and community stakeholders. Regulatory instruments and the underlying policies clearly set out a framework for action and the roles of the various institutions and agents. Technical regulations for conventional solutions to storm water drainage and waste are also well developed, though not for non-conventional systems.

Maputo Municipal Council has developed a sanitation bylaw identifying fees and the mode of calculation regarding its application. However this has not yet been applied for almost eight years due to a) a lack of investment in improving the collector network and encouraging new connections and b) uncertainty about the modalities for introducing the fee into water supply bills so that the resulting levels comply with the regulator's requirements for maintaining monthly costs below a certain ceiling and also avoiding political opposition.

Institutionally, the regulatory framework favours centralized management by an autonomous entity. The relationship between the municipality and the regulator CRA is not well clarified. Although policy clearly points to the autonomy of sanitation services, and to the central role of State investments in infrastructure and the sustainability of operations, the transition process from the municipality as the operator of the service to entirely autonomous services is not clearly defined.

Solid waste management - The legal and institutional framework for the management of municipal solid waste is clear and better established than the sanitation services with policies and in Maputo, bylaws that are being implemented providing guidance on coordinated action by public, private and community actors. The legal instruments outline clear definitions, goals and means to achieve them as well as the range of rights and obligations.

At the institutional level, the basis for action is the principles and regulations established by MICOA. Local authorities are bound to the government through mandatory instructions on the subject and are functionally dependent on authorization of management plans and necessary environmental licenses. Local authorities are also subject to review by the government regarding environmental pollution.

Local authorities thus have a dual role: they have some regulatory powers over the services and local actors, but CMM like most other municipalities are still operators in the removal, transport and disposal of waste and are subject to the obligations and restrictions provided in the legal framework.

Management of Urban Autonomous Services - The legal framework for municipal authorities supports the creation of autonomous services or municipal public enterprises as well as the participation of municipalities in the capital of private companies with the restriction that they pursue objectives of overriding public interest.

Creating sanitation services managed according to business rules is effectively endorsed in the municipal legislation.

Plans for establishment of the autonomous services in Maputo are currently focused on establishing an initial nucleus with a technical professional Executive Director (indicated by the President of the Municipal Council) and members recruited publicly and competitively who will be included into the technical career structure so that remuneration is competitive with the private sector.

The CMM expects in the short term to establish a nucleus that can then be legalized institutionally as an autonomous entity which will operate via programme contracts and regular performance evaluation. In the medium term it is expected to include solid waste management into the scope and responsibilities of this entity, and finally once sufficient capacity is established, water supply.

4 CURRENT SANITATION AND WATER SUPPLY CONDITIONS

4.1 Development status, Sanitation conditions and Options for immediate improvement

1/ *Formally Demarcated, Consolidated and Planned Areas*

With exception of the service area of the existing sewer network, these areas are normally served with septic tanks. In the southern sub-districts (bairros) of the city the effluent of the septic tanks is discharged into the underground storm water drainage networks in the other areas the effluent is discharged in local drains/stream or infiltrated into the sub-soil. Main problems encountered are:

- Postponed maintenance of the sewer and drainage networks which results in operational problems and inefficient discharge of raw and semi treated (effluent of septic tanks) sewage;
- Deficient construction and/or maintenance of septic tanks (non compliance with existing standards) results in overflowing of septic tanks and the discharge of raw sewage in local drainage networks and open streams;
- Lack of sufficient/ adequate services for desludging of septic tanks; desludging is mainly done manually and in many cases untreated sludge is dumped anywhere, which represents a public health risk.
- Existing desludging services, if locally available are relatively expensive.
- Sludge collected by the few public and private service providers is discharged at the existing WWTP, which is located far away from the urban areas, which contributes to the high cost of the services.

In order to mitigate the immediate problems and issues it is suggested to: i) focus on the promotion of the construction of proper septic tanks (as per standard), ii) promotion of efficient desludging, collection and disposal/treatment of sludge preferably to be done by well equipped and licensed small private operators, iii) introduce and enforce an adequate tariff system for the use of the existing sewer networks as to ensure that sufficient budget will become available for regular and postponed maintenance.

On the medium to long term the implementation of additional local sewer networks, which can be connected to the existing main sewers should be taken into consideration. For areas which cannot be connected to the existing main sewers in the long term the implementation of local sewer networks and decentralized treatment facilities should be considered

2/ *Not-formally demarcated areas, Un-planned areas*

These areas have the worst sanitation conditions and are generally characterized by:

- Precarious houses;
- No water supply in the house. Normally the population obtains water from the neighbors or through standpipes;
- Lack of space between houses, houses are disorderly distributed;
- Tight accesses between houses which does not allow for the passage of motor vehicles;
- In general excreta facilities consist of latrines (traditional and improved);

Main problems in these areas include:

- Limited number of latrines
- Collapse of latrine pits and superstructure due to rain
- Lack of space to build a new latrine when the old latrine is full (in densely populated areas)
- Lack of adequate technology and construction skills, specifically in areas with a high groundwater table
- Difficulty in the implementation of desludging services due to the lack of accessibility for the vehicles (in densely populated areas)

In these areas at least for the short-term the emphasis should be on low-cost, private and communal solutions, which are affordable and achieve and immediate improvement of current sanitation service levels. Medium to long-term solutions can be considered once the areas are structured and the overall urban infrastructure has been improved.

4.2 Existing Water supply, Drainage and Sewerage Infrastructure

4.2.1 Water supply infrastructure and service levels

The lay-out of the “Greater Maputo Water Supply System” developed under the responsibility of FIPAG and operated by Aguas de Mozambique (AdeM) is shown in Figure 4.1. AdeM operates the water supply system under a concession which ends in 2014.

Please note that within the study area four Distribution Centers (DC) are located; i) DC Chamanculo, ii) DC-AltoMaé, iii) DC-Maxaquene and iv) DC-Laulane. Each distribution center, which supplies water to its local service area is supplied with treated water via a transmission main and consists of a water tower, reservoirs, filling facilities for water tankers and other facilities. The above mentioned DCs provide water to the southern bairros of Maputo, the northern bairros are not yet incorporated into the *Greater Maputo Water Supply Service Areas*, as a rule (limited and irregular) water supply services are provided by so-called POPs (small private operators) to the northern bairros.

The installations and services provided by the POPs vary greatly from bairro to bairro, see also the pictures below. The services provided range from the provision of untreated water from a local shallow well up to piped water supply. As a rule, POPs provide also water to local water sellers. In the central bairros of Maputo the formal and informal re-sale of water supplied by AdeM is quite common. Recently the national water regulator (CRA) has started a pilot to legalize the resale of water provided by AdeM in three bairros (Chamanculo C, Unidade 7 and Aeroporto B).

The current concession of AdeM runs until 2014, the national and local government entities (CRA, FIPAG, others) are currently in the process of studying alternative solutions for water distribution and resale. One of the options under consideration is the sub-division of the *Greater Maputo Service Area* into smaller distribution units which will be operated by professionally and legally established POPs. If this options is selected treated bulk water will be sold to these POPs who will distribute and sell water to the end-users. This option if implemented after 2014 it will create a great opportunity for these POPs to provide in addition to water supply services also specific wastewater management services.



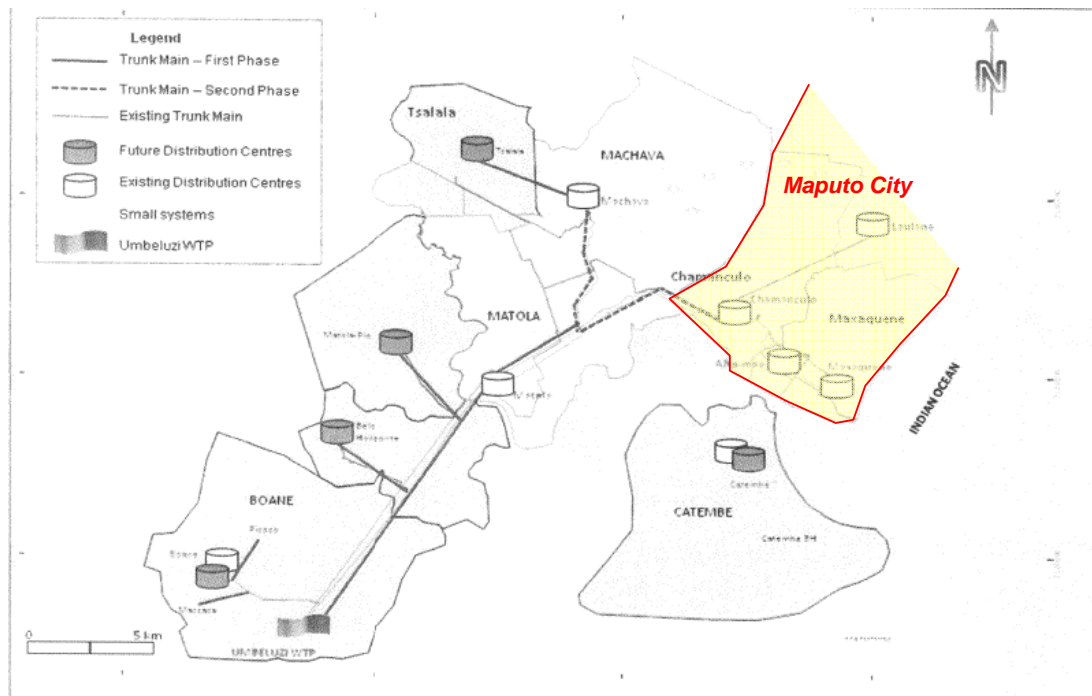
Water supply services and installations operated by POPs (small private operators) in the northern bairros of Maputo.

The services include resale, sales of ground water extracted from shallow wells and the provision of piped water supply from local sources (bore holes).

Main issues related to the services provided include: i) water quality and related impact on public health, ii) the cost of water, and iii) sustainability of the local groundwater resources



Figure 4-1 Greater Maputo Water Supply System - sources FIPAG



4.2.2 On-site wastewater management systems

Approximately 56% of the population of Maputo city uses on site sanitation, most of them use latrines. As a rule on site systems in Maputo comprise:

- Septic tanks connected to the drainage or sewer networks
- Septic tanks connected to infiltration pits/drains or with any other final disposal
- Improved latrines and traditional latrines
- Grey (sullage) water disposal into open local drains or infiltration pits located on the household's yard

According to estimates of PES (Maputo Strategic Plan – Lameheyer, 2004), probably 15 to 30 % of the total population has no access to improved facility for excreta and wastewater disposal. There is a need to extend the coverage of sanitation for the areas where the minimum level of acceptable sanitation service is not yet available and to improve/optimize and maintain the existing sewer facilities in other areas. Grey (sullage) water is normally disposed of into local drains or in shallow infiltration pits located on the household's yard, see the picture on the next page.

Collected sludge from septic tanks is brought to the Infulene treatment works and discharged into one of the anaerobic ponds. Desludging and cleaning services for septic tanks is offered by various institutions and private companies such as the Directorate of Water and Sanitation, DMAS, Maputo Drainage Office, APIE and private companies (ADASBU, Life, Sr. Fossa, etc).



Maputo: on-site sanitation
 Local infiltration pit for grey (sullage) water,
 Improved and Traditional latrines

4.2.3 Off site sanitation: Down-town Maputo – Cidade de Cimento

Current and planned coverage according with the Strategic Plan of Urban Sanitation (PESU 2006) is presented in table 4.1.

Table 4-1 Estimated Sanitation Coverage in Down-town Maputo

	2006		2010 – reality		2015 – planned	
	Population served	Coverage percentag	Population served	Coverage percentage	Population served	Coverage percentage
Septic tanks, mainly system I	179 170	14	265 000	20	355 109	24
Sewer network, mainly system II	135 000	11	50 000	5	164 000	11

System I – Combined storm water and wastewater collection system

This system is the oldest in town, it covers roughly the part of the cement city south of Eduardo Mondlane Avenue (Lower, Bairro central, Malanga, etc.) and includes storm water drainage for this areas.

Storm water and effluent from septic tanks is collected in underground pipes whose diameters are increasing towards the downstream discharge points. Discharge points are located all over the area and discharge untreated storm and wastewater flows directly in Maputo Bay, see the picture on the next page. Some of these discharge points in the Bay, are located at very low level. Consequently at times of high tides water from the Bay inundates the lower areas of down town Maputo.

A quick scan of the situation of system I shows that:

- Given the increasing impermeability of the urban areas, which is due to the ever-increasing urbanization of Maputo the system does not respond anymore as far as its peak drainage capacity is concerned. The system should be re-dimensioned.
- The majority of rainwater entry points (gutters) are blocked by dirt, solid waste, plastic bags, etc. Thus even during heavy storms the system is not used to the limits of its capacity. During heavy rain storms water runs down the asphalt roads as the water cannot enter the drainage network. Surface runoff during storms and stagnant water in potholes and low lying areas are the main reasons for the degradation of the roads
- The manholes of the systems do no longer have covers and do not fulfill their function. In many cases manholes become “dust bins” used by urban residents and even worse garbage is coming gradually into the pipes and contributes to the blockage and degradation of the system
- There are not many cases where the underground pipelines are in a poor condition (they are usually of concrete and very strong). This is a positive aspect that indicates that the system after cleaning and rehabilitation could still be used
- As far as the quality of drainage and wastewater is concerned the situation is getting worse year after year and at critical points some kind of (primary) treatment will be required in the near future.



Sky-line of Maputo – “Cidade de Cimento”



Untreated discharge into Maputo Bay

System II – Wastewater collection and treatment system

The existing "Sewer Network " refers to the so-called System II. The sewer network was built in the 80's and represented at that time a leap forward. As before the construction of system II practically all households in *cidade cimento* used septic tanks in combination with open drains and the environmental health conditions became almost unacceptable.

At the time of design and construction the system was known as the Public System for Wastewater Management. Given its characteristics (underground pipes which do not give mayor problems), nowadays it is little known by the public in general. The most important infrastructure elements of System II are:

- *Pumping station (EEAR1)* - located near the Polana Hotel along the hillside. EEAR1 collects wastewater from the *Polana Cimento* area,. it pumps water to a second pumping station downstream (EEAR2).
- *Pumping station (EEAR2)* – this station is larger, located on the corner of the Rua do Arcebisado with Julius Nyerere Avenue, and collects not only wastewater from PS-EEAR1, but also wastewater from bairro Sommershield. From this station, waste water flows under gravity to the WWTP which treats the collected wastewater in lagoons/ponds system. The WWTP is located in the Infulene river basin just outside the boundaries of Maputo city.

- *The Infulene WWTP* - where the city's wastewater is treated and then transported to and discharged into Maputo Bay
- *Automatic regulator gates* In the down stream section of the Infulene river - Water from the stormwater system of System I (basin A) joins the effluent flow from the WWTP and cross the N4. The automatic regulator gates, which are not visible from the road are constructed to prevent the entry of water from the Bay into the river during high tides.

Unfortunately the two pumping stations are already a couple of years out of operation, which causes a lot of problems in the upstream services areas of the sewer network. To minimize the problem of the bad odors in the vicinity of the pumping stations, currently sewage trucks transport wastewater directly to the lagoons (ponds) for treatment.

The WWTP/lagoons (ponds) were recently rehabilitated. The lagoons (ponds) fulfill an important role – they are the only spot in town where septic sludge and wastewater can be deposited and treated in an environmentally sustainable way.

Due to the poor state of repair of the pumping stations and a lack of house connections only wastewater from the bairros COOP and Malhangalene are currently discharged (by gravity) into the WWTP. As a result the WWTP is under used, which hampers its proper functioning.

4.2.4 Main Storm Water Drainage Networks

Basin A - In the 80^{ies} a system of open channels was built, in order to provide adequate drainage to the southern areas of Maputo; the so-called *lake zone* involving especially poor neighborhoods which today are called the *old zone*.



*Chamanculo - Basin A
 Secondary storm water drainage channel*

The main channel of this storm water drainage system runs along the Joaquim Chissano Avenue, and includes a system of secondary channels drains for this area. This storm water drainage system discharges directly into the Infulene river through a rectangular open channel.

Due to the deterioration of the political-military-economic situation in Mozambique at that time it was not possible to construct the tertiary networks. However, they were planned and in most areas space had been reserved for future tertiary drains. However, in the years after the civil war in some “bairros” the number of houses almost doubled and much of the limited space still available for future roads and drains was disorderly occupied by huts and other buildings.

Other storm water drainage systems

Events and problems in the past years with the combined system (System I) show clearly that “*postponed maintenance*” of drainage networks has a very negative effect on adequate drainage and the condition of the roads in the urban areas of Maputo.

Some of the problems are related to malfunctioning gutters or blocked underground drainage pipes. Multiple ruptures of Julius Nyerere Avenue, after heavy rains did occur since the 80's and resulted eventually into a full rupture after the heavy rains of 2000. Until then Julius Nyerere Avenue was one of the two exits roads to the north of Maputo and the country. Until now the interruption of the Julius Nyerere Avenue has not been remediated.



4.3

This photograph illustrates issues as indicated above: small roads where storm water lasts for several days even after moderate rains.

Seven Cities Sanitation Strategy Study, including Maputo (2004)

Background and key recommendations - In 2004 a Sanitation Strategy for 7 cities, including Maputo (and nearby Matola) was completed. In one way or another, both the Municipality Council of Maputo and DNA are still trying to implement the recommendations and priorities indicated in this study. The Strategic Plan for Maputo included several aspects that are still valid:

- It was recommended to associated sanitation development with the development plan for Water Supply Networks up to 2017 as prepared by FIPAG. The logic was (and is) that 70 to 80% of water supplied turns into wastewater, which subsequently needs to be collected and treated;
- The municipality must *promote and enforce the decommissioning of septic tanks in the potential service area of the existing sewer networks (System II) by 2017* and ensure that in this area all houses and business will be connected to the existing sewers. This, between others in order to use in an optimal way the installed capacity of the Infulene WWTP, which is a requirement for its proper operation and to ensure sustainable environmental health conditions in the service area.

Main activities and infrastructure proposed - Besides some work related to the rehabilitation of the WWTP of system II (which has been implemented) and limited extensions of the networks in Chamanculo and Xipamanine, the most important proposal of this plan was the re-structuring of System I (the so-called combined system). A radical transformation was proposed it included: i) the construction of a main sewerage collector main along *Avenue 25th of September* and other roads of West Maputo, which will intercept the majority of sewer/drainage lines that discharge directly into the Maputo Bay. This new main collector would divert existing wastewater streams to a new WWTP (Ponds) to be located along the Infulene river, downstream of the existing WWTP. It was proposed that this new system will collect all wastewater streams including those of septic tanks. The new sewerage collection and treatment system would require two pumping stations, and to a certain extent be a replication of the current System II. In addition an independent wastewater collection and treatment system for the Costa del Sol area was proposed, this because the Costa del Sol area is along the coast and far away from the Infulene river.

In addition to these new infrastructure works the Strategic Plan proposes a number of other priority activities, such as: i) an inventory of all septic tanks, identification of remedial actions and establishment of minimum operational conditions, ii) urgent repair and rehabilitation of the current wastewater collection and treatment networks (System II).

In 2004 it was estimated that a budget of USD 5 million was required for these activities. So far the rehabilitation of the WWTP [ponds] and some minor components of the system have been rehabilitated. In general it may be concluded that despite the great efforts made by the municipal authorities and DNA only a few of the planned activities have been implemented. *The most urgent outstanding activity is the rehabilitation of the two old sewage pumping stations of System II, which are already since 2008 out of operation.*

General perception of modern wastewater collection and treatment facilities - The poor functioning of System II - *mainly due to the lack of funds for normal and preventive maintenance* - has in the minds of the local authorities and the public in general discredited the feasibility of applying modern concepts for wastewater collection and treatment in Maputo City. Mainly the feasibility of pumping stations and modern WWTPs (wastewater treatment plants) requiring substantial amounts of energy and a certain level of technology is questioned. It was observed that even the WWTP (ponds system) was malfunctioning - *mainly due to the very low loading of the system* - despite the fact that they require relatively simple operation and maintenance, and limited energy if compared to more sophisticated WWTPs. Another negative example is the treatment station located at the International Airport, which does not function adequately. The only WWTP in Maputo, in this case a compact type, whose operation and maintenance has been effective, is located at the condominium of MOZAL located near the Portuguese and American schools. It is located in a low-lying area where septic tanks and drains are no option due to the high groundwater table. It should be noted that this WWTP is operated and maintained by MOZAL, the biggest industrial entity in Maputo and that in this case adequate operation and maintenance is provided.

Taking into consideration these points it should be argued that it is not the modern technology that makes adequate off-site wastewater management systems unpopular and ineffective in Maputo but it is the lack of adequate operation and maintenance of the existing facilities and networks. Key elements contributing to the

currently poor operation and maintenance of the installations are between others: the fact that the existing wastewater tax is not yet implemented, inadequate embedding of wastewater management into the existing legal and organizational frameworks of CMM, a lack of awareness at all levels (political and public in general) concerning the importance of adequate wastewater management systems for public health and the relatively fast development of the city in recent years.

4.4 Best practice, ongoing projects and activities

In addition to the Maputo off-site wastewater management system, a substantial number of community based improvement projects for sanitation, drainage, water supply and urban infrastructure in general have been implemented recently. Below a limited listing and concise description of some success full projects is presented. It is strongly recommended that lessons learned from those successfully implemented projects will be used as reference for the development of the citywide sanitation strategy.

4.4.1 Avenue Dr. Lacerda da Almeida reconstruction

In 2006 the city of Maputo opened a new era in the rehabilitation of roads and urban infrastructure by initiating, among others the reconstruction project of Avenue Dr. Lacerda da Almeida. The reconstruction project, called "*Drainage and road construction*" is located in the neighborhoods of Chamanculo and Xipamanine.

The project represented a new approach to remediate problems of past; it was concluded that the fact that asphalt roads deteriorated so quickly was essentially due to the material used and the lack of adequate drainage. In the context of this project, by stressing the word "*drainage*" it was tried to avoid repeating past failures and also to created clear awareness for the need to make additional costs at the time of construction as to ensure that the work was done in a sustainable and effective way, which safeguards a proper functioning of the new infrastructure under all circumstances. Some results of this new philosophy can already be seen in Maputo, where new infrastructure had a pivotal role in the development of the area as it changed the environment in a positive way and started also to address some issues related to sanitation.

4.4.2 Bairro Chamanculo

The neighborhood of Chamanculo has been identified in the Structure Plan for the City of Maputo (CMM 2008) as one of the city's historical heritage areas. Due to this status the restructuring and rehabilitation of the area has been prioritized and the process of "restructuring of the bairro" has been accelerated. Restructuring of the bairro involves various activities such as: reorganization, realignment of roads, formalization of land ownership, rehabilitation of urban infrastructure etc. The restructuring of the bairro creates better conditions for living, economic development and a unique opportunity to address also the problems related to environmental health which include wastewater management, local drainage, solid waste collection and of course water supply. During the March workshop (see Appendix G), current developments and opportunities in the Chamanculo neighborhood where discussed.

It should be noted that in this and adjacent bairros the reconstruction and expansion of the water supply distribution network promoted by FIPAG is ongoing and that a major component of the Greater Maputo water supply system "Distr bution Center Chamanculo" is located in this bairro.

It is anticipated that the experience of these pilot interventions can be replicated in other areas with similar problems and conditions. It is recommended that as an integral part of the citywide sanitation strategy for Maputo city restructuring of bairros and the upgrading of water supply and sanitation infrastructure and service levels will be approached in an integral way.

4.4.3 Multi-service Sanitation Block - Q5 (5th quarter) bairro Chamanulo C

In august 2009 WSUP in coordination with the local authorities and communities constructed a pilot Multiservice block, which provides the community with toilet facilities, a water collection point and a place to wash cloth. Below a brief description of the community participation survey and design process is presented. The photos on this page show the facility after one year of continuous use.

Community participation process – As a first step a workshop with representatives of 7 pre-selected quarters was organized. The purpose of the workshop was to give the future end-users (community representatives) an opportunity to present their problems, priorities, wishes and commitment for active participation with regard to the provision of water supply and sanitation services. During the workshop the community representatives identified their priorities regarding public institutions, schools, “compondes”, and communal or individual latrines. Proposals were presented and discussed and the community prioritized the pre-selected quarters taking into consideration current conditions and need for improvement.

Q5 was selected as the top priority, the multi-service block serves 37 families about 200 people, it uses a very small already available plot where traditional latrines in urgent need for rehabilitation were located. Moreover the local community committed itself to participate in both the construction and subsequent operation and maintenance of the facilities.



Multi-service block Chamanulo C - Q5

Conditions after one year of operation.

Services provided: water supply (stand post), separate toilets for ladies and man and cloth washing.

Construction cost around USD 85 per capita.

Design and construction – A survey of the quarter (number of families, number of children, number of elderly people, number of disabled) was done, followed by a mapping of the quarter (location of houses, domestic water supply connections, existing latrines, existing drains etc.). Based upon the information collected a group discussion with was organized in order to further discuss and agree upon: i) design and facilities to be implemented, ii) person of the community to be involved during construction, and iii) planning and management of the construction of the multi-service sanitary block with active involvement of the community. In parallel the creation of a management committee was started. The committee consists of: President, Vice-President, Treasurer, 2 Supervisors. In additionally multi-service block/standpipe operator was appointed. It is understood that the all-in cost related to the implementation of this facility was in the order of USD 17 000 or USD 85 per capita. Lessons learned during the pilot phase indicate that further cost reductions are possible.

Operation and cleaning - The multi-service sanitary block is functioning since September 2009. Currently families (end-users) take turns for: the cleaning of the facilities, filling of the water reservoir located on top of the multi-service block, and the daily use and operation of the facilities.

Initially the families did not pay for the use of the facilities the only income generated was from the operation of the standpipe. This income proved to be insufficient for the general operation and upkeep of the facilities. In March 2010 the community (end users) decided that each family should contribute with 20Mt/month in order to

create a fund for management, operation and maintenance of the facility. Until now the community was able to pay for desludging of the septic tank (1750 Mt) as well as minor repairs to the facility.

The way forward – Although no formal monitoring of the impact of the multi-service block in Chamanulo has been implemented, from field observations and interviews with current users of the facility it appears that the intervention has been successful. The facility is well used and maintained, users are satisfied, sanitation service levels have substantially improved, the community generates some funds for operation and maintenance and the initiators (WSUP) have completely handed over the facility to the community. Moreover, it is confirmed that at short notice WSUP will replicate this project in adjacent areas. Consequently it may be concluded that this pilot is an important input for the selection of sanitation systems and technologies which will need to be done in the context of the Citywide Sanitation Strategy for Maputo City.

4.4.4 **ADASBU – Community based organization providing integrated sanitation services**

Bairro Urbanização is one of the unplanned neighborhood in the City of Maputo. It has 15,000 inhabitants mostly of them low income, and a population density of about 130 inhabitants/ha. Following major floods in 2000, the neighborhood suffered from a high level of water-related diseases such as malaria and cholera.

MSF, in partnership with DMAS and neighborhood residents, initiated an integrated water and sanitation program, creating a community-based organization, ADASBU, which manages the program. The results achieved by the program include:

- Construction of drainage channels in priority areas, designed with the assistance of the University Eduardo Mondlane. The community contributed about 50% of the investment costs in kind, in the form of community labor. Currently the community pays a monthly fee to cover the cost for drainage channel cleaning and maintenance
- The construction of improved latrines, culminating in a 100% coverage with improved latrines. Ten EcoSan latrines have been built for demonstration purposes, the technology is now being promoted
- Establishment of a solid waste collection system, with primary collection by handcart and transfer to containers emptied by the Municipality. This was initially funded by a special household charge but is now funded through the Municipal sanitation fee. ADASBU is being paid for the primary collection service by the municipality
- Desludging services for latrines and septic tanks. Two small machines specially designed for use in unplanned areas are used. Sludge is subsequently transferred to mobile tankers towed by a tractor and treated at the Infulene WWTP
- Construction of standpipes and the introduction of a prepaid fee system for the provision of water
- Training of 15 community development specialist who focus mainly on hygiene promotion through periodic group discussions, street theater and door to door visits.

The services provided by ADASBU are all self-financing in terms of operations, repairs and maintenance, but the association remains dependent on outside funding to cover the capital costs for infrastructure and equipment used. Plans do exist to replicate this experience to adjacent areas.

4.4.5 **WaterAid**

The international NGO WaterAid is very active in Maputo city and has gained valuable experience with pilot projects, which in the context of the Citywide Sanitation Strategy is recommended to be assessed and replicated in other areas. Some examples include:

Hulene B sludge removal project - private entrepreneurs are trained in desludging of latrines and septic tanks, WaterAid provided local sludge collection tanks which are emptied by ADASBU. Subsequently ADASBU transports the sludge to the WWTP for treatment.;

EcoSan pilots – Pilot latrines have been installed in the bairros Mahotas and Costa do Sol. Urine and excreta are later uses as fertilizer for local urban agriculture activities.

5 SELECTION OF WASTEWATER MANAGEMENT SYSTEMS

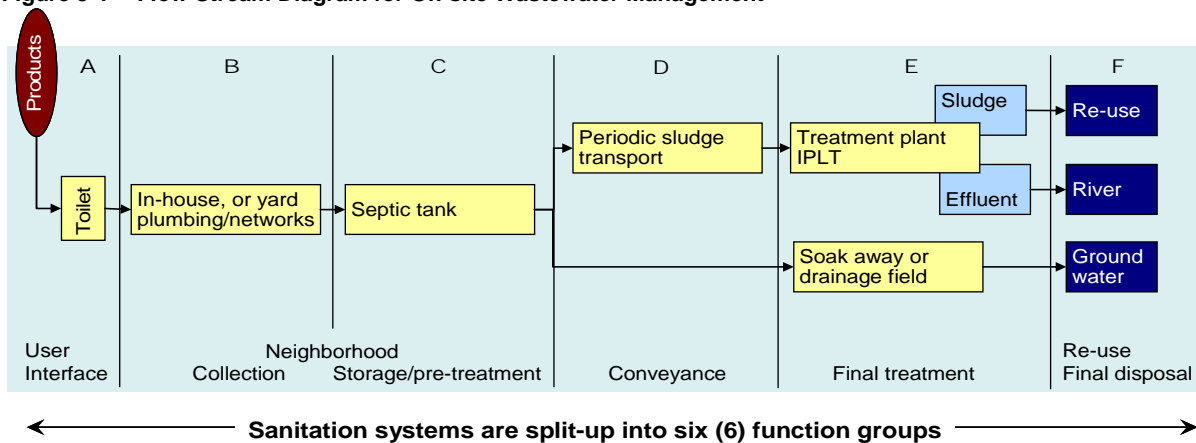
5.1 The System Concept

In the context of this study wastewater management is considered to be a multi-step process (or system), in which various types of waste (or products) are managed from the point of generation (source) to the point of re-use or final disposal. This multi-step process is referred to as “The Sanitation System”

Within a sanitation system various types of waste (or products) travel through the system and at each stage (or functional group) receive adequate management. Each sanitation system is a combination of product- and process-specific technologies designed to dispose-off, transport, temporary store, treat, re-use and final disposal of products (waste) generated by the users of the sanitation system. As can be seen from Figure 6.1 from source to final disposal any sanitation system consists of six so-called function groups. Within these function groups “technical options”; specific devices such as pour flush- or cistern flush toilets, septic tanks etc) exist, each with their specific management, operation and maintenance conditions.

Starting at the level of a household, industry or institution which generates waste products (example urine, excreta, grey water, or rain- storm water) one or more technologies (technical options) are required within each function group. Once the wastewater management system is selected “Technical options” to be used in specific areas (zones) are during the project preparation/design stage to be selected in close consultation with the future users (communities) and community based or public entities responsible for operation and maintenance.

Figure 5-1 Flow Stream Diagram for On-site Wastewater Management



5.2 Wastewater Management Systems

Wastewater management systems are generally sub-divided into the following three main groups, which in line with local conditions can be further sub-divided into sub categories.

- On-site, retaining wastes in the vicinity of the toilet in a pit, tank or vault.
- Off-site, removing wastes from the vicinity of the toilet for disposal elsewhere.
- Hybrid, retaining solids close to the latrine but removing liquids for off-site disposal elsewhere.

5.2.1 On-site systems

In the case of on-site sanitation systems, excreta and wastewater are collected and treated in user owned facilities such as septic tanks, which as a rule are located on private property. Also small community facilities such as communal septic tanks (for up to 5 to 10 families) and Communal Multi Service Blocks (CMSB),

providing water supply (water kiosk), toilet and bathing facilities with their own (on-site) septic tanks are generally considered as on-site facilities.

On-site systems may be either wet or dry; dry systems do not use water for flushing. It is understood that dry systems are rarely used in Maputo. All adequate on-site systems require a pit, vault or tank to hold fecal sludge and the wet systems are dependent on percolation of wastewater into the ground. The pits, vaults or septic tanks all require periodical sludge removal.

Properly designed and constructed septic tanks require sludge removal about once every two years. Collected sludge should be transported to and treated in purposely designed central treatment plants (ETARs). It is understood that in the informal settlements of Maputo sludge collection is not (yet) well organized and/or possible due to the lack of adequate access roads for sludge tankers. In addition these informal settlements often do not have adequate drainage, which in the rainy season leads often to the overflow of septic tanks and pits (soak aways). In these cases strategically located CMSB may provide the best solution for the short and medium term.

If sufficient space for the on-site facilities is available (in low and medium densely populated areas), properly designed and managed, on-site systems provide a service that is as hygienic and convenient as off-site (sewerage) and generally speaking cheaper and from an institutional point of view easier to sustain.

Even in areas with medium population densities (let us say up to 200 to 300 people/ha) where water use is low, on-site sanitation may provide a better service than a poorly functioning sewerage system. However, the risk of groundwater pollution has always to be considered, particularly in areas where the population is highly dependent on local (shallow) groundwater resources for their day to day provision of household and drinking water. However it has to be considered that where water use is more than about 30 liters per capita per day, in addition to on-site sanitation facilities separate provision will be needed for grey water (sullage) disposal, which often is combined with the local storm water run-off drainage network. These so-called micro drainage systems are often poorly designed and maintained and may become a mayor environmental and health risk, which can only be overcome if the communities in close coordination with the municipal entities in charge of drainage are able and willing to ensure proper maintenance.

5.2.2 Off-site systems

These systems transport and treat excreta and wastewater in, generally public owned central or de-central wastewater treatment plants. International experience indicates that off-site sanitation should be provided in high density population areas and in areas that are "not technically suited" for on-site sanitation, such as poorly drained low-lying areas with high groundwater levels. Off-site systems are also the preferred system for: i) city centers, business and commercial districts, where the future users can afford to pay for the services and ii) in new properly structured development areas where population density is expected to increase substantially over the years. In new development areas the construction of the wastewater collection system can often be implemented together with other basic infrastructure (e.g. water supply, roads etc), which has the big advantage that construction cost will be lower and the inhabitants of these areas can be connected to the sewer networks before they will have to invest in private on-site facilities.

All off-site systems incorporate cistern- or pour flush toilets connected to sewers and de-central or central treatment of collected wastewater before it can be safely discharged to the environment or used for irrigation or aquaculture. Please note that for off-site sanitation systems water is the key-element that makes the system work, consequently off-site sanitation requires a minimum water use of about 50 l/capita/day in order to ensure a proper functioning of the system.

Black- and grey water are normally combined on-plot and discharged to the sewer through a single household connection. Particular care should be taken to prevent the discharge of surface run-off through the sewers, as in areas with high intensity rainfall the discharge of surface run-off through sewers will result in discharges which may exceed the design flow. This will cause major problems in the network; man holes may overflow and discharge raw sewerage into the urban areas. Moreover, treatment plants may not be able to handle the extreme flow meaning that the normal process is disturbed and a substantial part of the flow may have to be by-passed, which will have a negative impact on the water quality of the receiving water body.

An off-site waste water collection and treatments system, generally called a sewerage systems; consists of sewers (buried pipes) and treatment facilities, it collects conveys and treats excreta and wastewater. All sewerage systems consist of:

- a private in-house (yard) collection system, which is connected to an inspection/control box (house connection)
- a community, private or public owned local collection system,
- public conveyance (transport) networks which could include pumping stations
- public central or de-central wastewater treatment facilities.

The following three main types of sewerage systems can be distinguished:

1 - Public (conventional or central) sewer systems and treatment plants are widely used around the globe and in the central parts of a limited number of cities in Mozambique, including part of Maputo (catchment A). Generally, central sewerage systems are applied for densely populated areas, business and industrial districts where sufficient amounts of wastewater can be produced and households and other entities (public and private) are willing to connect to the system and pay for services as provided. In the “West” where the local economy and institutional arrangements are strong these systems have proved to be effective and efficient for the last 50 to 150 years.

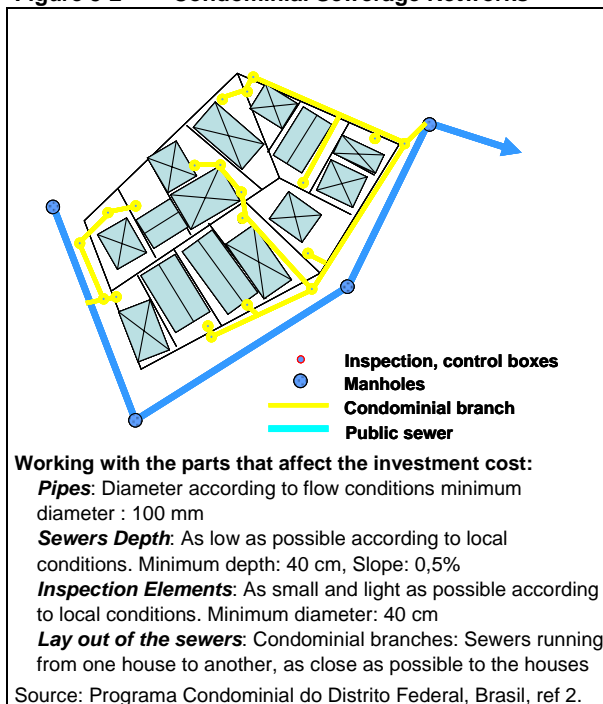
The sewerage network of Maputo, which was constructed in the 1980-ies, counts with a recently rehabilitated central treatment plant (ponds). Only a very limited number of the people living in the service area of the existing sewer network are actually connected to the sewer lines. It is believed that with a limited upgrading of the system including the mitigation of postponed maintenance a substantial number of the population could be connected to the existing sewer lines, which will also ensure an optimal use of the current treatment facilities. Additional studies will be required in order to define the feasibility of an overall upgrading of the system, but it is estimated that on medium term (5 to 10 years) an additional 150.000 to 200.000 people could be connected to the existing system. For the densely populated informal settlements of the service area condominal/group connections (see below) are to be favored over the traditional individual house connections.

2 - Condominial sewerage (sometimes called simplified sewerage) is often used in (low-income) residential urban and peri-urban areas. These systems, widely used in Brazil allow for enormous cost savings as compared to conventional sewerage due to the fact that: instead of laying the sewer in the center of the road and connecting every house on an individual basis, the pipe (sewer) runs from one house or dwelling to another, see Figure 6-2. These “group or condominial” connections are connected to a (conventional) sewer network and public de-central or central wastewater treatment plant.

3 - Community based local sewerage system, in Indonesia the ‘Sanimas’ system also known as DEWATS has been developed by WSP-EPA (Water and Sanitation Program of the World Bank) in cooperation with the Ministry of Public Works (PU), BORDA (a German NGO) and selected local partners (NGOs).

As far as the collection system (condominial branch) is concerned the design principles are similar to the Brazilian condominial sewerage networks. However, Sanimas systems are not

Figure 5-2 Condominial Sewerage Networks



connected to public sewers but have individual treatment plants (often baffle reactors). In recent years hundreds of Sanimas systems have been built. They provide off-site sanitation services to isolated low-income communities (varying from 50 to 200 households) in both peri-urban and urban areas.

In some cases these community based schemes are combined with Community Multi Service Blocks (CMSB) as discussed before. The CMBS and the local sewer network are connected to the same local/de-central treatment facility, which often is located under the CMSB. In this case the better off households are connected to the sewer network while people who cannot (yet) afford a sewer connection or do not have in-house toilet facilities make use of the CMBS.

These systems are also attractive from an operational and financial point of view. The community (under-employed men and woman) can provide management, operation and maintenance while the better of users contribute financially to the construction and operation of the facility. In many cases they provide a kind of cross-subsidy for the system, which allows lower monthly fees for poor people. When properly designed in the long run when the area is served by a public sewer network the overflow of the local/de-central treatment can be discharged into the sewers, while the operation of the CMSB and local network continues as planned.

5.2.3 Hybrid systems

These systems retain solids close to the latrine (in storage or simple septic tanks) but collect liquids for off-site treatment, re-use or disposal elsewhere. All hybrid systems incorporate cistern- or pour flush toilets connected via interceptor tanks to sewers. They require periodic removal of septic sludge, which requires further treatment in a purposely designed sludge treatment plant or, if available, a wastewater treatment plant (ETAR).

Small bore or solids free sewerage systems are the best known and widely applied hybrid systems. These systems have the advantage that the diameter of the sewers can be substantially reduced as well as the slopes. This is due to the fact that the sewers transport liquid only. The disadvantage is that each house or a group of houses still requires a tank for the collection of solids, which periodically need to be removed.

These systems are effective in medium densely populated areas with relative high ground water levels which impede the infiltration of the overflow of the septic tanks. Moreover, these systems are suitable for the upgrading of existing on-site wastewater management in medium and high income areas, where the overflow of septic tanks and/or water proof collection tanks can be easily be incorporated in new sewerage systems by collecting the overflow of the tanks only.

In the south of the “Cidade de Cimento” this is what happened over the years. The local so-called “Combined system” in this area collects the overflow of existing septic tanks in the underground closed surface water drainage (sewer) networks. Unfortunately the “combined system” still discharges its untreated wastewater and storm water flows directly into the ocean and local streams. Moreover it has been observed that there is a lack of regular maintenance of this system which results into local blocking of sewer lines and subsequent spillage of untreated waste and storm water in the urban areas.

If a basic (at least primary) treatment could be provided at the various outlets of the existing networks, the back lock in maintenance could be resolved the existing “combined system” could ensure adequate sanitation services in its services areas for at least the medium term. For the long term a further upgrading of the system and strict regulations concerning the discharge of pre-treated wastewater to the existing systems will be required.

5.3 Ecosan - Ecological or New Sanitation

Definition - Ecological sanitation¹, also known as Ecosan, is a new paradigm in sanitation that recognizes human excreta and household wastewater not as waste but as resources that can and are recovered, treated (where necessary), and reused. Unlike most conventional sanitation methods, ecological sanitation processes

¹ Source: http://en.wikipedia.org/wiki/Ecological_sanitation

human waste (as well as sometimes animal waste, and organic kitchen waste) to recover nutrients (usually for the purpose of growing crops) that would otherwise be discarded.

Operation - Ecological sanitation is usually set-up through the use of composting toilets. Sometimes, an extra separation of urine and faeces at the source for sanitization and recycling is done. Separation of faeces and urine has several advantages, which are widely discussed in literature. Alternatively, vermin-composting, solar toilets or (in special cases), low-flush toilets with embedded nutrient-recovery systems are used. In most cases, it thus eliminates the creation of black water and sometimes immediately eliminates faecal pathogens from any still present wastewater (urine) at the source. The objectives are to offer economically and ecologically sustainable and culturally acceptable systems that aim to close the natural nutrient and water cycle.

Application – Worldwide, a lot of research has been done and is still ongoing related to Ecosan technologies and application. However, it is generally concluded that Ecosan is not yet financially or technically viable for densely populated (low-income) urban areas, see also blog of Prof. Duncan Mara ([Sanitation](#)) and A Guide to decision making; Technology options for urban sanitation in India

In Maputo at pilot level some Ecosan projects in peri-urban areas have been implemented. However, results so far do not show that Ecosan can already be used at operational scale in the peri-urban areas of Maputo. However, as part of the future sanitation strategy it is recommended to include a number of Ecosan pilots at operational level, particularly in peri-urban areas where the products (mainly compost and to a limited extent bio-gas) can be used for “urban agriculture” and/or household/community cooking facilities or small industrial installations. The application of Ecosan for specific community and school based sanitation facilities would be an effective option for the introduction and further development of EcoSan in Maputo.

Based upon the assessment of the current situation as presented in this report, the general description of wastewater management systems presented in this section and system selection criteria discussed in the next section (section 6.2) potential wastewater management systems, which could potentially be used in Maputo are presented in section 6.3. During the second CSS-workshop, which is now planned for 01 July 2010 for each of the proposed “sanitation districts” the preferred system or systems would ideally be agreed upon and form the basis for the proposed outline citywide sanitation strategy as discussed in chapter 7.

During subsequent feasibility studies (not included in this study) the preferred systems for each of the “sanitation districts” should be further developed and agreed.

5.4 Selection of Wastewater Management Systems

5.4.1 General

The starting point for the selection of any wastewater management system is a thorough assessment of the existing system(s), and their suitability for upgrading and the provision of the required level of wastewater management services at medium and long term, which should be in line with **what the future users of the sanitation facilities Want, can Afford and are able to Maintain.**

General factors to be considered for both system and technology choice are shown in Figure 6.3. Complementary considerations which place the final selection in the context of national and local standards and requirements are shown in Figure 6.4. Figure 6.4 illustrates that the selection of a technology cannot be done before a sanitation system has been selected. It shows also that a number of regulations, planning documents and local conditions have to be taken into consideration during the technology selection process.

Figure 5-3 Key Issues for Selection of Sanitation Systems and Technologies

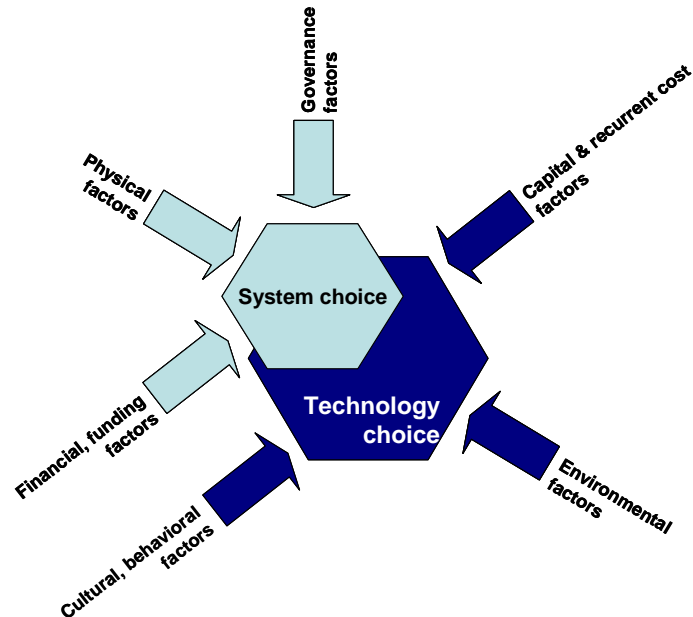
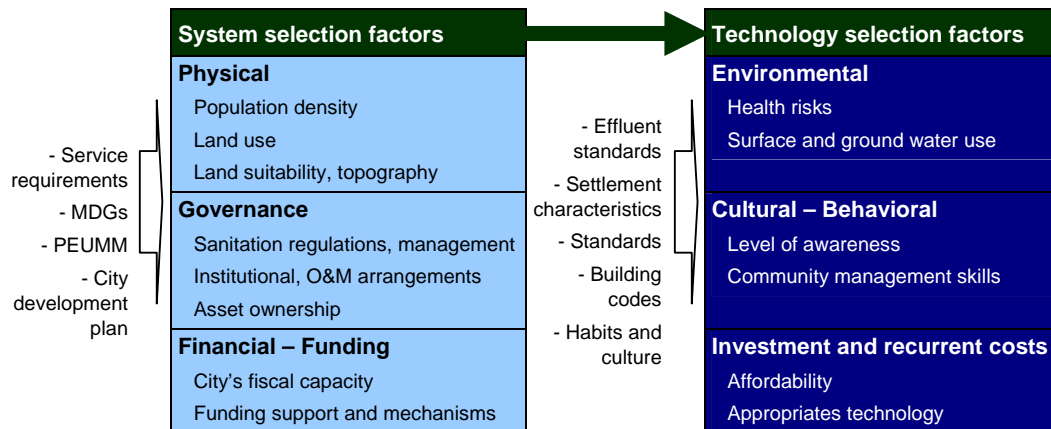


Figure 5-4 Considerations for Selection of Sanitation Systems and Technologies



5.4.2 Wastewater management system selection criteria and considerations

General

A whole range of selection criteria for the final choice between on-site, off-site hybrid sanitation and systems can be considered. However, in practice the main and in most cases overruling criteria is; the **availability of funds for the construction of off-site collection and treatment systems**.

It is hard to argue that; without realistic options for access to the substantial funds required for construction of sewerage systems it makes any sense to start the discussion on the development of sewer networks and the related treatment plants.

On the other hand, very poor sanitation conditions in many densely populated low-income districts and the related health risks are a strong argument to start discussions on; planning and advocacy for a gradual, phased development of off-site or hybrid sanitation facilities in specific carefully selected urban districts.

Only with well designed, operated and maintained sewerage systems living conditions for the population of these districts can be improved at relatively short-term. Even if funds for the construction of off-site systems may not be readily available the discussion on the need for and benefits of these systems should be started in the context of CSS preparation: Without well formulated and viable plans for the development of off-site sanitation in specific areas of the city adequate mobilization of funds will be virtually impossible.

Sustainable hygienic sanitation means:

- affordable;
- socially, technically, physically and institutionally feasible;
- able to be used easily, properly and on demand;
- able to be maintained easily, regularly and at affordable cost, by its users, including women and children;
- provides a hand-washing facility (or has one nearby); and
- no adverse effects on the environment.

Prof. Duncan Mara: Sanitation blog of 02/08/08

Population density

International experience and literature indicates that off-site sanitation is the most appropriate system for wastewater management if population densities exceed 250 to 300 people/ha in areas without high rise buildings. This is true for existing residential areas but not necessarily so for business districts, commercial and industrial areas, nor for new or rapidly developing residential areas.

A generally accepted cut-off rate for off-site sanitation is 40 houses/ha, or 160 to 210 persons/ha.

Technical criteria

- **Current and/or planned land-use;**
 - For environmental, functional and economic reasons sewerage systems may be desirable in central business districts, tourist and industrial areas with relatively low population densities. Please note that non-domestic users may prove to be reliable clients who can provide for regular income.
 - Sewerage systems could also be selected for rapidly growing new low cost housing development areas (as is the case in the northern districts of Maputo), which at the time of construction still have relatively low population densities. In these areas the development of adequate sanitation infrastructure (mainly drainage and wastewater) could be implemented together with other municipal infrastructure which will lead to substantial cost savings in the long-term
- **Geographic location and topography;**
 - Areas adjacent to areas already selected for sewerage, which could easily be connected to the planned sewerage systems should be considered for at least future connection to the planned sewerage system. This could stimulate the development of these areas and accelerate the local demand for adequate sanitation.
 - While designing a sewerage system it is considered to be good practice to take into consideration the future extension of the system to areas which dewater naturally to the selected service area.
- **Availability of land and access to off-site sanitation facilities;**
 - Per household 1 to 1.5 m² is required for a septic tank and 10 m² for leach fields. In densely populated urban areas space for the construction of septic tanks and infiltration beds may not be available and become a constrained for on-site sanitation. Moreover, particularly in low-income areas the width of access roads and path may not be enough to allow regular access of desludging tankers. Limited access to on-site facilities would increase recurrent cost and jeopardize proper operation and maintenance of these facilities.
- **Sewer networks rely on water;**
 - Wastewater is used as a medium to transport excreta, toilet paper etc. To prevent clogging of the sewer system, there should be enough water flowing through the system. Population densities should therefore not be below about 50 persons/ha and the water use should be in the order of 50 l/capita-day, to ensure sufficient flow in the upstream sections of the sewer network.
- **Minimum cost;**
 - Generally speaking areas with high groundwater levels are less suitable for on-site sanitation and in these areas the cost for on-site facilities will be relatively high.

- Economy of scale: particularly condominal/simplified sewerage becomes cheaper above a certain population density. In Natal (Northeast Brazil) it was found that if population densities exceed 160 persons/ha condominal sewerage is economically feasible
- Particularly for fast growing (new) urban areas and business district investment cost for sewerage may be turn out to be substantially lower when the system is constructed in an early stage of development
- For any system a so-called life-cycle cost estimate should be performed in order to assess the minimum cost of the system. The life-time cost estimate does not only consider investment costs but also operation and maintenance cost during the live time of the installation.

Institutional, financial and social criteria

In addition to technical criteria discussed in the previous section, other criteria should be taken into consideration, they include: Sustainability, Social and Institutional feasibility, Access to funding, Investment and recurrent costs.

- **Sustainability**, a system is sustainable when²:
 - It functions properly, it is used and provides the services for which it was planned, including: adequate sanitation access, service continuity and reliability; health and economic benefits;
 - It functions over a prolonged period of time, according to the designed life-cycle of the equipment;
 - It can be operated and maintained at the local level with limited, but feasible external support (e.g. technical assistance, training and monitoring) meaning; the local government in cooperation with the community (users) should be able to operate, maintain, extend and when needed to replace the infrastructure to guarantee a reliable long-term service;
 - The management of the service involves the community (or the community itself manages the system); adopts a perspective that is sensitive to gender issues; establishes partnerships with local authorities; and involves the private sector as required.
 - Its operation, maintenance, rehabilitation, replacement and administrative costs are covered at local level through user fees and/or through alternative sustainable financial mechanisms.
 - It has no harmful effects on the environment; meaning pollution is reduced to a minimum and water resources are available for future generations.
- **Social and institutional feasibility** - Around the world there are numerous examples where sewerage systems have been constructed but; i) the potential users resist connecting to the new systems, ii) final arrangements and responsibility for operation and maintenance are still under discussion and iii) O&M funds prove to be insufficient to guarantee the proper functioning of the system in the long term. Some common problems include:
 - Potential users are insufficiently aware of the benefits of proper wastewater management services: insufficient awareness and demand creation
 - Adequate funding schemes for the funding of in-house (yard) sanitary facilities and infrastructure, which are a pre-requisite for house connections, are not yet in place.
 - Local legal mechanisms to encourage and enforce adequate disposal of wastewater are not (yet) in place or enforced
 - Institutional arrangements and capacity building both at community and city level to ensure long term operation and maintenance of new facilities need to be developed and implemented
 - Sustainable and affordable funding mechanisms for recurrent cost need to be discussed, agreed and implemented.
- **Access to funding**
 - Funding requirements related to a (gradual) implementation of adequate citywide wastewater management systems are generally speaking beyond the capabilities of city governments. Consequently, financial supports from national and provincial governments and in many cases support from international donors are required.
 - Mechanisms to obtain the required funds and to channel the funds during the implementation are not always very clear or operational, require advocacy (lobbying) at various level and are time consuming.

² Paraphrased from <http://duncanmarasanitation.blogspot.com> (2 august 2008); WHO-IRC, (2003) South African department of water affairs and forestry (May 2008)

▪ **Investment costs**

- It is generally agreed that conventional sewerage systems are too expensive for low-income areas in developing countries. But for central business, tourist and industrial districts the situation may be different, as long as adequate measures are taken and can be enforced to ensure that the users (polluters) pay for the (compulsory) services;
- In Brazil affordable and sustainable off-site sanitation services (condominial systems) have been implemented at large scale in low-income urban areas. Some studies have shown that these systems could, under certain circumstances be cheaper than traditional on site sanitation systems. In Natal (northeast Brazil) off-site condominial systems proved to be cheaper than on-site systems when population density exceeds 160 people/ha;
- Sewerage systems become extremely expensive and cumbersome to construct in existing densely populated urban areas and business districts without any basic sanitation infrastructure. However, in new residential and business districts the situation is quite different. First of all the cost of the system can, to a certain extent be incorporated in the cost of the land (premises), house owners do not have to invest in on-site facilities, and construction can be done together with the construction of other municipal infrastructure;
- Although the combination of septic tanks and infiltration beds are found to be less expensive than sewerage; adequate construction and operation are difficult to enforce, meaning that pollution cannot always be reduced to the required levels when on-site systems are used;
- On-site sanitation requires in addition to the private investments done by the owners of premises although a substantial investment from the public/private sector as to ensure that septic sludge can adequately be collected, transported and treated.

▪ **Recurrent costs**

- Operation and maintenance of sewerage systems is an ongoing task and requires a well established public and/or private (community based) entity empowered, responsible and capable to carry out these tasks. Consequently operation and maintenance of sewerage systems should include in addition to the cost for energy, regular and preventive maintenance also running cost for the entity (entities) responsible for administration, operation and maintenance of the sewerage systems;
- O&M cost could and should be minimized (optimized) at the design stage of the systems by the selection of adequate technologies;
- Operation and maintenance costs of on-site (private) systems are the direct responsibility of the owners of the system. In most cases the owners are willing to pay these periodical costs because if maintenance is not properly done the system will cease to function, which has a direct impact on their day to day living conditions. As a consequence in most urban areas the public and (mainly) private sector is providing services as required, which are charged at cost plus profit.
- It is the obligation (challenge) of the public sector to ensure that these services are implemented adequately and do not become a threat to the environment. Often the related costs, which include construction, operation and maintenance of adequate treatment facilities for septic sludge and enforcing their use as well as adequate on-site treatment facilities, are overlooked.

General guidelines for the choice between On-Site and Off-Site Options

On-site options will be most appropriate in areas of low-density housing (typically less than 40 housing units per hectare), relatively low water consumption, and ground conditions that allow the absorption of wastewater without harm to an aquifer.

On-site disposal of blackwater via leach pits or soakaways, with off-site disposal of sullage (grey) water may be possible, even for relatively high density areas and relatively high water consumption, provided that ground conditions allow that and there is no problem of contaminating water supplies.

Hybrid systems may be appropriate in medium-to high-density areas with a flat topography, particularly where the water table is high.

Off-site options will be most appropriate where housing density is high (>40 houses per hectare), there is a reliable water supply on or close to the plot and preferably sufficient fall is available to transport solids through the sewer without pumping

Source: A Guide to Decision making: Technology Options for Urban Sanitation in India, Part C: Framework for Decision making

Political considerations

Experience shows that at the political level sanitation is given a relatively low priority. Reasons include: i) improved sanitation service levels are not commonly demanded by the general public as there is limited awareness at all levels of the direct relation between adequate sanitation service levels, public health and general well being, ii) wastewater management facilities are, once constructed mainly underground and not visible. This with the exception of treatment facilities, which often are given a higher political priority than the essential underground installations, iii) the provision of adequate sanitation services is often a shared responsibility of a number of municipal entities, meaning the lobby for improved sanitation services is mostly weak and not focused.

Experience shows that in order to accelerate the development of the wastewater management sector often incentives from outside are required and “local champions” with sufficient influence (clout) should be found. Incentives could be given by the central or regional government, international funding agencies, bi- or unilateral donors, NGO etc. Local champions should be looked for at all levels of government, the communities and the public and private sector.

In Indonesia the establishment of formal “**sanitation working groups**”, which include representatives of the municipal government, communities, NGOs and CBOs proved to be an effective way to encourage local champions and to develop sanitation strategies which reflect local knowledge, priorities and requirements and show a high level of local ownership.

The “sanitation working groups” develop ideas and scenarios but the ultimate decision concerning the development of a wastewater management system belongs to the local executive (Mayor) and legislative powers (city council). Important political considerations at this level may include;

- if there is a public demand for improved sanitation
- if the city’s image would benefit at regional and national level if sanitation services would substantially be improved,
- if the local government is able and willing to accept loans which may be required for the construction of sewerage systems,
- incentives from and easy access to other levels (provincial or national) of government and
- if adequate fees (retribution) systems can be developed and enforced as to ensure that the recurrent costs of the sewerage facilities can be covered in the long-term.

6 SECONDARY DATA AND SANITATION DEVELOPMENT PLANNING

6.1 Administrative Sub-division and Planning Units

As discussed in chapter 2, Maputo is administratively subdivided into seven (7) Municipal districts of which only 5 are included in the current study area. The municipal districts No. 6 Ka Tembe and No. 7 Inhaca are not included because they do not form a territorial unit with the other 5 municipal districts. The overall administrative subdivision of Maputo City is presented in Figure 2.1 (source PEUMM 2008), a detailed map of the administrative subdivision of the study area is presented in Annex G, map 1.

Each municipal district is further sub-divided in a number of so-called “Bairros³”. Bairros are sub-divided into *quarteirões*. From an organizational point of view a *Bairro*, which is headed by a “Secretario⁴”, is considered as the smallest administrative unit. Consequently for this study the *Bairro* has been selected as the smallest planning unit. In the future when sanitation strategies at *Sanitation and Drainage Zone* level are to be prepared it is recommended to choose the *quarteirões*, as the smallest planning unit for further planning and detailed design.

6.2 Secondary Data Sources, Availability and Reliability

In accordance with the scope of the current study, all assessments made are primarily based upon existing secondary data and take into account results of detailed surveys done in the context of other and similar studies. A full list of resources, background information and reports used is presented in Appendix A. Main resources used include but are not limited to: i) results of the population census (1997 and 2007), ii) surveys and assessments made in the context of the Urban Structure Plan for Maputo (2008) and iii) Seven Cities Sanitation Strategy Study (2004).

Inconsistencies between the various data sources have been found and as far as practical been remediate using “*engineering judgment*”. Moreover, key conclusions and recommendations have been cross checked in the field and with resource persons.

It is anticipated that during the next stage (detailed sanitation strategy at zone level) the current data set can be completed and if required be corrected. At that stage also some primary data collection will be required in order to provide a solid basis for the conclusions and subsequent additional studies and designs.

6.3 The Maputo Central Sanitation Data-base and its Data Assessment Procedures

Central sanitation data base - The first version of a purposely designed central data base for Maputo sanitation has been prepared in the context of this study. The available information entered in the data base (MS-excel) is presented in Appendix D. It should be noted that the data base is not yet complete as a substantial amount of information is not yet available for all bairros, for a number of parameters only qualitative information is currently available and as a lot of information is taken from previous studies the information is sometime a bit outdated. This has been a limiting factor for the assessment of the information, see also the next chapter.

It is strongly recommended that as part of the follow-up and subsequent planning activities the data base will be completed, updated and further developed. Because it is believed that the central data base could be a very important tool for the preparation of the final CSS and the subsequent regular updating of the sanitation planning at city level. Moreover, the data base if properly maintained and managed could become an important data management and exchange tool for all stakeholders involved in planning, design and implementation of sanitation infrastructure in Maputo

³ Within the study area a total of 55 Bairros are located

⁴ A “secretario” is elected every 5 years by the inhabitants of the bairro

Data base structure, data assessment and results – The central data base and its “data assessment tools” consists of the eight (8) sheets, the two final sheets include the results/recommendations as far as implementation phasing and wastewater management systems for each bairro. The 8 sheets and their key functions are presented below:

1. *Data base*: The actual database it contains all basic information. The information is entered for each bairro and bairros are grouped per municipal district. This is the only sheet where information can be entered;
2. *Scenarios*: Defines priority setting scenarios and specific “weights” (weighting coefficient) for the related criteria;
3. *Score population*: Key indicators for the “scoring” of population related data are taken from “data base”, the “weights” are taken from “scenarios” and subsequently “population scores are calculated for each bairro”;
4. *Score poverty*: The same approach is followed for “poverty” related data
5. *Score overall*: Key indicators per bairro are taken from “data base”, the population and poverty scores are taken from the respective sheets and their “weights” are taken from “scenarios” subsequently the overall priority score is calculated;
6. *Zonal indicators*: Key indicators and assessed priority scores are presented for each bairro, the bairros are grouped per “*sanitation and drainage zone*”, see also the next section. In Table 6.1 the results of the overall data assessment and priority setting as included in this sheet are presented, maps for each “Sanitation and drainage zone” are presented in Appendix F;
7. *Results 01*: Key indicators and scores for all 3 scenarios are brought together in this sheet. Subsequently the bairros are grouped into Sanitation and drainage zones and sub-zones. Finally using Consultant’s judgment an implementation phasing per Sub-zone is proposed;
8. *Results 02*: Basically the same sheet as “results 01”. However, the recommended potential wastewater management systems (see Table 8.1) per bairro are added.

6.4 Sanitation and Drainage Zones

In the context of the preparation of an outline *Citywide Sanitation Strategy (CSS)* for Maputo it is proposed to introduce “*Sanitation and Drainage Zoning*” as a tool to visualize and agree with all stakeholders on: opportunities, constrains and priorities for the planning and implementation of (integrated⁵) sanitation infrastructure and improved service levels.

The “*sanitation and drainage zoning*” is a proposed sub-division of the city into *Sanitation and Drainage Zones* which are based upon: catchment boundaries, administrative boundaries and takes into consideration a range of secondary information collected in the course of the study, see the database in Appendix D. The sanitation zoning as presented, discussed and agreed during the second workshop (July 2010) is presented in Appendix F, map 2.

As a follow-up to the *Outline Citywide Sanitation Strategy* as discussed in this report it is recommended to further detail the sanitation planning at Sanitation and Drainage Zone level. For the preparation of these more detailed strategies it is recommended to apply a similar approach as used for the Sanitation Strategy at City level. However, with the help of the local authorities, resources persons, end-users and other stakeholders more detailed and comprehensive data bases (at sanitation and drainage zone level) can be prepared and more reliable assessments made.

Sanitation and Drainage Zones can be used as a basis for the gradual implementation and possibly also for the future operation and management of the improved sanitation infrastructure.

⁵ Integrated sanitation development considers: water supply, solid waste management, local drainage and excreta management and pay due attention to all aspects related to restructuring of slums. In the context of the current study the focus will be mainly on excreta management, which is currently very much under developed in Maputo

Table 6-1 Proposed Sanitation and Drainage Zones their Characteristics and Assessed Priorities.

Scenario 2, balanced development		Area ha	Population 2007		Density pars/ha	Development status	Natural conditions		Water supply coverage 2003			Wastewater coverage			Score assessment	Current actors											
Municipal district	No		Total population	average annual growth 1997 - 2007			Urban poor, head count	High ground water level	Low lying areas	Piped	water sellers	Others	Onsite, combined	Septic tanks		latrines	DM/SEIMA	CMAM/MSA	CBO	operari	Non	Population	Poverty	Propose d priority	Government	Private	CBO	MGO's and others
Area Residencial (Bairro)																											
Sanitation and drainage zone I																											
Inhagôia B	5	150	16,153	0.8%	8,800	108				37%																	
Jardim	5	210	12,720	-1.2%	5,700	61				58%																	
Aeroporto B	2	120	17,857	0.2%	10,000	149				37%																	
Unidade 7	2	50	8,890	-0.5%	5,100	178				61%																	
Chamanculo D	2	80	13,578	-0.7%	7,200	227				55%																	
Xipamanine	2	70	20,139	-1.8%	10,800	288				45%																	
Mkhadjuine	2	40	8,821	-0.8%	4,400	216				73%																	
Munhuana	2	50	3,103	0.0%	1,600	62																					
Aeroporto A	2	90	16,407	-0.4%	8,100	182				55%																	
Mafalala	3	90	20,730	-0.2%	10,900	231				18%																	
Urbanização	3	110	15,798	1.3%	8,300	144				91%																	
Maxaquene A	3	90	22,750	0.0%	12,700	285				50%	28%	28%															
Maxaquene B	3	110	30,431	0.3%	16,700	277				39%	38%	14%															
Maxaquene C	3	100	19,581	0.4%	11,700	198				51%	2%	30%	18%														
Maxaquene D	3	90	22,351	0.9%	13,100	249				55%	47%	14%															
Mavalane A	4	120	20,829	0.4%	11,300	174				21%																	
FPLM	4	100	11,428	0.5%	6,800	114																					
Mavalane B	4	80	13,030	0.9%	7,500	217				35%	42%	17%															
Malhangalene B	1	100	17,348	0.1%	6,400	180				39%																	
Coop	1	70	5,839	-1.2%	1,000	85				97%																	
Zone I has 20 barrios			1,870	317,383	167,700																						1.9
Sanitation and drainage zone II																											
Luis Cabral	5	290	33,800	0.1%	18,700	117				25%																	
Malanga	2	150	17,276	-0.2%	8,000	115				54%																	
Chamanculo C	2	140	26,179	-0.5%	13,900	187				30%																	
Chamanculo B	2	70	10,854	-0.3%	5,400	152				34%																	
Chamanculo A	2	40	12,758	-1.2%	5,500	319				26%																	
Alto Maé B	1	120	12,416	-2.4%	4,100	107				80%																	
Alto Maé A	1	50	8,800	-2.3%	2,800	189				81%																	
Central C	1	210	8,352	-1.7%	2,800	40				97%																	
Central B	1	80	11,275	-2.8%	3,100	201				97%																	
Central A	1	80	10,879	-2.0%	3,000	189				97%																	
Malhangalene A	1	50	6,818	-4.8%	1,800	142				84%																	
Polana Cimento A	1	110	7,807	-3.2%	1,300	73				94%																	
Zone II has 12 barrios			1,350	166,714	70,200																						2.8

Scenario 2, balanced development

DM	Municipal district	Area ha	Population 2007		Density pers/parsha	Development status		Natural conditions		Water supply coverage 2003			Wastewater coverage				Score Population Poverty Proposed priority assessment	Current actors				
			Total population pers	average annual growth 1997 - 2007		Urban poor, head count	Consolidated Planned	Not planned	High ground water level Low lying areas	Piped water/sewers Others	On-site, combined Septic tanks latrines	O and M private operator Non	Government DMA - DES/GDM CIMA - MOAS MISAU CIMA - MDS	Private ADASBU, stodge	CBO ACADEC Heritons Aul	NGO's and others						
Sanitation and drainage zone III																						
	Polana Cimento B	1	90	8,131	-4.4%	1,900	108			97%					2.1	0.0						
	Sommershield	1	440	9,040	-2.3%	1,700	21			87%					1.0	0.0						
	Polana Caniço A	3	220	45,883	0.1%	25,900	209			2%				3.4	0.0	1						
	Polana Caniço B	3	420	46,184	1.9%	28,000	110							3.2	0.0	2						
	Zone III has 4 barrios		1,160	109,238		55,500										1.9						
Sanitation and drainage zone IV																						
	Hulene B	4	370	45,290	1.8%	25,100	123			8%				3.2	0.0	2						
	Ferrovário	4	340	49,877	1.9%	25,500	147			31%		1%	41%	15%	3.2	0.0	2					
	Hulene A	4	130	28,240	0.2%	18,000	217			14%				3.3	0.0	1						
	Laulane	4	380	27,989	1.9%	14,900	78							3.0	0.0	2						
	3 de Fevereiro	4	220	16,710	1.7%	8,700	78							2.9	0.0	2						
	Mahotas	4	860	47,508	8.4%	25,900	55							2.9	0.0	3						
	Costa do Sol	4	3,420	16,828	1.7%	9,500	5			14%				1.8	0.0							
	Abazine	4	1,710	15,957	12.0%	11,700	9			74%				2.1	0.0							
	Zone IV has 8 barrios		7,410	248,479		137,300										2.3						
Sanitation and drainage zone V																						
	Zimpelo	5	1,730	27,889	9.0%	15,800	18							2.2	0.0							
	Magoanine C	5	-	-	0.0%	-	-							0.0	0.0							
	Magoanine A incl B and C	5	2,330	76,588	20.5%	43,800	34			31%				2.9	0.0	3						
	Magoanine B	5	-	-	0.0%	-	-							0.0	0.0							
	Zone V has 4 barrios		4,060	104,277		59,400										3.3						
Sanitation and drainage zone VI																						
	Inhagáia A	5	90	16,405	-0.9%	9,100	182			32%				2.6	0.0	2						
	Nsalene	5	20	4,011	-0.7%	2,400	201							3.0	0.0	1						
	25 de Junho A	5	190	13,154	0.1%	8,500	69			48%				2.6	0.0	3						
	25 de Junho B	5	180	23,758	2.2%	12,800	148			14%				3.0	0.0	2						
	Bagamoyo	5	240	19,995	-0.9%	11,200	83			57%				2.7	0.0	3						
	George Dimitrovi Benfica	5	480	40,972	0.3%	22,800	85			31%				2.9	0.0	2						
	Mashazine	5	90	8,752	0.3%	4,900	97							2.4	0.0	3						
	Zone VI has 7 barrios		1,270	127,045		69,700										2.3						
Total for project area			17,120	1,073,118		559,800																

7 BAIRO PRIORITY SETTING AND IMPLEMENTATION PHASING

7.1 General

One of the reasons to prepare an outline *Citywide Sanitation Strategy* for Maputo is the fact that the problems are big, divers and scattered over a large area. Consequently it is rather difficult to compare the situation in one bairro to the situation in an other bairro and to define which situation needs earlier attention than an other.

In order to kick start this discussion in a structured way, in the context of this study an approach for “*Bairro priority setting*” has been developed. The approach and results are presented in this chapter and where also presented and discussed during the CSS workshop held in July 2010 in Maputo, see Appendix G. Recommendations from the workshop have been incorporated in the approach as presented here.

7.2 Criteria and Indicators for Bairro Priority Setting

7.2.1 Population and urban poor

General - The most crucial criteria for bairro priority setting and the subsequent selection of wastewater management systems and technology are related to the urban population and the so-called urban poor. Fortunately a rather consistent and complete set of data related to these indicators could be made available for this study.

Population development indicators – In the context of this study three crucial population indicators are considered: i) total population in 2007, ii) average annual growth rate (1997 – 2007) and iii) gross population density (2007).

Official data from the population census held in 1997 and 2007 has been used, it is not clear if the census areas used in 1997 and 2007 are exactly the same, if this is not the case some inconsistency in the data sets may occur.

Urban Poor - In 2006 a World Bank sponsored study for Maputo was implemented, the study: “Avaliação e Mapeamento da Pobreza na Cidade de Maputo”, December 2006 was implemented by Métier and provides crucial information concerning the “urban poor” in Maputo. The results of this study which provides detailed information at “bairro level” where used to assess poverty levels.

Three indicators have taken into consideration: i) head count index, ii) number of urban poor in 2006 and iii) the Gini⁶ coefficient.

7.2.2 Current urban infrastructure and related service levels

General - As no consistent/completed set of information related to current service levels for urban infrastructure at bairro level is available as this information could only be used in a qualitative way. If in the future better information becomes available it is recommended to adjust the priority setting process in such a way that these indicators can be used as well.

Wastewater management - Information related to wastewater (excreta) management found so far is mainly qualitative. Once better information becomes available this information should be taken into consideration for the bairro priority setting and the selection of sanitation systems and technologies. For the time being the qualitative information has been taken into consideration as a cross reference for the proposed priorities and implementation phasing.

For the definition of “Sanitation and drainage zones” the qualitative information related to current type of wastewater management has been taken into consideration. The potential service area of the so-called “off-site system – system 2” has been included in zone 1, while the potential services areas of the so-called “combined systems – system 1” are included in zone 2

⁶ Gini coefficient, named after the Italian statistician Corrado Gini, is between others used to measure the “inequality of income” (prosperity). Its value varies between 0 and 1; 0 represents the “perfect equality” (every body has the same income) and 1 represents the “perfect inequality” (one person has all the income and the others have nothing).

Current water supply and sanitation service levels - Current water supply and wastewater management service levels will, to a large extent define the need and opportunities for the further development of the “bairros”. If in a certain “bairro” no formal and/or affordable water supply system exists the population’s top priority will most likely be to improve this situation and the type of sanitation improvements that at short term can be implemented will have to be consistent and compatible with the actual level of water supply services.

As can be seen in the data base (provided in appendix D), so far limited information concerning current water supply and sanitation service level have been found; information available concerning piped water supply is based upon information provide in the “Plano Estratégico dos 7 Municípios, Volume 2.7, Maputo” from Lahmeyer. In addition for a limited number of bairros detailed information collected by local NGO’s could be traced.

Drainage infrastructure - In the context of previous drainage and wastewater management studies the city has been subdivided into a number of catchments “bacias”, these catchments together with current administrative boundaries have been taken into consideration for the proposed sub-division of the city into the “Sanitation and drainage zones” as discussed in the previous chapter, Table 6.1. Information with respect to the quality of “neighborhood drainage” is not yet available. As these local drains full fill a crucial role for the disposal of grey water (sullage) their actual conditions and coverage are an important indicator for the priority setting of bairros with mainly on-site sanitation.

Major transportation infrastructure – For the sub-division of the city into the proposed “Sanitation and drainage zones” the airport located more or less on the watershed between Maputo’s two main catchments dewatering into the ocean and the river Infulene has been considered to be a defining factor. The railway to the north of the country, the Avenida de Moçambique and some other main roads have also been taken into consideration for the sanitation and drainage zoning.

7.2.3 Urban development

Land development status – Maputo’s Urban Structural Plan (PEUMM - 2008) distinguishes the following conditions as far as the land development status is concerned: i) Consolidated, ii) Planned and iii) Not planned. As far as bairro priority setting is concerned particularly the areas with the status “not planned” are of importance as it is to be anticipated that at short to medium term these areas will be restructured which will have a major impact on urban infrastructure and most likely also on land registration and ownership. Planning and phasing of activities in these areas should take into consideration the planned restructuring.

Current and planned land-use - The outline citywide sanitation strategy (CSS) is to be based upon the agreed city development scenario for Maputo as presented in Maputo’s Urban Structural Plan (PEUMM) of 2008. As a sectoral development strategy the CSS should contribute to the implementation of PEUMM. Consequently for the preparation of the outline CSS it is essential to use information provided in PEUMM as starting points.

A key element from the PEUMM which forms the basis for the outline CSS is the general classification of land use and grouping of population densities for residential areas. Table 2.1 shows the land-use classification in a summarized form, additional information has been included in the data base, see Appendix D and map 9 of Appendix G shows current land use.

7.2.4 Physical conditions

Existing rivers, major drains and catchments – In general terms it can be said that the western part of Maputo slopes towards the Infulene river and that the eastern part slopes towards the ocean. Most of the southern part slopes towards the estuary. These tendencies are taken into consideration for the sub-division of the city into *Sanitation and drainage zones*.

Groundwater level and sub-soil conditions – These are important considerations for the selection of future wastewater management systems/technologies and subsequently for the selection of critical/priority development areas. During the preparation of the final citywide sanitation strategy (not included in this study) detailed information related to the average annual/seasonal groundwater levels and topography (identification

of low lying areas) of the bairros will need to be collected. This information will to a certain extent define the selection of feasible wastewater management systems and technologies, sustainable future population densities and thus sustainable future development (land use) of a number of critical areas. In this context also the current and planned nature reserves (mainly mangrove areas) which are not suitable for urbanization will be identified.

7.2.5 Social Indicators

So far formally very little is known with respect the demand for improved sanitation and the commitment of the end-users (communities) to active participate in the planning, design, implementation and operation of future systems as well as to pay for the additional services to be provided. It is believed that Governmental and NGO's working in the field of sanitation have a reasonable understanding of the "demand for sanitation" and the need for the additional community development and social marketing. As no structured information related to these aspects has been found in the course of this study social indicators, although crucial for the success of any project are not yet taken into consideration. Once agreement between stakeholders concerning the proposed priority setting and implementation phasing has been reached the "demand for sanitation" in the pre-selected areas should be assessed in a structured way. Subsequently priorities could be adjusted and/or the demand for improved sanitation should be created with the help of social marketing, community development and awareness creation.

7.3 Bairro Priority Setting

7.3.1 Scenarios

In the context of this "Outline CSS study" three scenarios have taken into consideration, see Table 7.1.

- *Focus on current problems* – Under this scenario the highest priority is given to the alleviation of current problems and the focus is mainly on the current urban poor;
- *Focus on development trends* – This scenario focuses on the prevention of future problems -it tries to prevent the creation of new slums - and pays to a far lesser extend on current slum and current urban poor
- *Balanced Development* – This scenario tries to find the middle ground between the two other scenarios

Table 7-1 Bairro Priority Setting Scenarios

Scenario 1, focus on current problems			Scenario 2, balanced development			Scenario 3, focus on development trends		
Population	unit	Weight	Population	unit	Weight	Population	unit	Weight
Persons	pers	5%	Persons	pers	15%	Persons	pers	10%
Growth	%/yr	0%	Growth	%/yr	30%	Growth	%/yr	60%
Density	pers/ha	95%	Density	pers/ha	55%	Density	pers/ha	30%
Poverty			Poverty			Poverty		
Index	coef	0%	Index	coef	10%	Index	coef	20%
The poor	pers/ha	100%	The poor	pers/ha	80%	The poor	pers/ha	60%
Gini	coef	0%	Gini	coef	10%	Gini	coef	20%
Overall			Overall			Overall		
Population	score	10%	Population	score	50%	Population	score	90%
Poverty	score	90%	Poverty	score	50%	Poverty	score	10%

7.3.2 Data assessment and scoring

As discussed in the previous section due to the limited information available at the time of the study only two sets of information have been taken into consideration for *Bairro priority setting*. If in the future more and reliable information becomes available the *Bairro priority setting* could also include important indicators as discussed in the previous section. The current Bairro priority scoring is based upon:

Population development indicators - Three indicators are used to obtain a weighted “population priority score” for each bairro: i) total population in 2007, ii) average annual growth rate (1997 – 2007) and iii) gross population density (2007). Different weights (see Table 7.1) are assigned to each of the three factors.

A final weighted score, varying from 1 to 4 is calculated for each of the scenarios, see Table 7.2. Detailed results from the assessment for scenario 2 – *Balanced development* - are shown in Appendix E.

Urban Poor - In 2006 a poverty study for Maputo was implemented, the World Bank sponsored study (“Avaliação e Mapeamento da Pobreza na Cidade de Maputo”, December 2006), which was implemented by Métier. The results of this study which provides detailed information at “bairro level” where used to assess poverty levels.

The scoring for poverty is based on three factors: the i) index of poverty, ii) number of urban poor population and iii) Gini coefficient.

Different weights (see Table 7.1) are assigned to each of the three factors. A final weighted score, varying from 1 to 4 is calculated for each of the scenarios, see Table 7.2. Detailed results from the assessment for scenario 2 – *Balanced development* - are shown in Appendix E.

7.4 Proposed Implementation Phasing

Qualitative information taken into consideration – Taking into consideration the overall bairro priority scores and additional information related to i) development status, ii) land use (current and planned business public facilities and industrial districts) iii) current actors iv) settlement type, see section 2.2 Figure 2.2, and v) geographical location of the bairros, a re-grouping of the bairros within each of the *Sanitation and drainage zones* has been done. As a result more or less homogeneous sub-districts have been identified, see Table 7.2

Proposed phasing of interventions – Taking into consideration the assessed priorities for each of the bairros located within these sub-zones an implementation phasing is proposed. The implementation phasing considers the following indicative design horizons: i) short term or immediate action; < 5 years, ii) short to medium term; 5 to 10 years, iii) medium to long term; 10 to 15 years and iv) long term; > 15 years. The proposed implementation phasing is presented in Table 7.2.

Table 7-2 Assessed Bairro Priorities and Implementation Phasing

MD	Municipal district	Population 2007			Poverty	Priority scenarios assessment	Development status	Indicative settlement type	Business districts	Proposed phasing	
		Total population pers	Population density pers/ha	average annual growth 1997 - 2007 %							
Sanitation and drainage zone I											
1a	Inhagóia B	5	16,153	108	0.6%	8,800	3 3 3	#	A	#	40,000
	Jardim	5	12,720	61	-1.2%	5,700	#	#	A	#	
	Aeroporto B	2	17,857	149	0.2%	10,000	3 3 3	#	B	#	
	Unidade 7	2	8,890	178	-0.5%	5,100	1 2 3	#	B	#	
	Chamanculo D	2	13,578	227	-0.7%	7,200	1 1 2	#	B	#	
	Xipamanine	2	20,139	288	-1.8%	10,600	1 1 3	#	B	#	
	Mikhadjuine	2	8,621	216	-0.8%	4,400	1 1 3	#	B	#	
	Munhuana	2	3,103	62	0.0%	1,600	#	#	B	#	
	Aeroporto A	2	16,407	182	-0.4%	8,100	3 3 3	#	B	#	
	Mafalala	3	20,730	231	-0.2%	10,900	1 1 2	#	B	#	
	Urbanização	3	15,798	144	1.3%	8,300	3 2 2	#	B	#	
	Maxaquene A	3	22,750	285	0.0%	12,700	1 1 2	#	B	#	
	Maxaquene B	3	30,431	277	0.3%	16,700	1 1 2	#	E	#	
	Maxaquene C	3	19,561	196	0.4%	11,700	1 1 2	#	E	#	
	Maxaquene D	3	22,351	249	0.9%	13,100	1 1 2	#	E	#	
	Mavalane A	4	20,829	174	0.4%	11,300	3 3 3	#	F	#	
	FPLM	4	11,428	114	0.5%	6,600	3 3 3	#	F	#	
	Mavalane B	4	13,030	217	0.9%	7,500	1 1 2	#	F	#	
	Malhangalene B	1	17,348	180	0.1%	6,400	3 3 3	#	C	#	
	Coop	1	5,639	85	-1.2%	1,000	#	#	C	#	
	Zone I has 20 barrios		317,363			167,700	1.9 1.9 2.6				
Sanitation and drainage zone II											
II.a	Luis Cabral	5	33,800	117	0.1%	18,700	3 3 3	#	A	#	40,000
	Malanga	2	17,276	115	-0.2%	8,000	3 3 3	#	B-C	#	
	Chamanculo C	2	26,179	187	-0.5%	13,900	1 2 3	#	B	#	
	Chamanculo B	2	10,654	152	-0.3%	5,400	3 3 3	#	B	#	
	Chamanculo A	2	12,758	319	-1.2%	5,500	1 1 3	#	B	#	
	Alto Maé B	1	12,416	107	-2.4%	4,100	3 3	#	C	#	
	Alto Maé A	1	8,800	189	-2.3%	2,800	3 3	#	C	#	
	Central C	1	8,352	40	-1.7%	2,600	#	#	C	#	
	Central B	1	11,375	201	-2.6%	3,100	2 3	#	C	#	
	Central A	1	10,679	189	-2.0%	3,000	3 3	#	C	#	
	Malhangalene A	1	6,618	142	-4.6%	1,800	3 3	#	C	#	
	Polana Cimento A	1	7,807	73	-3.2%	1,300	#	#	C	#	
	Zone II has 12 barrios		166,714			70,200	2.6 2.8 3.4				
Sanitation and drainage zone III											
III.a	Polana Cimento B	1	8,131	106	-4.4%	1,900	#	#	C	#	
	Sommersfield	1	9,040	21	-2.3%	1,700	#	#	C	#	
	Polana Caniço A	3	45,883	209	0.1%	25,900	1 1 2	#	D	#	
	Polana Caniço B	3	46,184	110	1.9%	26,000	2 2 1	#	D	#	
	Zone III has 4 barrios		109,238			55,500	1.9 1.9 1.9				
Sanitation and drainage zone IV											
IV.a	Hulene A	4	28,240	217	0.2%	16,000	1 1 2	#	F	#	
	Ferrovário	4	49,877	147	1.9%	25,500	2 2 1	#	F	#	
	Hulene B	4	45,390	123	1.6%	25,100	2 2 1	#	F	#	
	Laulane	4	27,969	78	1.9%	14,900	3 2 1	#	F	#	
	3 de Fevereiro	4	16,710	76	1.7%	8,700	3 2 2	#	F	#	
	Mahotas	4	47,508	55	8.4%	25,900	3 1	#	H	#	
	Albazine	4	15,957	9	12.0%	11,700	2	#	H	#	
	Costa do Sol	4	16,828	5	1.7%	9,500	3	#	I	#	
	Zone IV has 7 barrios		231,651			127,800	2.7 2.3 1.4				
Sanitation and drainage zone V											
V.a	Zimpeto	5	27,689	16	9.0%	15,600	#	#	H	#	
	Magoanine C	5	-	-	0.0%	-	3 1	#	H	#	
	Magoanine A incl B and C	5	76,588	34	20.5%	43,800	3 2	#	H	#	
	Magoanine B	5	-	-	0.0%	-	3 2	#	H	#	
	Zone V has 4 barrios		104,277			59,400	4.0 3.3 1.3				
Sanitation and drainage zone VI											
VII.a	Inhagóia A	5	16,405	182	-0.9%	9,100	1 2 3	#	G	#	
	Nsalene	5	4,011	201	-0.7%	2,400	1 1 3	#	G	#	
	25 de Junho A	5	13,154	69	0.1%	6,500	3 3 3	#	G	#	
	25 de Junho B	5	23,756	148	2.2%	12,800	3 2 1	#	G	#	
	Bagamoyo	5	19,995	83	-0.9%	11,200	3 3 3	#	G	#	
	George Dimitrov(Benfica)	5	40,972	85	0.3%	22,800	2 2 3	#	G	#	
	Mashazine	5	8,752	97	0.3%	4,900	3 3 3	#	G	#	
	Zone VI has 7 barrios		127,045			69,700	2.4 2.3 2.6				

8 PRE-SELECTED WASTEWATER MANAGEMENT SYSTEMS AND TECHNOLOGIES

8.1 Pre-selection of Wastewater Management Systems and Technologies

Taking into consideration the current situation and selection criteria as discussed in chapter 5 it may be concluded that potential wastewater management systems for Maputo include on-site, off-site and hybrid systems and that in a limited number of bairros Eco sanitation systems appear to be feasible.

A major challenge will be to select and agree with all key stakeholders and the end-users on the specific systems at bairro level for the short-, medium term and long term. Taking into consideration the proposed implementation phasing as discussed in section 7.2, system selection criteria in chapter 5, current conditions and development trends table 8.1 shows a number of pre-selected wastewater management systems and technologies. However, for the final selection a number of additional criteria not yet known at present are to be taken into consideration:

- the political will at municipal level to improve current conditions;
- pressure from the national government to improve sanitation conditions, which comply at least with the agreed Millennium Development Goals (MDGs);
- willingness of the national government and international donors to cooperate closely with Maputo City to improve wastewater management and to make the required funds available;
- local community based demand for improved living conditions which include adequate levels of wastewater management;
- others

Taking into consideration the current situation, data as available at this moment (see chapter 6), selection criteria as discussed in chapter 5 and recommendations put forward during the workshops held in the context of this study the proposed wastewater management systems at bairro level for the short medium and long term are presented in the following sections. Pre-selected sanitation systems for each of the “sanitation zones” (Figure 6.5) are proposed.

Table 8-1 Overview of Proposed/Potential Wastewater Management Systems for Maputo City

Type	General description		Technology options					Settlement type	Design horizon		
	Toilet	Grey water	User interface	Neighborhood	Conveyance	Final treatment	Re-use, Final disposal		Short term < 5 yrs	Medium term 5 to 15 yrs	Long term >15 yrs
A.1	On-site	Consolidation of existing developments: Hygienisation, replacement of traditional with improved latrines, and some septic tanks	Poor flush slabs and toilets	Simple pits, some septic tanks	Manual Small trucks	On-site Central WWTP	Down stream	AB			
		Disposal in local drains and water courses		Small drains		Non	Local infiltration Down stream	DE	XXX	X	
A.2	On-site	Gradual introduction of Eco Sanitation: HH latrine with possible onsite reuse of urine in garden. Faeces dehydrated possible reuse onsite or further downstream	Poor flush or dry slabs and toilets	Simple pits, some septic tanks	Manual Small trucks	On-site Sludge digester Central WWTP	Down stream Re-use of wastes in gardens and urban agriculture	A		XXX	X
		Some pre-treatment, disposal in local drains and water courses	Local drains	Non Grease filter	Small drains	Non	Local infiltration Down stream	FG			
A.3	On-site	Improved latrine system at HH level with infiltration of liquid wastes, emptying of faecal sludge when full and additional hygienisation	Poor flush slabs and toilets	Simple pits, some septic tanks	Small trucks	On-site Central WWTP	Down stream	B			
		Some pre-treatment, disposal in local drains and water courses	Local drains	Non Grease filter	Small drains	Non	Local infiltration Down stream	DE	XX	XXX	X
A.4	On-site	Public toilet facilities – A community multi service block could include toilet, water supply (stand post), laundry and other services	Poor flush slabs and toilets	Septic tank Baffled reactor	Small and medium trucks	Central or de-central WWTP or digester	Infiltration of effluent	BE		XXX	XX
		Some pre-treatment, disposal in local drains and water courses	Local drains	Non Grease filter	Small drains	Non	Local infiltration Down stream	DF			
A.5	On-site	Improved latrine system and/or full toilet and sanitary facilities at HH level with proper infiltration of liquid wastes, emptying of faecal sludge when full	Poor or full flush slabs and toilets	Adequate septic tanks	Small and medium trucks	Central or de-central WWTP or digester	Limited reuse of sludge to be sold on local market Downstream	G H I	XXX	XX	X
B.1	Off-site	Consolidation and rehabilitation of existing CONVENTIONAL sewer systems including postponed maintenance	Poor or full flush slabs and toilets	Household connections and secondary and primary sewer networks		Existing WWTP Facultative ponds	Downstream	BC E	XXX	XX	X
B.2	Off-site	DEWATS – Community or private/public operated de-central simplified local wastewater collection and treatment systems. Can be	Poor or full flush slabs and toilets	HH connections and simplified sewer network	Direct to local treatment or Existing	Baffled reactor Small UASB	Downstream	DE FI G	X	XXX	XX

Type	General description		Technology options				Re-use, Final disposal	Settlement type	Design horizon		
	Toilet	Grey water	User interface	Neighborhood	Conveyance	Final treatment			Short term < 5 yrs	Medium term 5 to 15 yrs	Long term > 15 yrs
B.3	Off-site	combined with Type A.4			secondary sewer	Existing WWTP					
		CONDOMINIAL - Community operated simplified local collection sewer networks and house connections. Public/private operated conventional conveyance system and de-central treatment	Poor or full flush slabs and toilets	Simplified sewer networks operated by end-users	Conventional secondary and/or primary sewer lines	Facultative ponds UASB plus trickling filter	Down stream Treated sludge sale to local agriculture market I	H G DF	X	XX	XXX
C.1	Hybrid	Consolidation and upgrading of existing septic tanks connected to the underground drainage system	Poor or full flush slabs and toilets	Septic and holding tanks	Small pipe lines connect septic tanks with storm water drains	Currently non De-central treatment (UASB)	Down stream	C	X	XXX	X
		Directly discharged into drainage canals	Mainly closed drainage canals	Non Grease filter	Storm water drainage system	Non or future de-central treatment (UASB)	Down stream				
C.2	Hybrid	Small bore sewer networks This system can be used to upgrade existing on-site sanitation systems by collecting the effluent of septic tanks in small bore sewers. In the long-term the system will gradually evolve into a condominial system	Poor or full flush slabs and toilets	Septic and holding tanks	Small bore sewer networks	De-central treatment (UASB)	Down stream Treated sludge sale to local agriculture market	G F	X	XX	XX
D.1	EcoSan	Eco Sanitation with limited de-central off-site treatment systems. Possibly in combination with type A.2 (Off-site), and C.2 (small bore sewer networks)	Dry or full flush slabs and toilets	Septic and holding tanks Urine diversion		Baffled reactor UASB Trickling filters Sludge digester	Down stream Treat ed sludge sale to local agricultural market. Biogas sales to local users	A		X	XX
		Pretreatment at HH level	Local drains	Grease filter	Drainage networks	Non	Local infiltration Down stream				

8.2 Proposed Wastewater Management Systems at Bairro Level

8.2.1 Sanitation and drainage zone I

General description of current conditions - This area covers the potential service area of the existing conventional sewerage system. Only a small percentage of the population living in the planned and consolidated areas is connected to the sewerage system. The majority of the population lives in unplanned areas with poor to very poor sanitation conditions and depends on traditional latrines. NGO's and community based organizations are very active in these areas and substantial numbers of improved latrines and other on-site sanitation facilities have been implemented. It is anticipated that the NGO's will continue and extend their activities over the coming years.

Key characteristics and proposed wastewater management systems for this sanitation an drainage zone

Area Residencial (Bairro)	MD Municipal district No	Population 2007			Priority scenarios 1/ current problems 2/ balance of development 3/ development trends assessment	Development status Consolidated Planned Not planned puemm	Indicative settlement type	Current actors		Proposed phasing Short term Short- to medium term Medium- to long term Long term people served	Proposed / Potential Wastewater Management System							
		Total population pers	Population density pers/hect	average annual growth 1997 - 2007 %				CSO ADMSEL, Adige ACADEG Horizontes-Azul	NGOs and others ANDEC ASSOCIECHA Bambo Ela eros Linnings Machala Wairacuma Subindade W SJP W aneald Xonings		A1 Consolidation existing developments	A2. Gradual introduction of EcoSan	A3 Improved latrine s and septic tanks	A4 Refined or fresh animal facilities	A5 Full sanitation facilities, on plot lands	B1 Conventional existing system	B2 DEWATS and strepht sewer networks	B3 Combinational sewer r networks, de central treatment	C1 Upgrading septic tanks and drainage networks	C2 Small bore sewer systems, de-central treatment	D1 Full EcoSan both on site and de central
Sanitation and drainage zone I																		
Zone I A																		
Inhagôia B	5	16,153	108	0,6%	3 3 3		A			40,000	S	S						
Jardim	5	12,720	61	-1,2%			A											M L
Zone I B																		
Aeroporto B	2	17,857	149	0,2%	3 3 3		B			170,000	S	S						
Unidade 7	2	8,890	178	-0,9%	3 2 3		B								L			
Chamanculo D	2	13,578	227	-0,7%	3 3 3		B											L
Xipamanine	2	20,138	288	-1,8%	3 1 3		B											L
Mkhadjuine	2	8,621	216	-0,8%	3 1 3		B											L
Munhuana	2	3,103	62	0,0%			B											L
Aeroporto A	2	16,407	182	-0,4%	3 3 3		B											L
Mafalala	3	20,730	231	-0,2%	3 1 2		B											L
Urbanização	3	15,788	144	1,3%	3 2 2		B											L
Maxaquene A	3	22,750	285	0,0%	3 3 2		B											L
Zone I C																		
Maxaquene B	3	30,431	277	0,3%	3 1 2		E			80,000	S							
Maxaquene C	3	18,561	196	0,4%	3 1 2		E											
Maxaquene D	3	22,351	249	0,9%	3 3 2		E											
Zone I D																		
Mavalane A	4	20,828	174	0,4%	3 3 3		F			50,000	S							
FPLM	4	11,428	114	0,9%	3 3 3		F											
Mavalane B	4	13,030	217	0,9%	3 3 3		F											
Zone I E																		
Mahangalene B	1	17,348	180	0,1%	3 3 3		C			30,000	S							
Coop	1	5,638	85	-1,2%			C											
Zone I has 20 barrios		317,363			1,9 1,9 2,6													

For a detailed description of the sanitation management systems see Table 8.1, Design horizons: S = short term < 5 years, M = medium term 5 to 15 years, L = Long term > 15 years

8.2.2 Sanitation and drainage zone II

General description of current conditions - The prevailing sanitation system in this area is the so-called combined system, where effluent of septic tanks is discharged into the closed and open urban drains designed for storm water discharge. The population in unplanned and disadvantaged areas depends on traditional latrines, which are gradually upgraded to improved latrines. Two NGO's are active in these areas and improved latrines and other on-site sanitation facilities have been implemented. It is anticipated that the NGO's will continue and extend their activities over the coming years.

Key characteristics and proposed wastewater management systems for this sanitation and drainage zone

MD	Population 2007			Priority scenarios 1) current problems of balance of development 2) development trends	Development status Connected Planned Not planned	Indicative settlement type	Current actors CEO NGO's and others secondary information	Proposed phasing Short term Short - to medium term Medium - to long term Long term	Proposed / Potential Wastewater Management System											
	Total population pers	Population density pers/ha	average annual growth % 1997 - 2007						A.1 Consolidation existing developments	A.2 Gradual introduction of EcoSan	A.3 Improved latrines and septic tanks	A.4 Public toilet facilities	A.5 Full sanitation facilities, septic tanks	B.1 Conventional sewer network	B.2 DEWATS and simplified sewer networks	B.3 Conventional sewer networks, de-central treatment	C.1 Upgrading septic tanks and drainage networks	C.2 Small scale sewer systems, on-site treatment	D.1 Full EcoSan both site and central	
Area Residencial (Bairro)	No																			
Sanitation and drainage zone II																				
Lu	Luis Cabral	5	33,800	117	0.1%	3 3 3														
	Malanga	2	17,276	115	-0.2%	3 3 3														
Ilb	Chamanculo C	2	26,179	187	-0.9%	3 3 3														
	Chamanculo B	2	10,654	152	-0.3%	3 3 3			70,000											
	Chamanculo A	2	12,758	319	-1.2%	3 3 3														
	Aito Mac B	1	12,416	107	-2.4%	3 3														
	Aito Mac A	1	8,800	189	-2.3%	3 3														
	Central C	1	8,352	40	-1.7%	3 3														
	Central B	1	11,375	201	-2.6%	2 3														
	Central A	1	10,679	189	-2.0%	3 3														
	Mahangalene A	1	6,618	142	-4.6%	3 3														
	Polana Cimento A	1	7,807	73	-3.2%	3 3														
	Zone II has 12 barrios		166,714			2.6 2.8 3.4														

For a detailed description of the sanitation management systems see Table 8.1, Design horizons: S = short term < 5 years, M = medium term 5 to 15 years, L = Long term > 15 years

8.2.3 Sanitation and drainage zone III

General description of current conditions - The southern part of this area is part of “cidade cimento” which is partly served by the so-called combined system and partly by the conventional sewerage system. The part that is served by the conventional sewerage system has major operational problem due to the fact that the two pumping station are all ready quite some time out of service. The majority of the population living in the northern part of the area (critical areas) is subject to poor sanitation conditions and depends mainly on latrines. Bairro Polana Canicio B is gradually transformed into a high class residential area, the urban poor living in this area are slowly moving to other areas.

Key characteristics and proposed wastewater management systems for this sanitation an drainage zone

Area Residencial (Bairro)	Municipal district	Population 2007			Priority scenarios	Development status	Indicative settlement type	Current actors CEO NGOs and others	Proposed phasing	Proposed / Potential Wastewater Management System											
		Total population	Population density	average annual growth 1997 - 2007						1/ current problems assessment	2/ balanced development	3/ development trends	Consolidated	Planned	Not planned	On-site	Off-site	Hybrid	EcoSan		
No.		pers	pers/ha	%					Short term	Short - to median term	Medium - to long term	Long term									
Sanitation and drainage zone III																					
IIIa	Polana Cimento B	1	8,131	106	-4.4%							20,000									
	Sommersfield	1	8,040	21	-2.3%																
IIIb	Polana Canicio A	3	45,883	209	0.1%	3	3	2													
	Polana Canicio B	3	46,184	110	1.9%	2	2	1													
Zone III has 4 bairros			109,238			1.5	1.3	1.5													

For a detailed description of the sanitation management systems see Table 8.1, Design horizons: S = short term < 5 years, M = medium term 5 to 15 years, L = Long term > 15 years

8.2.4 Sanitation and drainage zone IV

General description of current conditions - This area can be sub-divided in two areas: i) the area towards the ocean (Costa del Sol), which is still sparsely populated but the population is growing rapidly. For this area a new business district and high and medium class urban residential areas are planned (high class residential areas are currently under development), and ii) an area between the Airport and Costa del Sol where a number of critical and sub-critical areas with medium to high population densities are located. In the area adjacent to the airport the population depends on traditional latrines, which are gradually upgraded to improved latrines. NGO's are active in these areas and improved latrines and other on-site sanitation facilities have been implemented. Administrative boundaries of a number of bairros are under reconsideration. Some bairros (e.g Albazine) will eventually be split-up into smaller bairros.

Key characteristics and proposed wastewater management systems for this sanitation an drainage zone

Area Residencial (Bairro)	MD	Population 2007			Priority scenarios			Development status			Current actors		Proposed phasing	Proposed / Potential Wastewater Management System																				
		Total population	Population density	average annual growth 1997 - 2007	1) current problems	2) balance of development	3) development trends	Completed	Planned	Not planned	Indicative self-report type	ADENSEL, study		CEG	NGO's and others	A.1 Consolidation existing development	A.2 Gradual introduction of EcoSan	A.3 Improved latrines and simple tanks	A.4 Public toilets (multi-service facilities)	A.5 Full sanitation facilities, as pits tanks	B.1 Conventional existing system	B.2 DEWATS and stratified sewer networks	B.3 Conventional sewer networks, de-central treatment	C.1 Upgrading septic tanks and drainage networks	C.2 Small bore sewer systems, de-central treatment	D.1 Full EcoSan both on-site and de-central								
Sanitation and drainage zone IV																																		
Zone I/A																																		
Hulano A	4	28,240	217	0.2%	1	1	2				F																							
Ferroviário	4	48,877	147	1.9%	2	2	1				F																							
Hulano B	4	45,390	123	1.6%	2	2	1				F																							
Laulano	4	27,868	78	1.9%	3	2	1				F																							
3 de Fevereiro	4	16,710	76	1.7%	3	2	2				F																							
Zone II/B																																		
Mahotas	4	47,508	55	8.4%	2	3	1				H																							
Albazine	4	15,957	9	12.0%	3	2	1				H																							
Zone III/C																																		
Costa do Sol	4	16,828	5	1.7%	3						I																							
Zone IV has 7 bairros		231,651			2,7	2,3	1,4																											

For a detailed description of the sanitation management systems see Table 8.1, Design horizons: S = short term < 5 years, M = medium term 5 to 15 years, L = Long term > 15 years

8.2.5 Sanitation and drainage zone V

General description of current conditions - This generally planned area is subject to enormous population growth and is considered as the future extension area for low and medium cost housing estates. Moreover, the area is used for the relocation of people living in conflictive areas located elsewhere in the city. Currently sanitation conditions are under developed and most people use (improved) latrines and or poorly constructed septic tanks. Also water supply in this area is poorly developed and mainly privately owned local schemes are used. These schemes and door to door water sales are operated by so-called POP's (Small Private Operators). This zone is not included in the concession of Aguas de Mozambique. Administrative boundaries of a number of bairros are under reconsideration. Some bairros will be split-up in smaller bairros

Key characteristics and proposed wastewater management systems for this sanitation an drainage zone

Area Residencial (Bairro)	MD	Population 2007			Priority scenarios		Development status		Indicative settlement type	Current actors		Proposed phasing	Proposed / Potential Wastewater Management System										
		Total population pers	Population density pers/ha	average annual growth 1.997 - 2007 %	1/ current problems 2/ balance development 3/ development trends assessment	Consolidated Planned Not planned	CEB ACADEC Horizonte Azul FIMDEC ASSOCIECHA Bumbo Estancia Livrings Machika Wairane Camu Subleilade W SUP W atalid Zioningo	CEB NGOs and others		A.1 Consolidation existing developments	A.2 Gradual introduction of EcoSan		A.3 Improved latrine and septic tanks	A.4 Public toilet multi-service facilities	A.5 Full sanitation facilities, septic tanks	B.1 Conventional existing system	B.2 DWATS and strengthen sewer networks	B.3 Combined lower networks, de-central treatment	C.1 Upgrading septic tanks and drainage networks	C.2 Small scale sewer systems, de-central treatment	D.1 Full EcoSan bottom- site in de-central		
Sanitation and drainage zone V																							
Zimpeto	5	27,688	16	9.0%								40,000											
Magoanine C	5	-	-	0.0%	3	2						100,000											
Magoanine A incl B and C	5	76,588	34	20.5%	3	2																	
Magoanine B	5	-	-	0.0%	3	2																	
Zone V has 4 bairros		104,277			4.6	9.3	1.9																

For a detailed description of the sanitation management systems see Table 8.1, Design horizons: S = short term < 5 years, M = medium term 5 to 15 years, L = Long term > 15 years

8.2.6 Sanitation and drainage zone VI

General description of current conditions - The substantial part of the population lives in unplanned areas with poor to very poor sanitation conditions and depends on traditional latrines. Limited progress has been made with the implementation of improved latrines and other on-site sanitation facilities. The people living in the better off areas are starting to implement full fledged in-house sanitation facilities and septic tanks. Also water supply is a major issue in this area which to a large extent is served by so-called POP's.

Key characteristics and proposed wastewater management systems for this sanitation and drainage zone

MD	Municipal district	Population 2007			Priority scenarios	Development status	Indicative settlement type	Current actors	Proposed phasing	Proposed / Potential Wastewater Management System																								
		Total population	Population density	average annual growth 1997-2007						1) current problems assessment	2) balance of development	3) development trends	Consolidated	Planned	Not planned	A.1 Consolidation existing developments	A.2 Gradual introduction of EcoSan	A.3 Improved latrines and septic tanks	A.4 Public toilet / multi service facilities	A.5 Full sanitation facilities, septic tanks	B.1 Conventional, existing system	B.2 DEWATS and simplified sewer networks	B.3 Conventional sewer networks, de-central treatment	C.1 Upgrading septic tanks and drainage networks	C.2 Small bore sewer systems, de-central treatment	D.1 Full EcoSan, both on-site and de-central								
Sanitation and drainage zone VI																																		
	Inhagôa A	5	16,405	182	-0.9%	1	2	3																										
	Nsaken	5	4,011	201	-0.7%	1	1	1																										
	25 de Junho A	5	13,154	69	0.1%	3	3	3																										
	25 de Junho B	5	23,756	148	2.2%	3	2	3																										
	Bagamoyo	5	18,995	83	-0.9%	3	3	3																										
	George Dimitrov(Banica)	5	40,872	85	0.3%	2	2	3																										
	Mashazine	5	8,752	97	0.3%	2	3	3																										
	Zone VI has 7 barrios		127,045			2.4	2.3	2.6																										

For a detailed description of the sanitation management systems see Table 8.1, Design horizons: S = short term < 5 years, M = medium term 5 to 15 years, L = Long term > 15 years

9 MAPUTO OUTLINE CITYWIDE SANITATION STRATEGY

9.1 Introduction

The main objective of the current study is to develop, discuss and agree an outline Citywide Sanitation Strategy for Maputo with a number of key stakeholders. On basis of information collected assessed, presented and discussed in the previous chapters, in this chapter key elements of the proposed outline strategy are presented.

The key elements as discussed here incorporate all recommendations put forward during the two “CSS workshops” held respectively in March and July 2010 in Maputo. See Appendix G for detailed information concerning the results and outcomes of the workshops. Moreover, the Outline Strategy as presented here takes into consideration written comments received in the course of the study via WSUP .

The outline-CSS, if adopted by the municipal council of Maputo and other key stakeholders would become a guidance document for the future development of the sanitation sector in Maputo city.

After the acceptance of the “*Maputo outline-CSS*” the main challenge will be to further develop and detail the outline-CSS into a full fledged citywide sanitation strategy, to ensure that the now initiated process of strategic sanitation planning will be fully embedded in, and becomes a routine activity of the Municipal administration of Maputo, and to start with the gradual implementation of the agreed recommendations and strategy.

9.2 Sanitation Governance

9.2.1 Strategic view ahead and context for Maputo sanitation

Maputo city sanitation is currently being driven to secure investments in infrastructure improvements while in parallel, institutionally developing and implementing a framework that will permit the management reforms foreseen for the longer term.

In order to accommodate new stakeholders in the water and sanitation sector with the integration of sanitation into the water supply services CRA - *the water and sanitation regulators* – would require to review its role, strategies and structure and possibly revise its statutes. In this context it is hoped that CRA is authorized to develop a regulatory framework and differentiated regulatory approaches that could be applied to urban water and sanitation services whether publicly or privately operated. In this context its pro-poor approach will be an important factor when considering sustainable sanitation financing.

New institutions developed in Maputo to manage sewerage and sanitation will need to be supported through the initial years of operations with capacity building and operating costs, through programme contracts and probably donor support.

Current strategic lines that are being led by urban water sector donors focus on various key aspects that lend themselves to the long term sustainable operation of municipal sanitation services. These include:

- Maximizing the use of private operators
- Strategic investments to increase access and maximize coverage to all consumers
- Strong independent economic regulation to assure balance between consumer equity and commercial viability
- Graduate utilities and operations to full cost recovery and eliminate subsidies
- Maximize coordination between water and sewerage / sanitation providers
- The delegated management approach and maximization of use of local private operations for routine technical and financial operations
- Strong local input via municipalities in planning expansions of water and sanitation systems to make sure that designs match demands and to provide access and increased coverage at appropriate service levels - *stand post versus individual connections* -
- Coordinated and simplified regulatory oversight to assure sustainability and cost recovery of systems via indirect regulation from CRA

The Action Plan for the Reduction of Absolute Poverty (PARPA II) links poverty with poor environmental conditions and lack of basic infrastructure services. Although the government has clearly given water supply, education and health a higher priority than sanitation, DNA produced a Strategic Sanitation Plan in 2004 for seven cities including Maputo, and this was later followed up by an Urban Sanitation Plan 2005-2015 (2007) to assist with guiding urban sanitation developments over a 10-year planning horizon.

The 2007 Urban Sanitation Plan identified urban sanitation institutional characteristics as a) moving towards autonomous sanitation services, b) creating a sanitation investment fund, and c) increasing private sector involvement in the maintenance of sanitation systems and drainage. Depending on the degree of autonomy of the Municipality, the sanitation services may be organized in three ways in the future (1) as part of a department or section of the Municipal Council, (2) a semi-autonomous municipal service, (3) a fully autonomous service (or municipal company, public or private).

Ad 1. In case the water supply and sanitation service becomes a *part or a department of the Municipality*, the reorganized service is part of the City Council and does not have a separate account (but may have dedicated resources) and is regulated by the statutes of the City Council.

Ad 2. In the case of *semi-autonomous services*, the City Council maintains a supervisory role over the unit's activities. The semi-autonomous services are based within the municipality. The unit has a statute but has no separate legal personality. Although semi-autonomous services have their own revenue accounts and separate accounts from the municipality, the budget is partially funded by the City Council and must be approved by the Municipal Assembly. The approval of the Municipal Assembly is also need for the business plan and the establishment plan.

Ad 3. The *autonomous service* (municipal or public company) has an independent legal personality, and administrative and financial autonomy (own accountability and own revenue), and the City Council establishes a contract programme with the service or the company. The service is managed by a board that is autonomous from the City Council. The autonomous service can be public or managed by a private company through a management contract or concession (delegated management).

In Maputo, the autonomous municipal service already planned, will take over DNA's service provision responsibilities. The main challenge is to ensure that these services enhance the ability to create revenue by rapidly charging fees and charges. For this to occur regulations and bylaws need to be developed and approved.

The strategic objectives of the 2007 National Urban Sanitation Strategy cover:

- 1) Increasing coverage and improving quality;
- 2) Expanding the range of technological options available;
- 3) Promoting institutions and human resources and improving the sustainability of services;
- 4) Relating planning and financing with the evolution of decentralization.

The latter two institutional areas are further elaborated in the strategic lines below:

Ad 3. Promoting institutions and human resources and improving the sustainability of services;

- Develop an appropriate institutional framework for urban sanitation, which strengthens the decentralized powers of municipalities, defines the role of the central government and conditions of central government investment in infrastructure to the creation of autonomous sanitation services;
- Autonomous management of services - the gradual introduction of fees and charges for reorganization, as services are improved;
- Building capacity in municipalities for the provision of urban sanitation services to peri-urban areas;
- Intensive training programs in urban sanitation;
- Design an evaluation and monitoring system for access to urban sanitation services;
- Promote regular consultation of stakeholders at all levels, including the Ministry of Health, and improve the functioning of coordination mechanisms;
- Strengthen human resources, especially of municipal authorities, investing in training, improving working conditions;

- Support private sector development (training of local artisans) and vocational support to NGOs and CBOs (targeted training according to their role);
- Develop business packages for private sector participation in the construction / rehabilitation and maintenance of septic tanks.

Ad 4. Relating planning and financing with the evolution of decentralization.

- Relate the Sanitation Master Plans to the Urban Structure Plans, starting with the development master plan, based on technological options for sanitation and urbanization patterns;
- Conduct studies on demand and users' willingness to pay for sanitation services;
- Develop action plans for the city;
- Develop a strategy for cost recovery and subsidies, depending on technological options and the income of the population;
- Develop a program of incentives and administrative measures to promote proper maintenance of septic tanks and connection to existing central systems;
- Support communities to develop credit schemes / grants, for the poorest in particular.

9.2.2 Options for the Outline Citywide Sanitation Strategy

Taking into consideration the issues discussed in the previous section from an institutional point of view Maputo's Citywide Sanitation Strategy must take into account the following points:

- Clear policy and strategy goals and intentions exist;
- Maputo will continue to receive financing and technical attention from donors and attention from the government as sanitation service management is restructured into an autonomous institution and management of service provision is gradually decentralized accompanying service expansion into new areas;
- The government and donors will assist the CMM in financing investments to increase coverage and develop services;
- Financial support of service OMM must be achieved by means of tariffs;
- Strategic Sanitation Plans referring to Maputo and other municipalities already exist.

The future Maputo-CSS must build on the best aspects of existing plans, so that they provide a framework for moving forward with some of the most complicated institutional issues. Below a recommended basis for development of the city's Sanitation Strategy are presented:

Programmatically Maputo's spatial structure is to be sub-divided into six "Sanitation and drainage zones" that will have different growth dynamics in terms of services and institutional requirements:

- **Zones 1 and 2:** These urban centres will see full consolidation of sanitation, storm water and sewerage and solid waste management into the activities of the autonomous sanitation entity; the application of service fees will be closely accompanied by expansion and improvement of services;
- **Zone 3:** These densely populated areas adjacent to the main collector system will see the growth of satellite services initially based on local authority resources and capacities and later supported with their own resources; institutionally partnerships with small private enterprises, NGOs, CBOs and communities and empowerment and promotion of environmental health education will facilitate the expansion of sanitation services associated for on-site sanitation solutions until the expansion of the main sewerage and storm water drainage systems reach these areas. Pilot areas are being selected for initiating participatory urbanization and neighbourhood upgrading which will include on and off-site sanitation solutions – intensifying use of the main sewerage and rainwater collectors and drains and of septic tanks with attendant services when a sanitation tax is implemented.
- **Zones 4, 5 and 6:** The more peripheral neighbourhoods where mixed services for septic tanks are complemented by simple technology solutions; institutionally strategic development should see innovative strategic and implementing partnerships with NGOs, small private enterprises, CBOs and communities for service provision of construction and emptying of facilities as well as promotion of environmental health education.

Major institutional constraints to immediate improvements in the sanitation zones:

- The institutional transition to autonomous services incorporating the Drainage Office is complex requiring statutory and legal changes and its success is threatened by un-viably few resources.
- Implementing a sanitation tax means raising the water supply tariffs and thereby moving towards the affordability ceiling of the poorest groups, and the legally and internationally established affordability ceilings.
- The resources generated by the municipal sanitation services are not retained within the services.
- Services have limited range and capacity in the city.

Main institutional development opportunities:

- PROMAPUTO provides a good political space for structural and institutional reform of sanitation services.
- The potential for private sector intervention in the management of services is good.
- In consolidating the sanitation and drainage services CMM must ensure it acquires additional resources and skills from the DNA. It may be useful to engage in a partnership with a private sector company or NGO that specializes in organization change management to facilitate this transition more smoothly.
- The involvement of strategic partners in consultation and framework design might accelerate the process of creation of the nucleus of the autonomous service and eventually its transformation into a public or private company.
- Incorporating the cost of sanitation into water supply bills so that it is acceptable to all stakeholders must be creative and should not exclude the possible need for legislative changes.
- The regulator CRA's planned review and adjustment of scope of responsibilities provides a window for resolving sanitation tax issues and moving ahead with plans to initiate cost recovery for sanitation services and subsequently be able to establish the nucleus of autonomous services.
- Coordination and addressing key issues such as application of the sanitation tax can be strengthened through the proven method of creating a consultative forum or working group in the CMM. This can bring together stakeholders to participate in policy and institutional framework decisions. This Forum would best be institutionally recognized so that its decisions are binding until formalized through proper procedures. Such a Forum could include external parties on a less permanent basis to provide technical or facilitative assistance.
- The municipal technicians currently allocated to the municipal districts to provide assistance to the local authorities should be supported to develop their professional capacities and increase their effectiveness. If more successful, they might be replicated in all key districts and project areas to ensure that local decision-making has adequate technical foundation. These technical staff would be more motivated if associated directly with the new autonomous services.
- Making the best use of community potential to participate in decision-making, supervision, quality control and regulatory activities. This will be facilitated by the CMM's commitment to participatory management and programs with strong community involvement and to partnerships with NGOs and CBOs.
- Maintaining partnerships with financing and project support agencies such as UNICEF and international NGOs such as WaterAid and WSUP to test, implement and promote effective initiatives to institutionalize sanitation services and integrate planning and implementation with water supply and solid waste management services.

9.3 Community Empowerment and Participation

End-users and communities need to be involved right from the start of the sanitation improvement activities; meaning that once the outline CSS for Maputo is adopted by CMM and other leading stakeholders the outline strategy should be disseminated and presented to local formal and informal leaders. Subsequently a number of workshops at "Sanitation and drainage sub-zone" level should be organized where the Outline-CSS is presented, discussed and where needed amended. It is hoped that as a result of these workshops and the related awareness creation campaigns a certain level of commitment from local leaders and communities will emerge.

This will provide an important additional element for the "Bairro priority setting" process i.e local commitment to participate in the planning, design, implementation, operation and maintenance of the new sanitation

infrastructure and to pay a reasonable fee for addition services to be provided. Social marketing and further strengthening of the committed communities aims to ensure that that these communities have ownership of, utilize and pay for the sanitation services.

Once this process is getting underway end-users/communities should be encourage and empowered to get voluntarily involved in the planning process of sanitation development or to promote improved sanitation behaviors and practices in their neighborhood.

In the selection of the target groups for these community participation programs poor and better of women, men and children should be considered. Other secondary target groups to be considered are the local CBO's, NGOs, Government agencies and the local private sector as they can play an active role in promoting and communicating messages at local level.

9.4 Sanitation System and Technology Selection

In chapter 5 wastewater systems, their specific selection criteria and other issues to be considered during the selection process are presented. Based upon this information and taking into consideration local conditions and assessed priorities in chapter 8 a number of pre-selected wastewater management systems and technologies for Maputo city have been identified, see Table 8.1.

It is realized that the description of the pre-selected wastewater management systems and technologies is very concise and may not be fully understood by all stakeholders. Therefore it is strongly recommended that once the outline strategy has been adopted by the CMM and other stakeholders a "*technical catalogue for sanitation systems and technologies*" will be prepared.

The technical catalogue would show the pre-selected systems and technologies in more detail and provide clear indications for both the capital and recurrent costs of the systems and technologies. The target group for this "*technical catalogue*" should be the end-users, local and municipal decision makers. Once the "*technical catalogue*" is ready it should be used during community and local government meetings and workshops in order to discuss preferred sanitation solutions. In this way the catalogue will contribute to informed decision making and may become an important training tool for local sanitation workers and entities including local small and medium enterprises.

9.5 Private Sector Involvement

The Municipality can not afford to develop and operate sanitation services by themselves. The involvement of communities and private sector is extremely important. It is anticipated that further development of sanitation service levels will create also good opportunities for public-private/community partnerships.

The private sector is already involved in several water supply and sanitation services in the city but they will need further training and support specially in relation to the construction and maintenance (including emptying of septic tanks and latrines) of simple on-site facilities, public sanitation facilities and simple sewer networks.

The Municipal and National (CRA/DNA) government should be encouraged to further develop and enhance an enabling environment for the development of water supply and sanitation business, for example by technical cooperation and support to the private sector, low cost credit and financial schemes (for ex. loans, operational subsidies, tax exemptions, etc.) and further develop and implement policies that encourage people to use private sector water supply and sanitation services.

9.6 Gradual Development and Implementation of Maputo's Citywide Sanitation Strategy

9.6.1 Management arrangements for planning, design and implementation

Leadership of strategy development should reside in the Municipal Council as the entity responsible for management of city development initiatives and services. In order to operate from a base that can harmonise with existing and future planned initiatives, strategy development would best be located in the *Office for Strategic and Institutional Development (GDEI)* in the Maputo Municipal Council. This office was created by PROMAPUTO for leadership of planning and implementation of the ten year municipal development programme. It is likely to be able to provide the dynamic linkages for the sanitation strategy to develop in context. In the longer term it is expected that GDEI will focus more on institutional than strategic development, making it timely to collaborate with other entities at this stage of its own development.

Under the Decree 18/2009 the new *Water Supply and Sanitation Infrastructure Management Office (AIAS)* is the institution responsible for management of the large wastewater management and drainage systems in the country. The management of the existing wastewater management system in Maputo is in the process of passing from the National Directorate of Water (DNA) to the Maputo Municipal Council.

At the *technical management planning, coordination and supervision level* the Municipal Council of Maputo will implement sanitation, sewerage and solid waste management services through the following directorates and subordinate departments:

- Municipal Directorate of Infrastructure (DMI) and Water and Sanitation Department (DAS),
- Municipal Directorate of Urban Planning and Environment (DMPUA) through its Urban Planning, Cadastre, Environmental Management and Environmental Inspection departments and,
- Municipal Directorate for Public and Environmental Health through its Department for Solid Waste Management

These technical institutions are also driven by nominated municipal councilors (vereadores) responsible for the area portfolio responding directly to the elected Mayor.

Since development of the legal framework for the reform process approximately eight years ago, the intention of the government has been to gradually transfer responsibilities (together with the financial and sometimes human and structural resources) for local governance to the autarchies as they become capable of assuming the management responsibilities. Aside from the districts in the country, it is really only Maputo Municipal Council that has assumed significant responsibility for services. Specifically responsibility for the health, education, transport and trade sectors was transferred from the beginning of 2010 from the Maputo City Government to the Maputo Municipal Council. The transfer of DNA's Drainage Office is couched in the same reform process, as will be the eventual transfer of responsibility for management of water supply infrastructure from FIPAG through the mechanism of the Delegated Management Framework.

Water sector reform endorses participation of the private sector in service provision recognizing the limitations of government capacity. This principle will define the on-going trend established by the water and sanitation sectors and the Municipality of Maputo. Management of sewerage and sanitation services through an autonomous public or public-private mix municipal service is planned.

Subsidizing sanitation and sewerage services will be necessary in the short and medium term and therefore delay implementation of the principle of consigning income from service provision back to the service. The new autonomous municipal service unit will still be faced with the question of how to rapidly create revenue through implementing fees and charges to water supply consumers in areas that are, or can be covered by sewerage and sanitation services in the short to medium term. For this to occur, regulations and bylaws need to be developed and approved.

The Municipal Council is being attributed many responsibilities but its capacity to implement is limited in the areas of good quality human resources, leadership of sector activities and material resources among others. Financing uncertainties, the demand for transparent governance and the effects of political flux surrounding

medium term implementation of medium term plans all contribute to undermining confidence in the institution and its capacity to deliver.

Capacity building to manage strategic and service implementation partnerships with private sector providers is underway and should be developed further with an emphasis on service effectiveness, efficiency and sustainability.

In order to clarify *roles, responsibilities and sources of financing* for the way forward, sewerage and sanitation strategic development planning must involve the Municipal Council and National level sector actors. The leadership of the City Government should accompany the process.

Capacity development for planning sanitation development in the short term should focus on an integrated approach to urban planning and iterative development of infrastructure and upgrading of residential areas and their services. The following institutions should be the focus for capacity development for planning sewerage and sanitation strategic development:

- GDEI's function is overall supervision and support with strategic direction.
- DMPUA will be the lead agency in prioritizing, developing strategic and spatial plans for urban development that include sanitation and water supply.
- DMPUA should be brought together with the Municipal District leadership and DMI/DAS for integrated planning of urban and particularly sanitation development.
- The Municipal District representatives may be invited to participate in a wider approach that incorporates various stakeholders in the process required to validate decisions and strategic lines in the sanitation development plans.

Capacity development that supports decentralization is difficult. Examples from the various municipalities in the country (Nacala Porto, Nampula, Beira) and district development in Nampula and Cabo Delgado show that training and support must be long-term, originate from inside of the institution using various levels to train and support the other levels in a structured system with donor support over time.

Strengthening the Municipal Districts to play active roles in guiding sanitation development in their areas will require similar support at the institutional level. Current initiatives of placing technicians in some of the districts to support development of civil works is only minimally effective due to their lack of an institutional support structure and supervision and training inputs to ensure their most effective application.

A further development of the Maputo-CSS provides an opportunity for an NGO/agency such as WSUP to provide institutional support to the Municipal Council; assisting it in financing the recruitment and short/medium term operational costs of good quality technical staff, their training and support in developing integrated local level sanitation plans and organizing, monitoring and evaluating the implementation of these.

9.6.2 Sanitation service provision models

Sanitation, drainage and solid waste collection services tend to be provided either by sole public provision of the main city-wide services combined with informal community based or micro-enterprise provision at local level or through various mixes of public-private partnership.

Public-private partnerships can provide benefits and advantages to service provision. Partnerships can be more responsive to public need; they can strengthen partners in various ways that helps them become more effective and the addition of extra financial, human, technical and other resources from businesses, NGOs and from service beneficiaries themselves can contribute to expansion in the supply of public goods and services. The arrangements can provide opportunities for greater citizen monitoring of public services and create new capabilities in the process of establishing and being part of a partnership.

However many partnerships are medium- term outcomes of temporary alliances rather than more enduring arrangements and public-private partnerships in particular are vulnerable to changing political circumstances affecting the survival of the alliances that supported them in the first place. On the ground, spatial inequalities in service coverage, a context of uneven demand, the difficulties in encouraging collective action in the socially fragmented peri-urban areas and the problem of political patronage of projects among many other factors, tend to work against their sustainable success.

Public-private partnerships are difficult to pursue successfully in the longer term, however careful analysis of the factors affecting potential partnerships and adequate preparation of partners to manage these, can indeed help service quality improvement and responsiveness.

In the case of Maputo, construction of public sanitation facilities may benefit from use of the franchising model to scale up services. In this way, appropriate technologies that can lower costs and increase acceptance may be applied widely. Franchising can enable each project to access the savings offered by economies of scale, and for example equipment can be obtained faster as franchising has standardized organisational and financial structures.

The *franchising model* targets the local entrepreneur ready to provide services, but without the resources to handle the contract alone. Support is provided by the internationally experienced franchisor, covering technical, commercial, organizational and financial solutions that aim for a win-win partnership.

Where the risks are judged too high to apply public-private partnerships community management of income generating public sanitation facilities for example, is an alternative. Although this model is being successfully tested in some specific contexts in Maputo at present, the many other failures in application of the model in the water sector and in drainage initiatives in the city would indicate that project planning and preparation must be extremely careful. For successful management, community groups must be independent and well prepared to avoid the misuse of collected funds. Strategically they must be sure that their market share will not be taken away from them by a continued or increased provision of similar or the same services by the public sector such as happened in Maputo with the small scale independent water supply providers.

9.6.3 Implementation approaches

Analysis has shown that management of sanitation and sewerage services is moving towards a focus on the municipality as the leading agency with the greatest potential to reach residents in the city, through direct services to the communities or where appropriate, service provision partnerships. Approaches within the present strategic framework are presented by *Sanitation and Drainage Zones* and with reference to identified critical areas:

Zone 1 - These densely populated areas adjacent to the main collector system will see the growth of satellite services initially based on local authority resources and capacities and later supported with their own resources. Institutionally, past and present partnerships with small private enterprises, NGOs, CBOs for service provision in the areas of solid waste management, sanitation and drainage initiatives are useful building blocks for future development in these areas.

Construction of public sanitation and drainage facilities can be carried through *public –private partnerships* based on positive experiences with small private sector enterprises and community groups and the sanitation strategy should reinforce the capacity of these to intervene in the sector by providing mechanisms by which they can gain access first, and then become competitive later. *Franchising construction* may be a way of expanding coverage faster, however the franchise must be equipped with or supported by a strong social component that can work with communities in the phase prior to site selection to guarantee as far as possible sustainable demand and future management.

Management of operation and maintenance of public sanitation facilities and infrastructure at local level must aim to ensure their hygienic and sustainable use. Current community management initiatives of public sanitation blocks may be expanded into appropriate areas where groups are prepared to take the responsibilities beyond the short term. Initiatives may be effectively started at “*neighbourhood centres*” where demonstration models may be replicated elsewhere in the neighbourhood. These could be installed at sites where the presence of many bars, markets or similar, create especially high local demand.

Community empowerment and promotion of environmental health education preceding the expansion of sanitation services associated with on-site sanitation solutions should be used as one of the mechanisms for creating demand. Pilot areas selected for initiating participatory urbanization and integrated neighbourhood upgrading will include various levels of technological interventions in the area of sanitation and drainage where lessons can be learned on a small scale. These will subsequently be used to inform all scaling up processes.

Zones 2 and 4 and some critical areas in Zones 5 and 6 - Financing of facilities and services should be innovative and local institutions with interests that may relate to the situation of poor families in a neighbourhood should be a focus for leveraging. Corporate social responsibility (CSR) is becoming increasingly familiar in Mozambique. The juxtapositions of better-off and the poorest in Maputo, of industrial areas that lie directly adjacent to areas of disorganized settlement and decaying environmental health are noted by all its residents and planners alike. Innovative partnerships might be pursued with industrial developers, with constructors of and corporations occupying new office blocks and residential areas, and the financiers of newly government office construction so that they contribute financially and conceptually to the strategy development and implementation of sanitation and drainage improvements in the poor areas around them.

Introducing such CSR as a condition of construction or occupation contracts would be an effective way forward for financing overall improvement of areas in the city and might also improve the attitudes between incongruous neighbours.

Where there are less great income differences in the neighbourhoods on the outer periphery of the city, partnerships initiated by strong local authorities might be supported. Service provision to the better off in these areas in septic tank emptying for example, is probably affordable, despite the relatively high costs of water supply services and electricity to these areas eroding the household budget. Local partnerships to provide lower cost goods and service solutions to poorer households would have to be subsidized by the income from the better off. The diversification of services (such as water supply, transport, solid waste management and sanitation) by entrepreneurs would be low risk options that should be considered for credit support.

Zones 2 and 3 - These urban centres will see full consolidation of sanitation, storm water and sewerage and solid waste management into the activities of the autonomous sanitation entity; the application of service fees should be closely accompanied by expansion and improvement of services;

9.6.4 Indicative implementation schedule

The implementation of the main activities leading to the further development and subsequent gradual implementation of the Maputo-CSS may, depending on the level of commitment of the Maputo Municipal Council, the National Government and other stakeholders as well as the availability of human and financial resources take a period of 15 to 20 years, see Figure 9.1.

The indicative implementation planning (2010 – 2023) takes into consideration that the term in office of the current President of the CMM runs until 2013 and that subsequent terms in office will be for 5 years.

It is estimated that the period up to 2013 will be needed to develop a sound planning and implementation mechanism, and an institutional and social basis that will ensure the long term sustainability of the improved sanitation infrastructure and its operation (service provision) and maintenance. In parallel with these initial sector development, planning and design activities the consolidation/rehabilitation of existing main infrastructure should be started, some pilot projects at operational level will be required to test the proposed wastewater management systems and technologies and if funding can be arranged the implementation of a major project for sanitation improvement (condominial sewer networks) in Zone 5 should be started in order to show real impact which may be needed to sustain the long term implementation. Key activities to be implemented until 2013 would preferably include:

At City level

1. Strengthen institutional and organizational framework
2. Development of sectoral (sanitation) policies and planning

At sanitation district level

3. **Specific studies and design:** i) consolidation and rehabilitation of existing major infrastructure and ii) planning, feasibility and detailed design for medium and long term projects
4. **Implementation:** i) Social marketing, community development and demand creation, ii) construction of a limited number of pilot project at operational scale in order to test pre-selected sanitation systems and technologies, iii) construction of a major sanitation improvement (condominial sewer networks) project in zone 5.

Figure 9-1 Indicative activity schedule for the completion and implementation of the Maputo-Citywide Sanitation Strategy

Main activity	sub-activities	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
City level - Strengthen institutional framework															
Re-confirm/define specific mandates and tasks:	ongoing strategic planning, monitoring and evaluation planning and budgeting, studies and design implementation: physical and non-physical measures operation and maintenance	.....	.....	.....	.....						
Develop, streamline sanitation norms and standards:	minimum service levels, design norms/standards			.....	.....								
Define, reconfirm legal status of planning documents:	review and approval procedures enforcement, regulations			.....	.....	.....	.....				
Streamline budgeting and funding procedures:	capital cost: fund mobilization/allocation recurrent cost: user retributions (tariffs/taxes), subsidies			.....	.....	.....	.....				
Capacity building:	review, development of manuals and guidelines formal and on the job training ongoing guidance and support	.....	.....	.....	.....	.....	.....	.....	.....	.....
City level - Development of sectoral (sanitation) policies and planning															
Urban development plan (PEUMM):	regular review and updating				.....						.....				.....
Citywide Sanitation Strategy:	outline citywide wastewater management strategy citywide strategy: 1 Overall framework 2 Medium and long term infrastructure development 3 Demand creation, community development/participation 4 Governance and funding mechanisms 5 Outline medium term investment plan	■	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	sub-sector policies: 1 Sector integration; water supply, drainage, solid waste 2 Governance, service levels, funding 3 Operation and maintenance; organization and funding 4 Participation/role of private sector, NGO's, CBO's 5 Sector coordination; health, urban development, others		.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Annual and medium term (5 years) budgeting:	medium term, linked to term in office of the President of CMM annual and multi annual budgeting	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Social marketing, consolidation of community based sanitation development concepts															
Social marketing and awareness creation:	Zone I, III, IV, V, VI Lessons learned - what works and what does not Consolidation of approach Implementation of activities	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Zone II Development of legal framework Dessimination and implementation	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Studies and Design															
Consolidation of existing infrastructure	transition period: Zone I and II			.....	.....								
Feasibility studies, detailed engineering	medium term, 5 yr: Zone I Zone II Zone III and IV Zone IV and V			.....	.....	.....	.....				
Implementation															
Construction and handing-over of the works	consolidation works: main infrastructure: community infrastructure and house connections				.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

APPENDIX A

List of Abbreviations and References

OUTLINE SANITATION STRATEGY FOR MAPUTO CITY

APPENDIX A ABBREVIATIONS, REFERENCES

Abbreviation	Portuguese	English
DNA	Direcção Nacional de Águas	National Directorate of Water
GDM	Gabinete de Drenagem de Maputo	Maputo Drainage Cabinet
PES	Plano Estratégico de Saneamento, 2004	Maputo Strategic Sanitation Plan, 2004
PESU	Plano Estratégico do Saneamento Urbano	Urban Sanitation Strategic Plan
CMM	Município de Maputo	Maputo City Municipality Council
WSUP	Água e Saneamento para os Pobres Urbanos	Water and Sanitation for Urban Poor
ADASBU	Associação de Desenvolvimento de Água e Saneamento do Bairro de Urbanização	Association of the Development of Water and Sanitation in the Urbanization <i>bairro</i>
ETAR/WWTP	Estação de Tratamento de Águas Residuais	Wastewater Treatment Plant, WWTP
PLM	Programa de Latrinas Melhoradas	Improved Latrines Programme
PEUMM	Plano de Estrutura Urbana do Município de Maputo	Urban Structure Plan for the City of Maputo
FIPAG	Fundo de Investimento e Património de Água	Asset Holding Body for Water in Mozambique
CRA	Conselho de Regulação da Água	Water Regulator Board
DMAS	Departamento de Água e Saneamento do Município	Municipal Department for water and Sanitation
OBC/CBO	Organização Baseada na Comunidade	Community Based Organization
NGO	Organização Não-Governamental	Non Governmental Organization
LSP	Provedores de Serviços Locais	Local Service Providers
EMA	Empresa Mocambicana de Águas	
EIP		Early Implementation Plan
NRW	Água não facturada	Non Revenue Water
SIPPS	Pequenos Operadores Privados	Small Scale Independent Providers
AdeM	Águas de Mocambique	
CMM	Conselho Municipal de Maputo	Municipality
INE	Instituto Nacional de Estatística	National Statistical Office
LM	Latrina Melhorada	Improved latrine
PARPA II	Plano de Acção da Redução da Pobreza Absoluta	Action Plan for the Reduction of the Absolute Poverty
MDGs	Objectivos de Desenvolvimento do Milénio	Millenium Development Goals
CSS	Estratégia de Desenvolvimento Municipal	Citywide Sanitation Strategy
PROMAPUTO	Programa de Desenvolvimento Municipal de Maputo	Maputo Municipal Development Programme
MICOA	Ministério para a Coordenação da Acção Ambiental	Ministry for the Coordination of the Environmental Affairs

OUTLINE SANITATION STRATEGY FOR MAPUTO CITY

DMSS	Direcção Municipal de Saúde e Salubridade	Health and Environmental Health Directorate
DAS	Departamento de Água e Saneamento	Department of Water and Sanitation
DMSC	Direcção Municipal de Saúde Ambiental e Cemitérios	Directorate of Environmental Health and Cemeteries
DC	Centro Distribuidor	Distribution Center
POP	Pequenos Operadores Privados	Small Scale Operators
EEAR	Estação Elevatória de Águas Residuais	Wastewater pumping station
MOZAL		Mozambique Aluminum Smelter
BORDA	ONG alemã	German NGO
WSP	Programa de Água e Saneamento do Banco Mundial	Water and Sanitation Program from World Bank
CMSB	Sanitários Comunitários de Multi-Serviços	Communal Multi Service Blocks
GDEI	Escritório para o Desenvolvimento Institucional e Estratégico	Office for Strategic and Institutional Development
DMI	Direcção Municipal de Infra Estrutura	Municipal Directorate of Infrastructure
DMPUA	Direcção Municipal de Planeamento Urbano e Ambiental	Municipal Directorate of Urban Planning and Environment

OUTLINE SANITATION STRATEGY FOR MAPUTO CITY

REFERENCES:

- CMM, Plano de Estrutura da cidade de Maputo, 2008
- DNA, Plano Estratégico de Saneamento Urbano 2005-2015 (Roadmap dos ODM).
- DNA, Política de Águas, Agosto 2007
- DNA, Plano Estratégico de Saneamento Urbano – Documento de Trabalho (1º Draft), 15 de Agosto de 2006
- CMM, Resolução da Assembléia Municipal Nº 51/AM/2001 de 30 de Novembro, Postura sobre a Utilização dos Colectores Municipais
- CMM, Resolução da Assembléia Municipal Nº 39/AM/2001 de 5 de Novembro, Postura sobre a Limpeza da Cidade
- CMM, Resolução da Assembléia Municipal Nº 15/AM/2004 de 24 de Setembro, Postura sobre as alterações da Postura sobre a Limpeza da Cidade
- CMM, Resolução da Assembléia Municipal Nº 15/AM/2004 de 24 de Setembro, Regulamento de Gestão de Resíduos Sólidos Urbanos no Município de Maputo
- CMM, Programa de Desenvolvimento Municipal De Maputo, Proposta, Maputo, Maio de 2006
- CMM, Programa de Desenvolvimento Municipal de Maputo, Proposta de Reestruturação do Conselho Municipal de Maputo, Maputo, Junho de 2006
- Jeremy Colin, Programa Nacional de Saneamento em Moçambique: Pioneiro no Saneamento Suburbano. Ouro Azul. Agosto 2002
- Lahmeyer, Plano Estratégico dos 7 Municípios. Volume 2.7. Maputo. Draft April 2004
- London School of Hygiene and Tropical Medicine (Steven Sugden), Sanitation Report for Maputo, Mozambique, February 2008
- Métier, Avaliação e mapeamento da Pobreza – Cidade de Maputo, Dezembro de 2006
- Marculino Chemane, Ecological Alternatives for Sanitation, Latrine emptying and ecological solutions for a sustainable sanitation in Urbanização, A challenge in hands of the local community association (ADASBU), Case study, September 2007
- Parceiros do CMM, Parcerias na Provisão de Água e Saneamento nas Áreas Peri-Urbanas de Maputo, Setembro 2009 (powerpoint)
- PNSBC, Manual de Latrinas Melhoradas, 1994
- Water FOR People, Sanitation Business Experiences in Peri-Urban Areas
- Wateraid, Gestão comunitária de água e saneamento nas zonas peri-urbanas, Experiências da Wateraid e Parceiros
- WaterAid, Mozambique Annual Report, 2004/2005 – 2005/2006 e 2006/2007
- World Bank, A Strategy to enhancing urban sanitation in Cambodia, 2005
- WSP, Total Sanitation and Sanitation Marketing Project. Indonesia Country Update June 2009. Learning at Scale

OUTLINE SANITATION STRATEGY FOR MAPUTO CITY

WSP, Report on national Sanitation Status, 2008

WSP, Marching together with a citywide sanitation strategy, January 2010

WSUP Maputo, Supported Tchemulane Project, Maputo, Mozambique. Summary Of Sanitation Strategy

WSUP Maputo, Baseline Study Results. September 2008

WSUP Maputo, Pre Intervention Analysis about the Water and Sanitation Infrastructure Situation in Chamanculo, in The City Of Maputo, Draft Report, 2009

WSUP, Community Managed and Operated Simplified Sewer System with DEWATS in Swathantra Nagar Slum, Proposed Operation and Maintenance Plan

WSUP Maputo, Plano de Implementação do Programa. Parte 1 – Programa Base. Outubro 2008

Seminário sobre o Saneamento Peri-urbano em Moçambique: Discussão das Linhas Estratégicas de Acção. Resumo do Seminário (26/11/09)

APPENDIX B

List of Key Informants

OUTLINE SANITATION STRATEGY FOR MAPUTO CITY

LIST OF KEY INFORMANTS:

N.	Name	Organization	Position
1	Valdemiro Matavele	DNA - Sanitation Department	Head of Department
2	Ilda Sumbana	Maputo Municipality - DAS	Technician
3	Análio Tembe	Maputo Municipality - DAS	Technician
4	Manuel Alvarinho	CRA	President
5	Magalhães Miguel	CRA	Technical Coordination Assistant
6	Peter Hawkins	WSP	Mozambique Coordinator
7	Odete Muximpua	WSP	
8	Pedro Pimentel	WaterAid	Senior Programme Manager
9	Carla Costa	WSUP	Project Manager
10	Osório Macano	WSUP	Coordinator
11	Zito Mugabe	WSUP - Maxaquene A	Community Technicians Development
12	Diniz Namburete	WSUP - Maxaquene B	Community Technicians Development
13	João Maweia	WSUP - Chamanculo	Community Technicians Development
14	João Mabombo	AdB	
15	Patrício Mucavele	BioBox	Partner
	Bairros		
16	Association activist	ASSCODECHA Chamanculo	
17	Pedro Massingue	Chamanculo C	Manager of the Chamanculo C sanitation block
18	Julieta Magaia	Chamanculo C	Standpipe manager
19		Bairro Secretariat- Luís Cabral	
20		Bairro Secretariat - Polana Caniço	
21		Bairro Secretariat - Zimpeto	
22		Bairro Secretariat - Magoanine	
23		Bairro Secretariat - George Dimitrov	

APPENDIX C

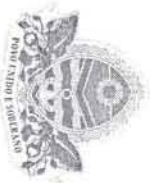
CMM's assessment of the current situation in Maputo's critical *bairros*

Relação de bairros críticos em termos de saneamento do meio no Município de Maputo

Item	Bairro	Problema	Interveniente	Acções desenvolvidas e em curso
01	Mafalala	Nível freático elevado; Latrinas tradicionais; Insuficiência de sistema de drenagem; Falta de vias de acesso.	Associação AMDEC	Financiamento a construção de latrinas, valas de drenagens terciárias e apoio as OCB´s locais em materiais/equipamentos de limpeza.
			Associação Livaningo	Apoio as OCB´s locais em materiais/equipamento de limpeza, criação e formação de OCB´s local.
			Associação Dambo	Realização de campanhas de limpezas, construção de valas de drenagens terciárias e campanhas de sensibilização.
			Associação Machaka	Campanhas de sensibilização e actividades culturais.
			CMM	Realização de campanhas de limpeza, sensibilização, apoio em equipamento e tecnicamente as associações nas campanhas de limpeza e acompanhamento das actividades desenvolvidas pelas associações, remoção de resíduos sólidos, manutenção do sistema de esgoto.
02	Maxaquene "A"	Nível freático elevado; Zona baixa; Insuficiência de sistema de drenagem; Vias de acessos apertado.	Associação AMDEC	Financiamento para construção de latrinas, valas de drenagens terciárias e apoio as OCB´s local (Horizonte Azul) em materiais de limpeza.
			Associação Livaningo	Apoio as OCB´s locais em materiais/equipamento de limpeza, criação e formação de OCB´s locais
			OCB Horizonte Azul.	Realização de campanhas de limpezas, acompanhamento de construção de valas de drenagens e latrinas, e campanhas de sensibilização.
			Waiene Gama Salubridade de Maxaquene.	Remoção de resíduos sólidos.
			CMM	Realização de campanhas de limpeza, sensibilização, apoio em equipamento/materiais as associações nas campanhas de limpeza e acompanhamento das actividades desenvolvidas pelas associações, remoção de resíduos sólidos.
03	Malanga	Zona baixa; Latrinas tradicionais; Falta de sistema de drenagem; Vias de acesso apertados.	CMM	Remoção de resíduos sólidos, manutenção do sistema de esgoto, campanhas de sensibilização.

04	Chamanculo “C”	Zona baixa; Insuficiência de sistema de drenagem; Latrinas tradicionais; Vias de acesso apertados.	Associação ASSCODECHA	Realização de campanhas de limpeza, construção de latrinas e campanhas de sensibilização.
			CMM	Reordenamento das ruas, realização de campanhas de limpeza, apoio em equipamento as associações nas campanhas de limpeza e acompanhamento das actividades desenvolvidas pelas associações.
05	Chamanculo “D”	Latrinas tradicionais; Falta de vias de acesso; Falta de sistema de drenagem.	Associação AMDEC	Financiamento para latrinas, valas de drenagens terciárias e apoio as OCB´s locais em materiais de limpeza.
			OCB ACADEC	Realização de campanhas de limpeza e campanhas de sensibilização, acompanhamento de construção de latrinas.
			CMM	Realização de campanhas de limpeza, apoio em equipamento as associações nas campanhas de limpeza e acompanhamento das actividades desenvolvidas pelas associações e financiamento/acompanhamento de construção de latrinas melhoradas.
06	Chamanculo “A”	Latrinas tradicionais; Vias de acesso apertados; Falta de sistema de drenagem.	CMM	Financiamento/acompanhamento de construção de latrinas melhoradas e sensibilização.
07	Chamanculo “B”	Latrinas tradicionais; Vias de acesso apertados; Falta de sistema de drenagem.	CMM	Financiamento/acompanhamento de construção de latrinas melhoradas e sensibilização.
08	Munhuana	Nível freático elevado; Insuficiência de valas de drenagens.	CMM	Realização de campanhas de limpeza, sensibilização, apoio em equipamento/materiais a comunidade.
09	Luís Cabral	Nível freático elevado; Latrinas tradicionais; Falta de sistema de drenagem.	CMM	Financiamento/acompanhamento de construção de latrinas melhoradas e sensibilização e remoção de resíduos sólidos.
10	Xipamanine	Nível freático elevado; Latrinas tradicionais; Falta de sistema de drenagem	CMM	Financiamento/acompanhamento de construção de latrinas melhoradas e sensibilização e remoção de resíduos sólidos.
11	Polana caniço “A”	Latrinas tradicionais; Insuficiência de sistema de drenagens.	Associação Livaningo	Apoio as OCB´s locais em materiais/equipamento de limpeza, criação e formação de OCB´s locais.
12	Polana caniço “B”	Latrinas tradicionais; Insuficiência de sistema de drenagens.	Associação Livaningo	Financiamento para construção de latrinas melhoradas, apoio as OCB´s locais em materiais/equipamento de limpeza, criação e formação de OCB´s locais.

13	Aeroporto "B"	Latrinas tradicionais; Insuficiência de sistema de drenagens.	CMM	Remoção de resíduos sólidos.
14	Hulene "B"	Latrinas tradicionais.	Associação Estamos	Financiamento para construção de latrinas melhoradas, apoio as OCB's locais em materiais/equipamento de limpeza, criação e formação de OCB's locais.
			Associação Xivoningo	Construção de latrinas, remoção de resíduos sólidos, campanhas de limpeza e sensibilização.



MUNICÍPIO DE MAPUTO
DIRECÇÃO MUNICIPAL DE INFRA-ESTRUTURAS
DEPARTAMENTO DE ÁGUA E SANEAMENTO

Lista das condições de saneamento do meio

Distrito Municipal	Bairros	Situação actual de Saneamento
2	Chamanculo "A, B e D", Unidade 7, Malanga, Aeroporto "A e B" e Micaджуine e Chamanculo "C"	Zonas secas. Inexistência de valas de drenagens Zonas secas, insuficiências e inoperacional de valas de drenagens terciárias.
	Xipamanine	Nível freático elevado. Inexistências de Valas de Drenagens
	Munhuana,	Nível freático elevado. Insuficiência de valas de drenagens terciárias.
3	Maxaquene "B, C e D" Polana Caniço ""	Zonas secas. Inexistência de valas de drenagens
	Mafalala e Maxaquene "A".	Nível freático elevado. Insuficiência de valas de drenagens terciárias.
	Urbanização.	Existência de valas de drenagens terciárias. Zona seca
4	Albasine, FPLM, Ferroviário, Hulene "A e B" Laulane, Mahotas, 3 de Fevereiro, Mavalane "A e B"	Inexistências de Valas de Drenagens. Zonas secas.
	Costa do Sol.	Nível freático elevado. Inexistência de valas de drenagens.
5	Luis Cabral, Jardim, Nsalene, Inhagoia "A" e 25 de Junho "A"	Nível freático elevado nas zonas baixas. Inexistência de valas de drenagens
	Maganine "A, B, C e C", George Dimitrov, Zimpeto, Malhazine Bagamoio, 25 de Junho "B" e Bagamoio "B"	Zonas secas. Inexistência de valas de drenagens.

APPENDIX D

Key Bairro Characteristics

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	
	Unidades Administrativas	Area	Greens	Popula ion			Companies		Markets				Poverty (indices 2003)			Critical area	Actors																					
	Área Residencial (Bairro)	Total area km2	Parks, reserves, green areas ha	hab 1997	hab 2007	fam 2007	no 2007	staff 2007	A	B	C	Inf	Index	Poor people No 2007	Coef Gini	CMM perception	DNA - DESGDM	Government	Private sector	CBO's																		
																	CMM - MDAS	MISAU	CMM- MDSS	MICOA	ADASBU sludge	Adem water supply	POP water supply	SSSP sanitation	ACADEC	Horizonte Azul												
100	Distrito Municipal nº 1 - Ka Mf	13,5	38,3	133.759	106.205	26.808	3.106	92.271	4	0	0	6	0,276	29.668	0,618																							
101	Alto Maé A	0,5	3,5	11.126	8.800								0,321	2.825	0,536							#																
102	Alto Maé B	1,2	3,5	15.794	12.416							2	0,334	4.147	0,533							#																
103	Central A	0,6	3,5	13.110	10.679								0,277	2.958	0,559							#																
104	Central B	0,6	3,5	14.806	11.375								0,271	3.083	0,572							#																
105	Central C	2,1	3,5	9.885	8.352				2			3	0,307	2.564	0,594							#																
106	Coop	0,7	3,5	6.358	5.639								0,185	1.043	0,642		#					#																
107	Malhangalene A	0,5	3,5	10.548	6.618								0,273	1.807	0,560		#					#																
108	Malhangalene B	1,0	3,5	17.138	17.348				2			1	0,367	6.367	0,519		#					#																
109	Polana Cimento A	1,1	3,5	10.787	7.807								0,166	1.296	0,644							#																
110	Polana Cimento B	0,8	3,5	12.791	8.131								0,230	1.870	0,604		#					#																
111	Sommersfield	4,4	3,5	11.416	9.040								0,189	1.709	0,668		#					#																
200	Distrito Municipal nº 2 - Ka Nlf	8,8	0,6	162.750	155.462	32.382	1.156	22.368	1	3	4	5	0,513	79.877	0,433																							
201	Aeroporto A	0,9	0,1	17.132	16.407								0,493	8.089	0,447		#					#																
202	Aeroporto B	1,2	0,1	17.577	17.857							2	0,560	10.000	0,401	#	#	#				#																
203	Chamanculo A	0,4	0,1	14.419	12.758					1		1	0,435	5.550	0,476	#	#	#				#																
204	Chamanculo B	0,7	0,1	11.006	10.654								0,505	5.380	0,412	#	#	#				#																
205	Chamanculo C	1,4	0,1	27.638	26.179					1		1	0,531	13.901	0,405	#	#	#				#																
206	Chamanculo D	0,6	0,1	14.535	13.578								0,530	7.196	0,408	#	#	#				#																
207	Malanga	1,5	0,1	17.651	17.276					1		2	0,465	8.033	0,476	#	#	#				#																
208	Mikhadjuine	0,4	0,1	9.349	8.621								0,512	4.414	0,429		#					#																
209	Unidade 7	0,5	0,1	9.310	8.890							1	0,575	5.112	0,391		#					#																
210	Xipamanine	0,7	0,1	24.133	20.139					1		2	0,525	10.573	0,416	#	#	#				#																
211	Munhuana	0,5	0,1	0	3.103								0,525	1.629	0,416	#	#	#				#																
300	Distrito Municipal nº 3 - Ka Ma	12,2	2,1	210.551	223.688	42.466	1.028	12.838	0	2	5	0	0,560	125.352	0,404																							
301	Mafalala	0,9	0,3	21.189	20.730							1	0,526	10.904	0,423	#	#	#				#																
302	Maxaquene A	0,8	0,3	22.809	22.750								0,558	12.695	0,403	#	#	#				#																
303	Maxaquene B	1,1	0,3	29.527	30.431								0,550	16.737	0,404	#	#	#				#																
304	Maxaquene C	1,0	0,3	18.790	19.561								0,598	11.697	0,435	#	#	#				#																
305	Maxaquene D	0,9	0,3	20.518	22.351					1		3	0,584	13.053	0,389	#	#	#				#																
306	Polana Caniço A	2,2	0,3	45.528	45.883								0,565	25.924	0,399	#	#	#				#																
307	Polana Caniço B	4,2	0,3	38.346	46.184					1		1	0,564	26.048	0,387	#	#	#				#																
308	Urbanização	1,1	0,3	13.844	15.798								0,525	8.294	0,405	#	#	#				#																

1	2	3	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	##	108	109	110	111	##	113	114	##	116	117	118	119	120	##	##						
Unidades Administrativas			Drainage				Water supply 2003						Solid waste collection				Wastewater/Drainage O&M						Problems and Issues																					
Área Residencial (Bairro)			1	2	3	4	1	2	3	4	5	6	1	2	3	4	Assets			Maintenance			Natural cond			Infrastructure																		
			Macro and micro	Macro only	Micro only	Not planned micro systems	Piped HC house connection	Piped YC yard connection	Piped SP stand pipe	Sub-total piped water supply	Water sellers	HH sources deep/shallow wells	Others	Sub-total water supply others	Public system	Public CB/Private	CB/Private/NGO	Informal	DNA/GDM	CMMMDAS	CBO/private operator	DNA/GDM	CMMMDAS	CBO private operator	Non	High ground water level	Low lying areas	Informal roads only	Limited access	Insufficient drainage	No drainage	key elements out of order	1	2	3	4	5	6	7					
100	Distrito Municipal nº 1 - Ka Mf																																											
101	Alto Maé A						81%				81%		0%									#																						
102	Alto Maé B						80%				80%		0%									#																						
103	Central A						97%				97%		0%									#																						
104	Central B						97%				97%		0%									#																						
105	Central C						97%				97%		0%									#																						
106	Coop						97%				97%		0%									#																						
107	Malhangalene A						75%		9%		84%		0%									#																						
108	Malhangalene B						39%				39%		0%									#																						
109	Polana Cimento A						94%				94%		0%									#																						
110	Polana Cimento B						97%				97%		0%																															
111	Sommershield						67%				67%		0%																															
200	Distrito Municipal nº 2 - Ka Ni																																											
201	Aeroporto A						41%		13%		55%		0%									#																						
202	Aeroporto B						24%		13%		37%		0%		#							#																						
203	Chamanculo A						11%		16%		26%		0%									#																						
204	Chamanculo B						14%		20%		34%		0%									#																						
205	Chamanculo C						21%		8%		30%		0%									#						#																
206	Chamanculo D						41%		15%		56%		0%									#							#															
207	Malanga						41%		13%		54%		0%		#							#						#																
208	Mikhadjuine						49%		24%		73%		0%									#																						
209	Unidade 7						37%		24%		61%		0%									#																						
210	Xipamanine						36%		9%		45%		0%		#							#					#																	
211	Munhuana										0%		0%									#					#																	
300	Distrito Municipal nº 3 - Ka Ma																																											
301	Mafalala						18%				18%		0%		#							#	#				#																	
302	Maxaquene A						16%		34%		50%		0%		#	#						#					#	#																
303	Maxaquene B						13%		26%		39%		0%									#																						
304	Maxaquene C						20%		41%		61%		0%									#																						
305	Maxaquene D						18%		38%		56%		0%																															
306	Polana Caniço A						2%				2%		0%																															
307	Polana Caniço B										0%		0%																															
308	Urbanização						35%		56%		91%		0%									#																						

1	2	3	123	124	125	126	127	##	##	130	131	132	133	##	135	136	##	138	139	140	##	##	143	144	145	146	147	148	149	150	##	##	##	##	##	##	##	##	##	160																							
			Unidades Administrativas	Special places/areas/land use											Current interventions and funding					Development status			Business districts			WS		Municipal district	type	ZONE																																	
Área Residencial (Bairro)	1	2	3	4	5	6	7	8	9	10	11	Capacity building CBO level	Campaigns cultural events	HH infrastructure	Community level O&M equipment	Restructuring of roads	Consolidated	Planned	Not Planned	Existing: offices, commercial	Existing: public facilities, industry	Planned	Distribution centre	Settlement type, SEEDs assessment																																							
100	Distrito Municipal nº 1 - Ka Mf																										1								1																												
101	Alto Maé A																										#									#	C												C	II.c													
102	Alto Maé B																										#				#	#																		C	II.c												
103	Central A																										#				#																			C	II.c												
104	Central B																										#				#	#																			C	II.c											
105	Central C																										#				#	#	#																			C	II.c										
106	Coop																										#																									C	I.e										
107	Malhangalene A																										#				#																					C	II.c										
108	Malhangalene B																										#				#	#																				C	I.e										
109	Polana Cimento A																										#																									C	II.c										
110	Polana Cimento B																										#				#	#																				C	III.a										
111	Somersshield																										#				#	#																				C	III.a										
200	Distrito Municipal nº 2 - Ka NiH																												2																																		
201	Aeroporto A																														#																						B	I.b									
202	Aeroporto B																														#																								B	I.b							
203	Chamanculo A																										#	#			#																								B	II.b							
204	Chamanculo B																										#	#		#																										B	II.b						
205	Chamanculo C																														#																										B	II.b					
206	Chamanculo D																										#	#	#		#																									B	I.b						
207	Malanga																										#				#	#	#																							B-C	II.b						
208	Mikhadjuine																														#																									B	I.b						
209	Unidade 7																														#																									B	I.b						
210	Xipamanine																										#	#			#	#	#																							B	I.b						
211	Munhuana																										#				#	#																								B	I.b						
300	Distrito Municipal nº 3 - Ka Ma																												3																																		
301	Mafalala																										#	#	#	#																													B	I.b			
302	Maxaquene A																										#	#	#	#																														B	I.b		
303	Maxaquene B																														#																														E	I.c	
304	Maxaquene C																														#																														E	I.c	
305	Maxaquene D																														#																												E	I.c			
306	Polana Caniço A																										#			#	#																													D	III.b		
307	Polana Caniço B																														#																													D	III.b		
308	Urbanização																														#																												B	I.b			

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38		
Unidades Administrativas		Area	Greens	Populacion			Companies		Markets				Poverty (indices 2003)			Critical area	Actors																						
Área Residencial (Bairro)		Total area	Parks, reserves, green areas	hab	hab	fam	no	staff	A	B	C	Inf	Index	Poor people	Coef Gini	CMM perception	Government				Private sector				CBO's														
		km2	ha	1997	2007	2007	2007	2007						No 2007			DNA - DES/GDM	CMM - MDAS	MISAU	CMM- MDSS	MICOA	ADASBU, sludge	AdelM water supply	POP water supply	SSSP sanitation	ACADEC	Horizonte Azul												
400	Distrito Municipal nº 4 - Ka Ma	76,9	-	228.244	293.766	56.973	1.222	5.016	0	1	7	7	0,548	162.699	0,421																								
401	Albazine	17,1		5.152	15.957							2	0,735	11.728	0,409												#	#											
402	Costa do Sol	34,2		14.186	16.828						2		0,562	9.457	0,559												#	#											
403	Ferrolviário	3,4		41.353	49.877							2	0,511	25.487	0,412													#											
404	FPLM	1,0		10.834	11.428								0,577	6.594	0,389											#	#												
405	Hulene A	1,3		27.655	28.240								0,567	16.012	0,401												#												
406	Hulene B	3,7		38.664	45.390				1	1			0,554	25.146	0,389	#										#	#												
407	Mahotas	8,6		21.282	47.508						2		0,546	25.939	0,419											#	#												
408	Mavalane A	1,2		20.064	20.829								0,544	11.331	0,406											#	#												
409	Mavalane B	0,6		11.896	13.030						2		0,574	7.479	0,388										#	#													
410	3 de Fevereiro	2,2		14.056	16.710							1	0,519	8.672	0,428												#												
420	Laulane	3,6		23.102	27.969						2		0,531	14.852	0,416												#												
500	Distrito Municipal nº 5 - Ka Mu	59,8	90,0	211.008	293.995	59.152	1.473	8.032	0	1	8	4	0,544	162.203	0,417																								
501	Bagamoyo	2,4		21.966	19.995						2		0,562	11.237	0,401												#												
502	George Dimitrov(Benfica)	4,8		39.667	40.972						1		0,556	22.780	0,398												#												
503	Inhagóia A	0,9		17.923	16.405								0,556	9.121	0,407												#												
504	Inhagóia B	1,5		15.195	16.153						1		0,544	8.787	0,390										#	#													
505	Jardim	2,1		14.335	12.720						1		0,447	5.686	0,493												#												
506	Luis Cabral	2,9		33.553	33.800					1			0,553	18.691	0,396	#											#												
507	Magoanine A incl B and C	23,3	90,0	11.900	76.588							3	0,572	43.808	0,399												#												
508	Magoanine B																										#												
509	Magoanine C																										#												
510	Mashazine	0,9		8.491	8.752						2		0,564	4.936	0,424												#												
511	Nsalene	0,2		4.296	4.011								0,586	2.350	0,401												#												
512	25 de Junho A	1,9		12.997	13.154								0,491	6.459	0,438												#												
513	25 de Junho B	1,6		19.035	23.756						1		0,537	12.757	0,419												#												
514	Zimpeto	17,3		11.650	27.689							1	0,563	15.589	0,413																								
700	Project area	171,2	131,0	946.312	1.073.116	217.781	7.985	140.525	5	7	24	22	0,509	559.798	0,510	14	0	0	0	23	10	0	0	0	0	7	51	3	0	0	0	1	1	0	0	0	0		

1	2	3	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	##	108	109	110	111	##	113	114	##	116	117	118	119	120	##	##							
Unidades Administrativas			Drainage				Water supply 2003						Solid waste collection				Wastewater/Drainage O&M						Problems and Issues																						
Área Residencial (Bairro)			1	2	3	4	1	2	3	4	5	6	1	2	3	4	Assets			Maintenance			Natural cond			Infrastructure																			
			Macro and micro	Macro only	Micro only	Not planned micro systems	Piped HC house connection	Piped YC yard connection	Piped SP stand pipe	Sub-total piped water supply	Water sellers	HH sources deep/shallow wells	Others	Sub-total water supply others	Public system	Public CB/Private	CB/Private/NGO	Informal	DNA/GDM	CMMDAS	CBO/private operator	DNA/GDM	CMMDAS	CBO private operator	Non	High ground water level	Low lying areas	Informal roads only	Limited access	Insufficient drainage	No drainage	key elements out of order	1	2	3	4	5	6	7						
400	Distrito Municipal nº 4 - Ka Ma																																												
401	Albazine								74%	74%			0%																																
402	Costa do Sol							14%		14%			0%																																
403	Ferroviário								31%	31%			0%																																
404	FPLM									0%			0%																																
405	Hulene A								14%	14%			0%																																
406	Hulene B								8%	8%			0%			#																													
407	Mahotas									0%			0%																																
408	Mavalane A								21%	21%			0%																																
409	Mavalane B								35%	35%			0%																																
410	3 de Fevereiro									0%			0%																																
420	Laulane									0%			0%																																
500	Distrito Municipal nº 5 - Ka Mu																																												
501	Bagamoyo							37%	20%	57%			0%																																
502	George Dimitrov(Benfica)							21%	11%	31%			0%																																
503	Inhagóia A							22%	9%	32%			0%																																
504	Inhagóia B							26%	11%	37%			0%																																
505	Jardim							58%		58%			0%																																
506	Luis Cabral							20%	4%	25%			0%		#											#																			
507	Magoanine A incl B and C								31%	31%			0%																																
508	Magoanine B									0%			0%																																
509	Magoanine C									0%			0%																																
510	Maslhazine									0%			0%																																
511	Nsalene									0%			0%																																
512	25 de Junho A							40%	7%	48%			0%																																
513	25 de Junho B							14%		14%			0%																																
514	Zimpeto									0%			0%																																
700	Project area																																												

APPENDIX E

Detailed results of the population and poverty scoring

Scoring and qualification of population related data

Scenario 2, balanced development

Unidades Administrativas Área Residencial (Bairro)	Population 2007	Score	Weight	Growth	Score	Weight	Density pers/ha	Score	Weight	Weighted score	Pop density			
											High	Medium	Low	Very low
Distrito Municipal nº 1 - Ka Mfumo														
Alto Maé A	8.800	1	15%	-2,3%	1	30%	189	3	55%	2,10				
Alto Maé B	12.416	2		-2,4%	1		107	3		2,25				
Central A	10.679	1		-2,0%	1		189	3		2,10				
Central B	11.375	2		-2,6%	1		201	4		2,80				
Central C	8.352	1		-1,7%	1		40	2		1,55				
Coop	5.639	1		-1,2%	2		85	3		2,40				
Malhangalene A	6.618	1		-4,6%	1		142	3		2,10				
Malhangalene B	17.348	2		0,1%	2		180	3		2,55				
Polana Cimento A	7.807	1		-3,2%	1		73	3		2,10				
Polana Cimento B	8.131	1		-4,4%	1		106	3		2,10				
Sommershiel	9.040	1		-2,3%	1		21	1		1,00				
Distrito Municipal nº 2 - Ka Nlhamankulu														
Aeroporto A	16.407	2		-0,4%	2		182	3		2,55				
Aeroporto B	17.857	2		0,2%	2		149	3		2,55				
Chamanculo A	12.758	2		-1,2%	2		319	4		3,10				
Chamanculo B	10.654	1		-0,3%	2		152	3		2,40				
Chamanculo C	26.179	3		-0,5%	2		187	3		2,70				
Chamanculo D	13.578	2		-0,7%	2		227	4		3,10				
Malanga	17.276	2		-0,2%	2		115	3		2,55				
Mikhadjuine	8.621	1		-0,8%	2		216	4		2,95				
Unidade 7	8.890	1		-0,5%	2		178	3		2,40				
Xipamanine	20.139	3		-1,8%	1		288	4		2,95				
Munhuana	3.103	1		0,0%	2		62	2		1,85				
Distrito Municipal nº 3 - Ka Maxakeni														
Mafalala	20.730	3		-0,2%	2		231	4		3,25				
Maxaquene A	22.750	3		0,0%	2		285	4		3,25				
Maxaquene B	30.431	3		0,3%	2		277	4		3,25				
Maxaquene C	19.561	3		0,4%	2		196	4		3,25				
Maxaquene D	22.351	3		0,9%	2		249	4		3,25				
Polana Caniço A	45.883	4		0,1%	2		209	4		3,40				
Polana Caniço B	46.184	4		1,9%	3		110	3		3,15				
Urbanização	15.798	2		1,3%	3		144	3		2,85				
Distrito Municipal nº 4 - Ka Mavota														
Albazine	15.957	2		12,0%	4		9	1		2,05				
Costa do Sol	16.828	2		1,7%	3		5	1		1,75				
Ferrovário	49.877	4		1,9%	3		147	3		3,15				
FPLM	11.428	2		0,5%	2		114	3		2,55				
Hulene A	28.240	3		0,2%	2		217	4		3,25				
Hulene B	45.390	4		1,6%	3		123	3		3,15				
Mahotas	47.508	4		8,4%	4		55	2		2,90				
Mavalane A	20.829	3		0,4%	2		174	3		2,70				
Mavalane B	13.030	2		0,9%	2		217	4		3,10				
3 de Fevereiro	16.710	2		1,7%	3		76	3		2,85				
Laulane	27.969	3		1,9%	3		78	3		3,00				
Distrito Municipal nº 5 - Ka Mubukwana														
Bagamoyo	19.995	3		-0,9%	2		83	3		2,70				
George Dimitrov(Benfica)	40.972	4		0,3%	2		85	3		2,85				
Inhagóia A	16.405	2		-0,9%	2		182	3		2,55				
Inhagóia B	16.153	2		0,6%	2		108	3		2,55				
Jardim	12.720	2		-1,2%	2		61	2		2,00				
Luis Cabral	33.800	3		0,1%	2		117	3		2,70				
Magoanine A incl B and C	76.588	4		20,5%	4		34	2		2,90				
Magoanine B														
Magoanine C														
Maslhazine	8.752	1		0,3%	2		97	3		2,40				
Nsalene	4.011	1		-0,7%	2		201	4		2,95				
25 de Junho A	13.154	2		0,1%	2		69	3		2,55				
25 de Junho B	23.756	3		2,2%	3		148	3		3,00				
Zimpeto	27.689	3		9,0%	4		16	1		2,20				
Project area average	19.511			1,3%			63							

Scoring of urban poverty related data

Scenario 2, *balanced development*

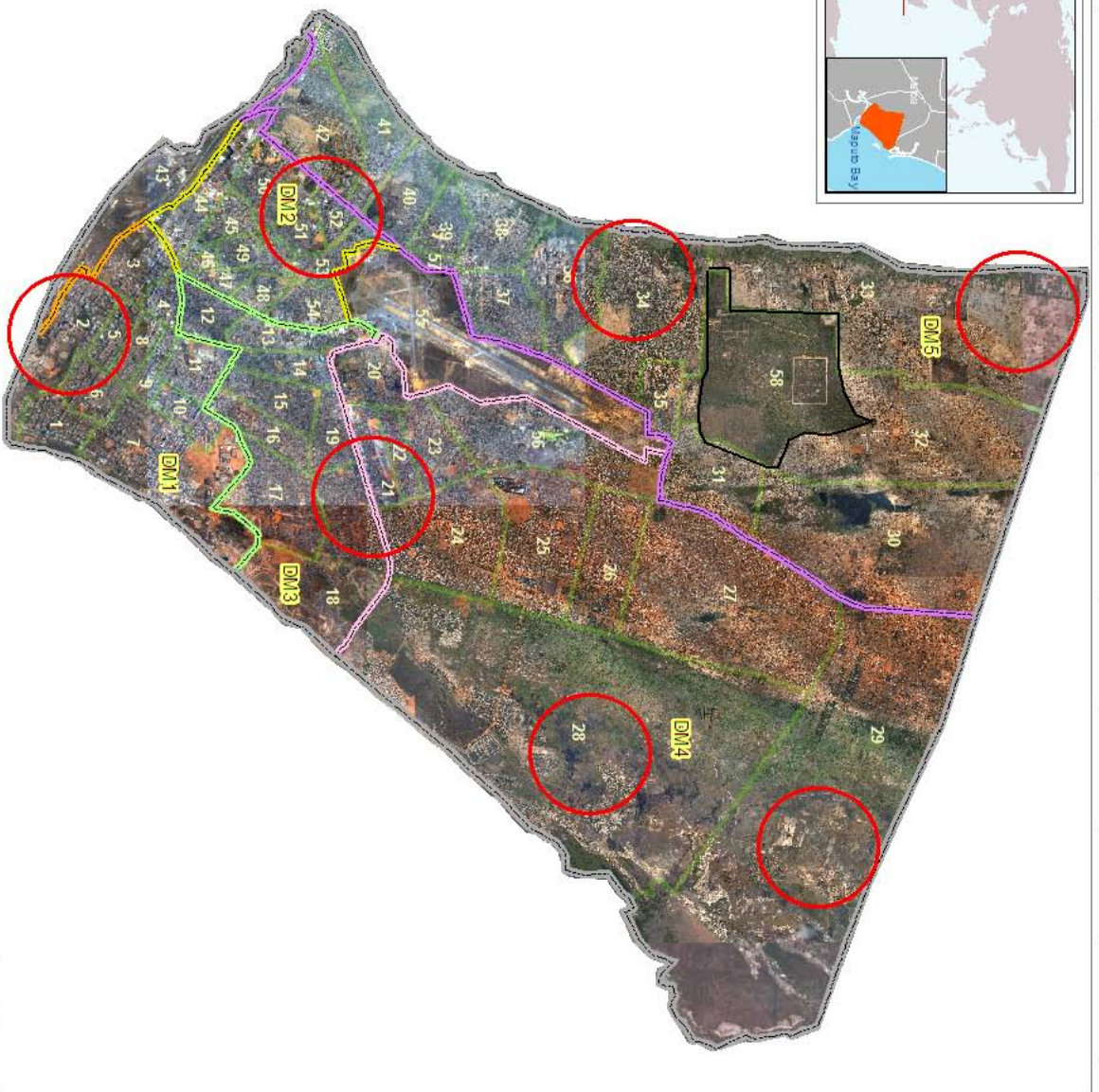
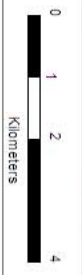
Unidades Administrativas Area Residencial (Bairro)	Index			Urban poor 2007			Gini			Weighted score	
	head count 2007	Score	Weight	pers	pers/ha		Score	Weight			
Distrito Municipal nº 1 - Ka Mfumo											
Alto Maé A	0,321	1	10%	2.825	56	3	80%	0,536	2	10%	2,70
Alto Maé B	0,334	1		4.147	35	3		0,533	2		2,70
Central A	0,277	1		2.958	49	3		0,559	2		2,70
Central B	0,271	1		3.083	51	3		0,572	2		2,70
Central C	0,307	1		2.564	12	1		0,594	1		1,00
Coop	0,185	1		1.043	15	1		0,642	1		1,00
Malhangalene A	0,273	1		1.807	36	3		0,560	2		2,70
Malhangalene B	0,367	2		6.367	64	3		0,519	2		2,80
Polana Cimento A	0,166	1		1.296	12	1		0,644	1		1,00
Polana Cimento B	0,230	1		1.870	23	2		0,604	1		1,80
Sommershiel	0,189	1		1.709	4	1		0,668	1		1,00
Distrito Municipal nº 2 - Ka Nihamankulu											
Aeroporto A	0,493	2		8.089	90	3		0,447	4		3,00
Aeroporto B	0,560	3		10.000	83	3		0,401	4		3,10
Chamanculo A	0,435	2		5.550	139	4		0,476	3		3,70
Chamanculo B	0,505	2		5.380	77	3		0,412	4		3,00
Chamanculo C	0,531	3		13.901	99	4		0,405	4		3,90
Chamanculo D	0,530	3		7.196	120	4		0,408	4		3,90
Malanga	0,465	2		8.033	54	3		0,476	3		2,90
Mikhadjuine	0,512	3		4.414	110	4		0,429	4		3,90
Unidade 7	0,575	3		5.112	102	4		0,391	4		3,90
Xipamanine	0,525	3		10.573	151	4		0,416	4		3,90
Munhuana	0,525	3		1.629	33	2		0,416	4		2,30
Distrito Municipal nº 3 - Ka Maxakeni											
Mafalala	0,526	3		10.904	121	4		0,423	4		3,90
Maxaquene A	0,558	3		12.695	159	4		0,403	4		3,90
Maxaquene B	0,550	3		16.737	152	4		0,404	4		3,90
Maxaquene C	0,598	3		11.697	117	4		0,435	4		3,90
Maxaquene D	0,584	3		13.053	145	4		0,389	4		3,90
Polana Caniço A	0,565	3		25.924	118	4		0,399	4		3,90
Polana Caniço B	0,564	3		26.048	62	3		0,387	4		3,10
Urbanização	0,525	3		8.294	75	3		0,405	4		3,10
Distrito Municipal nº 4 - Ka Mavota											
Albazine	0,735	4		11.728	7	1		0,409	4		1,60
Costa do Sol	0,562	3		9.457	3	1		0,559	2		1,30
Ferrovário	0,511	3		25.487	75	3		0,412	4		3,10
FPLM	0,577	3		6.594	66	3		0,389	4		3,10
Hulene A	0,567	3		16.012	123	4		0,401	4		3,90
Hulene B	0,554	3		25.146	68	3		0,389	4		3,10
Mahotas	0,546	3		25.939	30	2		0,419	4		2,30
Mavalane A	0,544	3		11.331	94	3		0,406	4		3,10
Mavalane B	0,574	3		7.479	125	4		0,388	4		3,90
3 de Fevereiro	0,519	3		8.672	39	3		0,428	4		3,10
Laulane	0,531	3		14.852	41	3		0,416	4		3,10
Distrito Municipal nº 5 - Ka Mubukwana											
Bagamoyo	0,562	3		11.237	47	3		0,401	4		3,10
George Dimitrov(Benfica)	0,556	3		22.780	47	3		0,398	4		3,10
Inhagóia A	0,556	3		9.121	101	4		0,407	4		3,90
Inhagóia B	0,544	3		8.787	59	3		0,390	4		3,10
Jardim	0,447	2		5.686	27	2		0,493	3		2,10
Luis Cabral	0,553	3		18.691	64	3		0,396	4		3,10
Magoanine A incl B and C	0,572	3		43.808	19	2		0,399	4		2,30
Magoanine B											
Magoanine C											
Maslhazine	0,564	3		4.936	55	3		0,424	4		3,10
Nsalene	0,586	3		2.350	118	4		0,401	4		3,90
25 de Junho A	0,491	2		6.459	34	3		0,438	4		3,00
25 de Junho B	0,537	3		12.757	80	3		0,419	4		3,10
Zimpeto	0,563	3		15.589	9	1		0,413	4		1,50
Project area	0,509			10.178	33			0,510			

APPENDIX F

Maps



MAPUTO CITY ADMINISTRATIVE BOUNDARIES



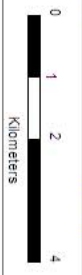
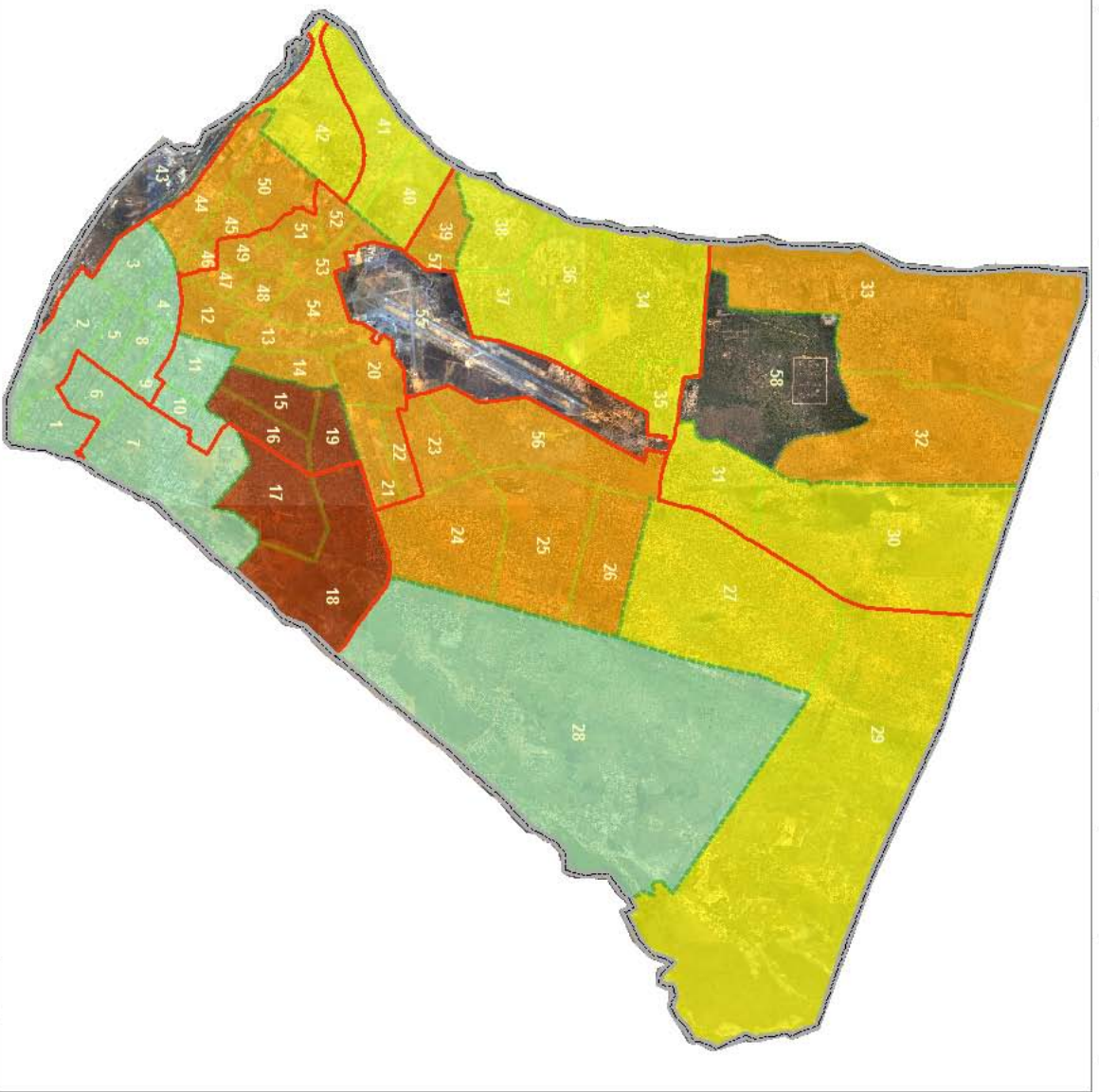
LEGEND

- Future Urban Centers
- Maputo City boundary
- DM1 - Kamfumu
- DM2 - Nhamankulu
- DM3 - Ka Maxaquene
- DM4 - Kamavota
- DM5 - Kamubukwana
- Maputo City Bairros boundaries

- | | |
|----------------------|-------------------------|
| 1. Polana Cimento A | 28. Costa do Sol |
| 2. Central C | 29. Albaszine |
| 3. Alto Maé B | 30. Maganine B |
| 4. Alto Maé A | 31. Maganine A |
| 5. Central B | 32. Maganine C |
| 6. Polana Cimento B | 33. Zimpeto |
| 7. Sommershield | 34. George Dimitrove |
| 8. Central A | 35. Malhazine |
| 9. Malhangalene A | 36. Begamito |
| 10. Coop | 37. 25 de Junho B |
| 11. Malhangalene B | 38. 25 de Junho A |
| 12. Mafalala | 39. Inhagola A |
| 13. Urbanização | 40. Inhagola B |
| 14. Maxaquene A | 41. Jardim |
| 15. Maxaquene B | 42. Luis Cabral |
| 16. Maxaquene C | 43. C.F.M |
| 17. Polana Cantico A | 44. Malanga |
| 18. Polana Cantico B | 45. Chamanculo B |
| 19. Maxaquene D | 46. Chamanculo A |
| 20. Mavalane A | 47. Minikadjuine |
| 21. FPLM | 48. Munkhuna |
| 22. Mavalane B | 49. Xipamanine |
| 23. Hulene A | 50. Chamanculo C |
| 24. Ferroviário | 51. Chamanculo D |
| 25. Lauiane | 52. Unidade 7 |
| 26. 3 de Fevereiro | 53. Aeroporto B |
| 27. Mahotas | 54. Aeroporto A |
| 58. Paial | 55. Aeroporto de Maputo |
| | 56. Hulene B |
| | 57. Nsalene |



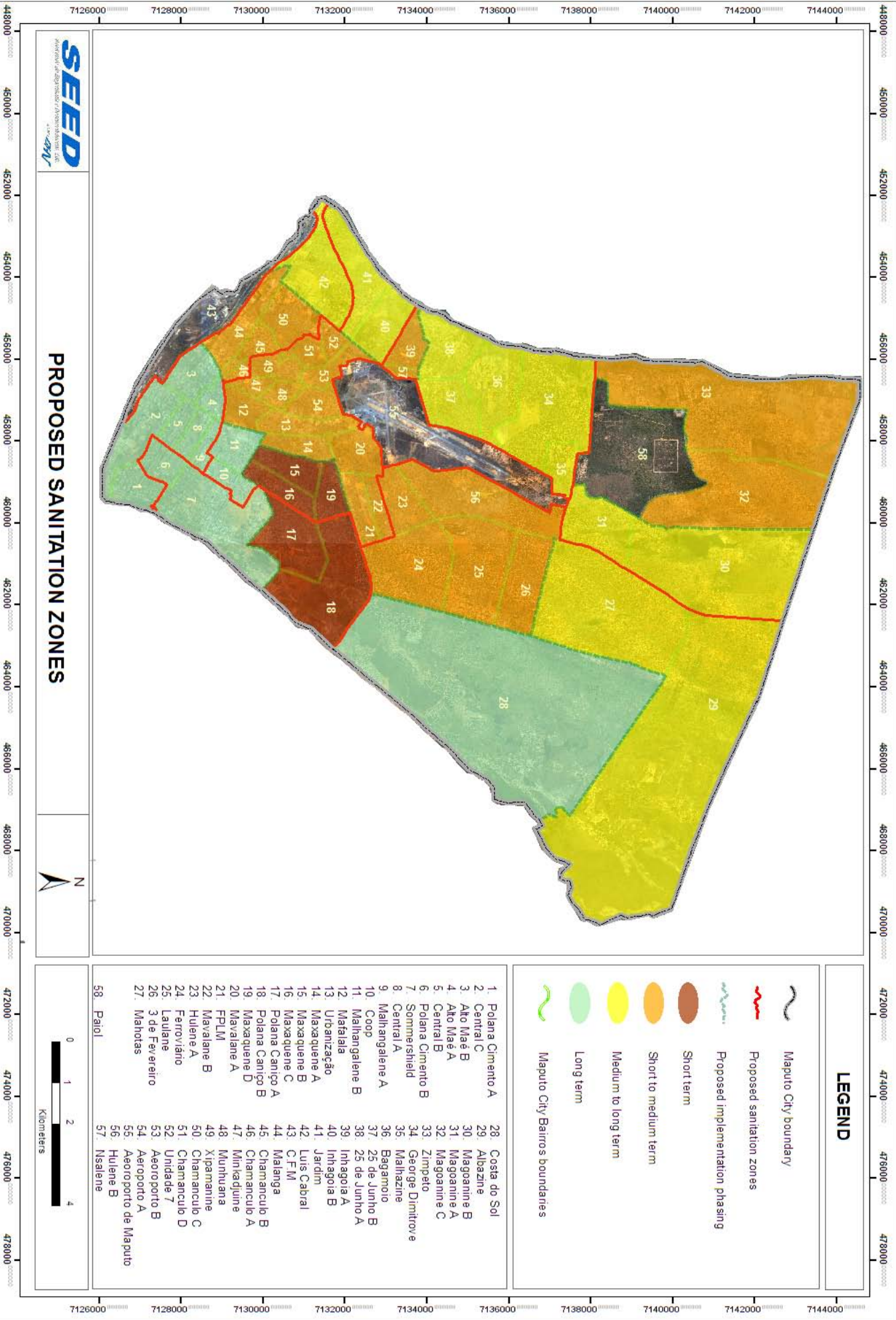
PROPOSED SANITATION ZONES



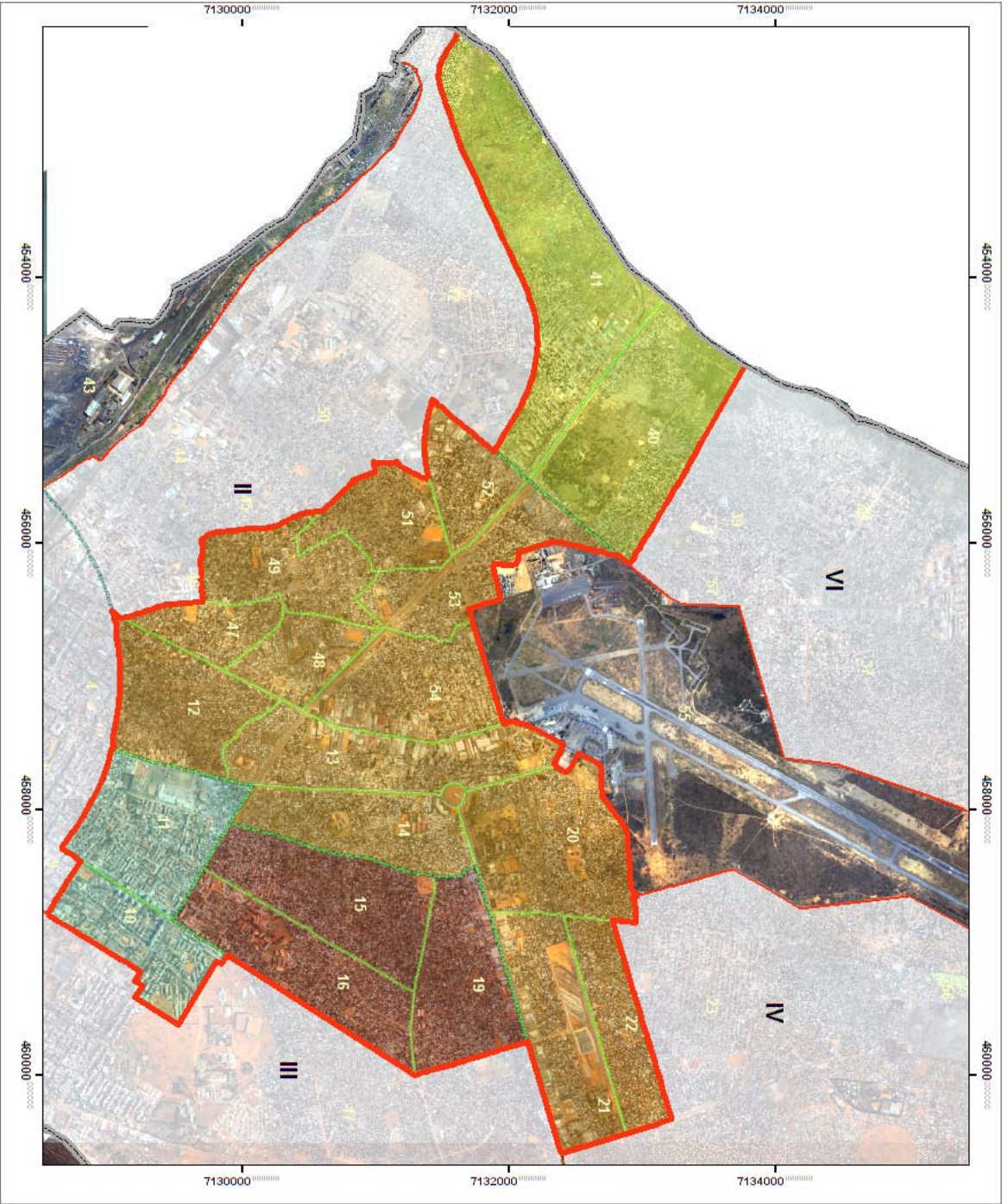
LEGEND

- Maputo City boundary
- Proposed sanitation zones
- Proposed implementation phasing
 - Short term
 - Short to medium term
 - Medium to long term
 - Long term
- Maputo City Bairros boundaries

- | | |
|----------------------|-------------------------|
| 1. Polana Cimento A | 28. Costa do Sol |
| 2. Central C | 29. Albasine |
| 3. Alto Maé B | 30. Maganine B |
| 4. Alto Maé A | 31. Maganine A |
| 5. Central B | 32. Maganine C |
| 6. Polana Cimento B | 33. Zimpeto |
| 7. Sommersfield | 34. George Dimitrovo |
| 8. Central A | 35. Malhazine |
| 9. Malhangalene A | 36. Bagamotio |
| 10. Coop | 37. 25 de Junho B |
| 11. Malhangalene B | 38. 25 de Junho A |
| 12. Matialala | 39. Inhagoia A |
| 13. Urbanização | 40. Inhagoia B |
| 14. Maxaquene A | 41. Jardim |
| 15. Maxaquene B | 42. Luis Cabral |
| 16. Maxaquene C | 43. C.F.M |
| 17. Polana Cantico A | 44. Malanga |
| 18. Polana Cantico B | 45. Chamanculo B |
| 19. Maxaquene D | 46. Chamanculo A |
| 20. Mavalane A | 47. Minikadjuine |
| 21. FPLM | 48. Munkhuna |
| 22. Mavalane B | 49. Xipamanine |
| 23. Hulene A | 50. Chamanculo C |
| 24. Ferroviário | 51. Chamanculo D |
| 25. Lauiane | 52. Unidade 7 |
| 26. 3 de Fevereiro | 53. Aeroporto B |
| 27. Mahotas | 54. Aeroporto A |
| 58. Paial | 55. Aeroporto de Maputo |
| | 56. Hulene B |
| | 57. Nsalene |



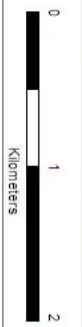
SANITATION ZONE I AND PROPOSED IMPLEMENTATION PHASES



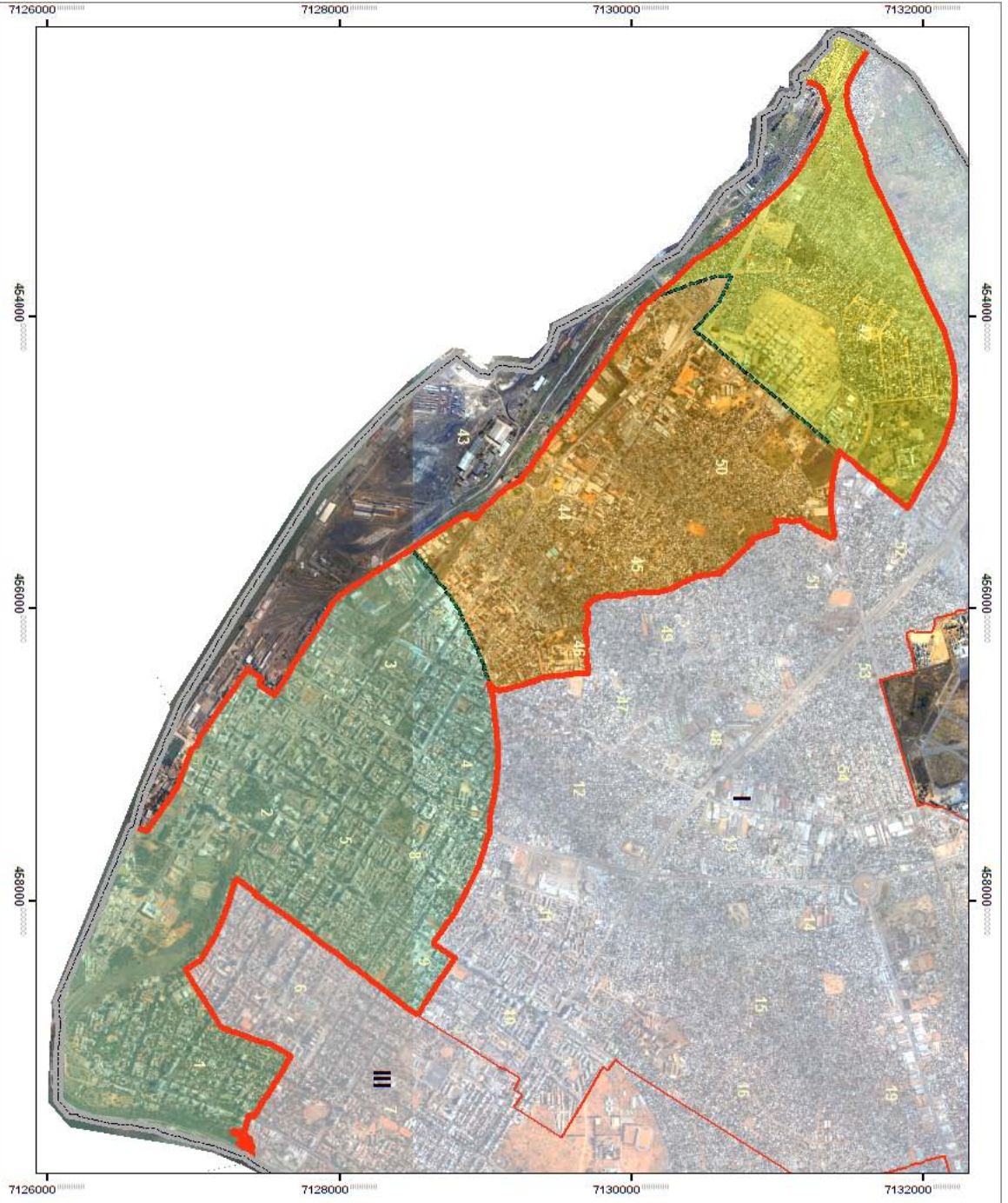
LEGEND

- Maputo City boundary
- Proposed sanitation zones
- Proposed implementation phasing
- Short term
- Short to medium term
- Medium to long term
- Long term
- Maputo City Bairros boundaries

- | | |
|----------------------|-------------------------|
| 1. Polana Cimento A | 28. Costa do Sol |
| 2. Central C | 29. Albaszine |
| 3. Alto Maé B | 30. Magoanine B |
| 4. Alto Maé A | 31. Magoanine A |
| 5. Central B | 32. Magoanine C |
| 6. Polana Cimento B | 33. Zimpeto |
| 7. Sommersfield | 34. George Dimitrovo |
| 8. Central A | 35. Malhazine |
| 9. Malhangalene A | 36. Begamnio |
| 10. Coop | 37. 25 de Junho B |
| 11. Malhangalene B | 38. 25 de Junho A |
| 12. Malalala | 39. Inhagoia A |
| 13. Urbanização | 40. Inhagoia B |
| 14. Maxaquene A | 41. Jardim |
| 15. Maxaquene B | 42. Luis Cabral |
| 16. Maxaquene C | 43. C.F.M |
| 17. Polana Cantico A | 44. Malanga |
| 18. Polana Cantico B | 45. Chamanculo B |
| 19. Maxaquene D | 46. Chamanculo A |
| 20. Mavalane A | 47. Minikadjuine |
| 21. FPLM | 48. Munkhuna |
| 22. Mavalane B | 49. Xipamanine |
| 23. Hulene A | 50. Chamanculo C |
| 24. Ferrovitário | 51. Chamanculo D |
| 25. Lauiane | 52. Unidade 7 |
| 26. 3 de Fevereiro | 53. Aeroporto B |
| 27. Mahotas | 54. Aeroporto A |
| 58. Paioi | 55. Aeroporto de Maputo |
| | 56. Hulene B |
| | 57. Nsalene |



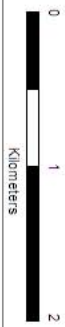
SANITATION ZONE II AND PROPOSED IMPLEMENTATION PHASES

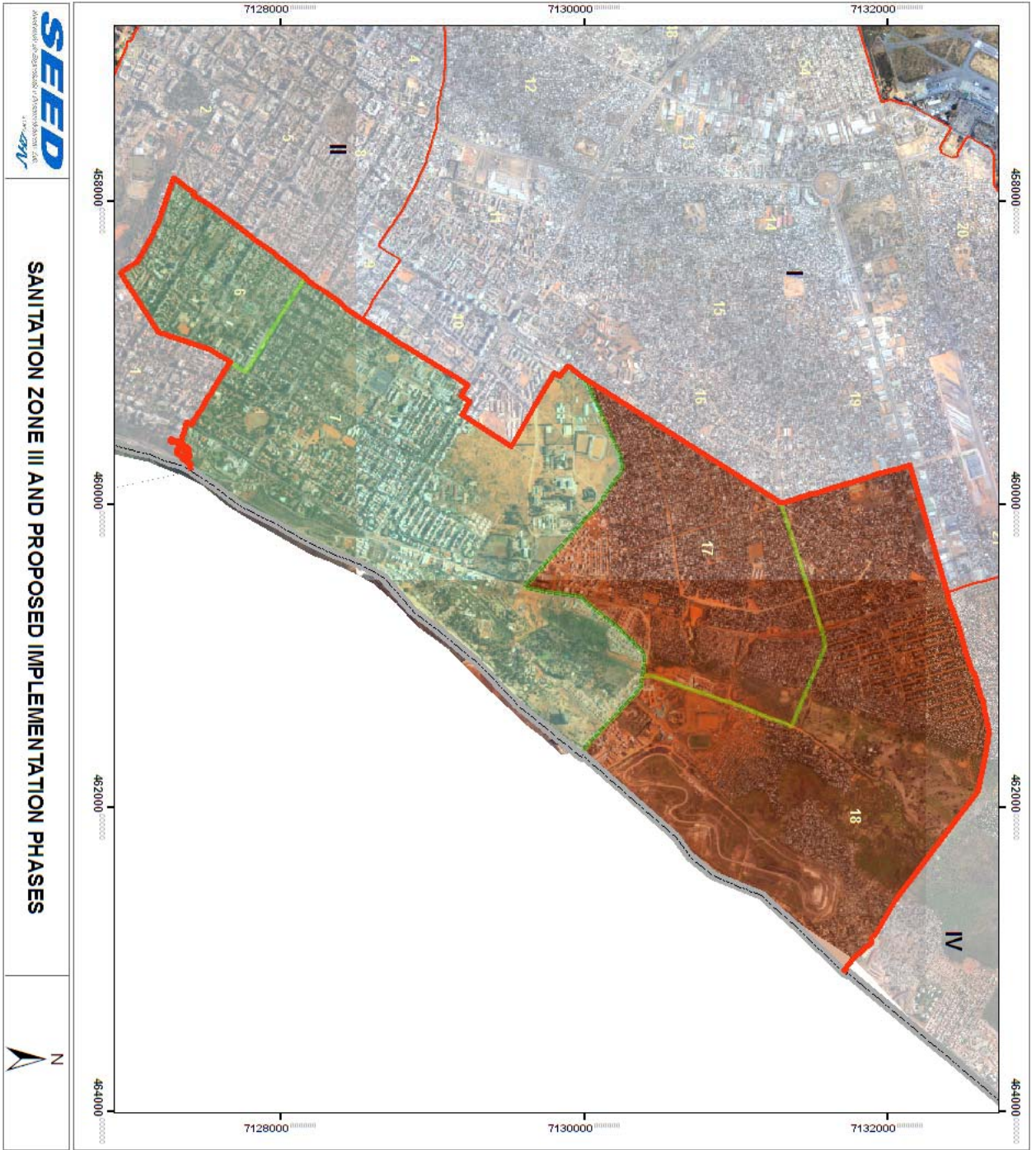


LEGEND

- Maputo City boundary
- Proposed sanitation zones
- Proposed implementation phasing
- Short term
- Short to medium term
- Medium to long term
- Long term
- Maputo City Bairros boundaries

1. Polana Cimento A
2. Central C
3. Alto Maé B
4. Alto Maé A
5. Central B
6. Polana Cimento B
7. Sommersshield
8. Central A
9. Malhangalene A
10. Coop
11. Malhangalene B
12. Matlalala
13. Urbanização
14. Maxaquene A
15. Maxaquene B
16. Maxaquene C
17. Polana Cantico A
18. Polana Cantico B
19. Maxaquene D
20. Mavalane A
21. FPLM
22. Mavalane B
23. Hulene A
24. Ferroviário
25. Lauilane
26. 3 de Fevereiro
27. Mahotas
28. Costa do Sol
29. Albaszine
30. Magoanine B
31. Magoanine A
32. Magoanine C
33. Zimpeto
34. George Dimitrove
35. Malhazine
36. Bagamoio
37. 25 de Junho B
38. 25 de Junho A
39. Inhagoia A
40. Inhagoia B
41. Jardim
42. Luis Cabral
43. C.F.M
44. Malanga
45. Chamanculo B
46. Chamanculo A
47. Minikadjuine
48. Munkhuna
49. Xipamanine
50. Chamanculo C
51. Chamanculo D
52. Unidade 7
53. Aeroporto B
54. Aeroporto A
55. Aeroporto de Maputo
56. Hulene B
57. Nsalene
58. Paioi





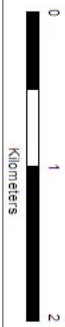
SANITATION ZONE III AND PROPOSED IMPLEMENTATION PHASES



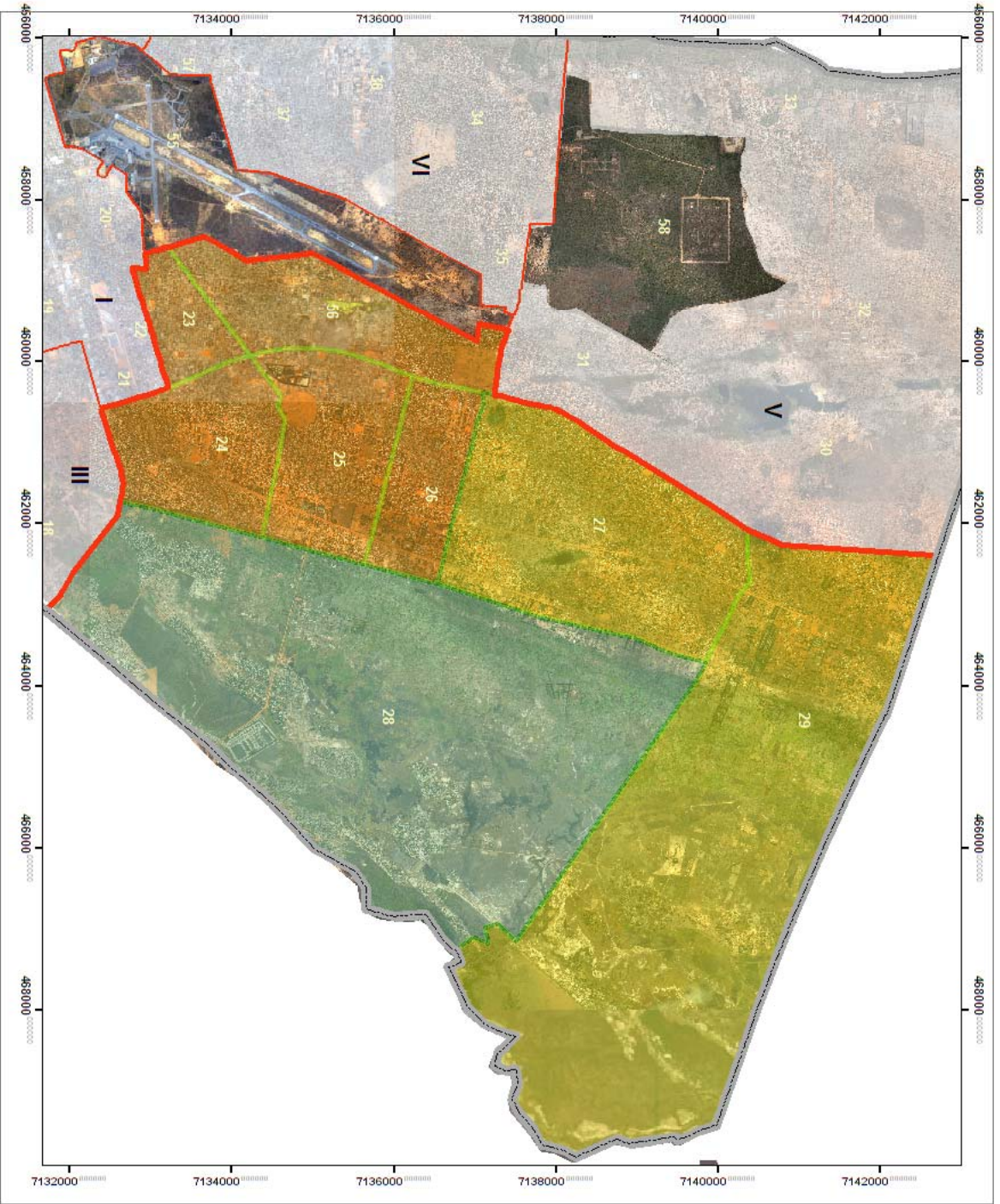
LEGEND

- Maputo City boundary
- Proposed sanitation zones
- Proposed implementation phasing
- Short term
- Short to medium term
- Medium to long term
- Long term
- Maputo City Bairros boundaries

- | | |
|----------------------|-------------------------|
| 1. Polana Cimento A | 28. Costa do Sol |
| 2. Central C | 29. Albaszine |
| 3. Alto Maé B | 30. Magoanine B |
| 4. Alto Maé A | 31. Magoanine A |
| 5. Central B | 32. Magoanine C |
| 6. Polana Cimento B | 33. Zimpeto |
| 7. Sommershield | 34. George Dimitrove |
| 8. Central A | 35. Malhazine |
| 9. Malhangalene A | 36. Bagamoio |
| 10. Coop | 37. 25 de Junho B |
| 11. Malhangalene B | 38. 25 de Junho A |
| 12. Mafalala | 39. Inhagoia A |
| 13. Urbanização | 40. Inhagoia B |
| 14. Maxaquene A | 41. Jardim |
| 15. Maxaquene B | 42. Luis Cabral |
| 16. Maxaquene C | 43. C.F.M |
| 17. Polana Cantico A | 44. Malanga |
| 18. Polana Cantico B | 45. Chamanculo B |
| 19. Maxaquene D | 46. Chamanculo A |
| 20. Mavalane A | 47. Minikadjine |
| 21. FPLM | 48. Munkhuna |
| 22. Mavalane B | 49. Xipamanine |
| 23. Hulene A | 50. Chamanculo C |
| 24. Ferroviário | 51. Chamanculo D |
| 25. Lauiane | 52. Unidade 7 |
| 26. 3 de Fevereiro | 53. Aeroporto B |
| 27. Mahotas | 54. Aeroporto A |
| 58. Paioi | 55. Aeroporto de Maputo |
| | 56. Hulene B |
| | 57. Nsalene |



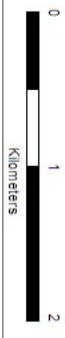
SANITATION ZONE IV AND PROPOSED IMPLEMENTATION PHASES



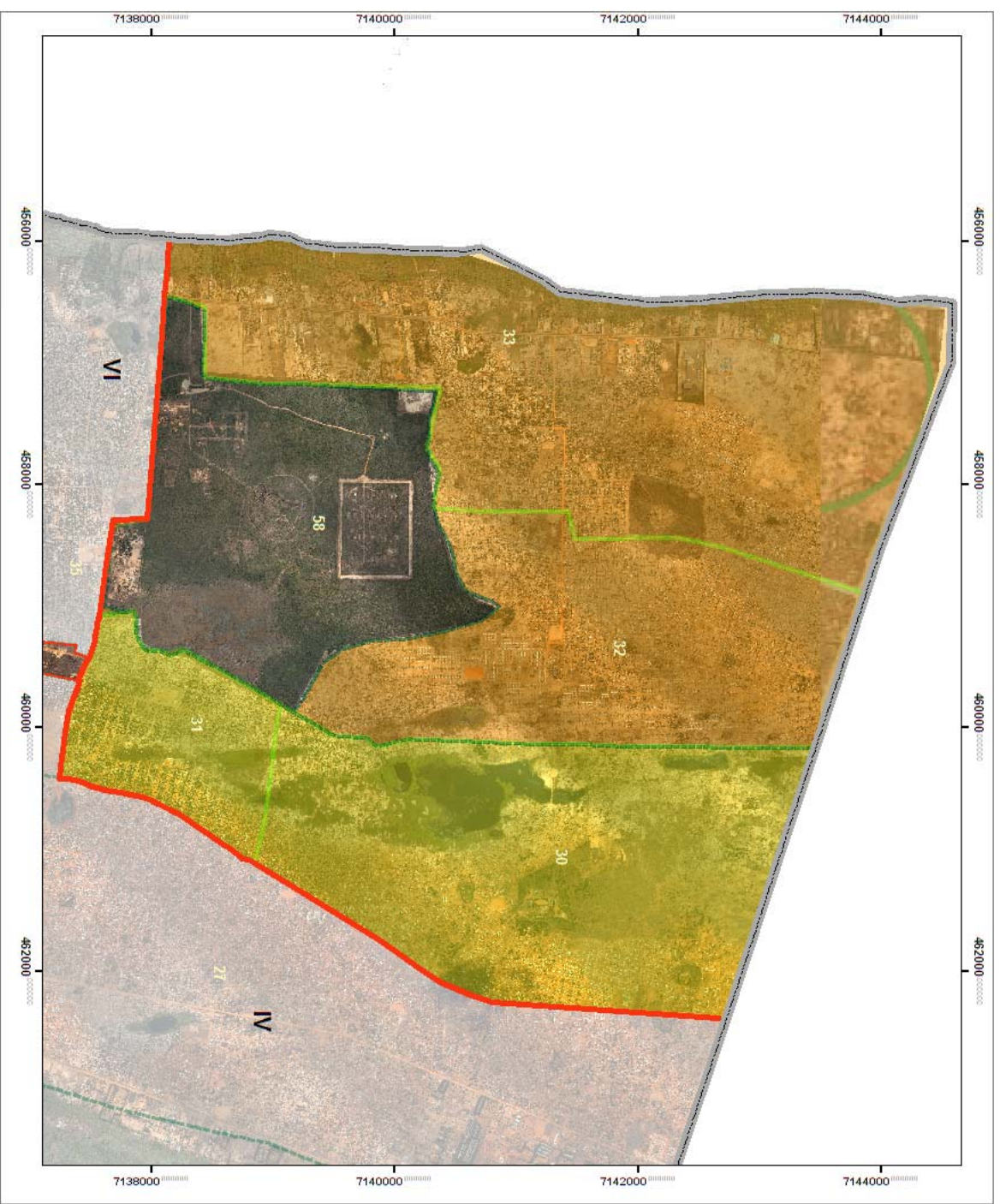
LEGEND

- Maputo City boundary
- Proposed sanitation zones
- Proposed implementation phasing
- Short term
- Short to medium term
- Medium to long term
- Long term
- Maputo City Bairros boundaries

- | | |
|----------------------|-------------------------|
| 1. Polana Cimento A | 28. Costa do Sol |
| 2. Central C | 29. Albasine |
| 3. Alto Maé B | 30. Magoanine B |
| 4. Alto Maé A | 31. Magoanine A |
| 5. Central B | 32. Magoanine C |
| 6. Polana Cimento B | 33. Zimpeto |
| 7. Sommershield | 34. George Dimitrovo |
| 8. Central A | 35. Malhazine |
| 9. Malhangalene A | 36. Begamio |
| 10. Coop | 37. 25 de Junho B |
| 11. Malhangalene B | 38. 25 de Junho A |
| 12. Mafalala | 39. Inhagoia A |
| 13. Urbanização | 40. Inhagoia B |
| 14. Maxaquene A | 41. Jardim |
| 15. Maxaquene B | 42. Luis Cabral |
| 16. Maxaquene C | 43. C.F.M. |
| 17. Polana Cantico A | 44. Malanga |
| 18. Polana Cantico B | 45. Chamanculo B |
| 19. Maxaquene D | 46. Chamanculo A |
| 20. Mavalane A | 47. Minikadjine |
| 21. FPLM | 48. Munkhuna |
| 22. Mavalane B | 49. Xipamanine |
| 23. Hulene A | 50. Chamanculo C |
| 24. Ferroviário | 51. Chamanculo D |
| 25. Lauiane | 52. Unidade 7 |
| 26. 3 de Fevereiro | 53. Aeroporto B |
| 27. Mahotas | 54. Aeroporto A |
| 58. Paioi | 55. Aeroporto de Maputo |
| | 56. Hulene B |
| | 57. Nsaliene |



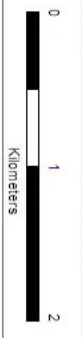
SANITATION ZONE V AND PROPOSED IMPLEMENTATION PHASES

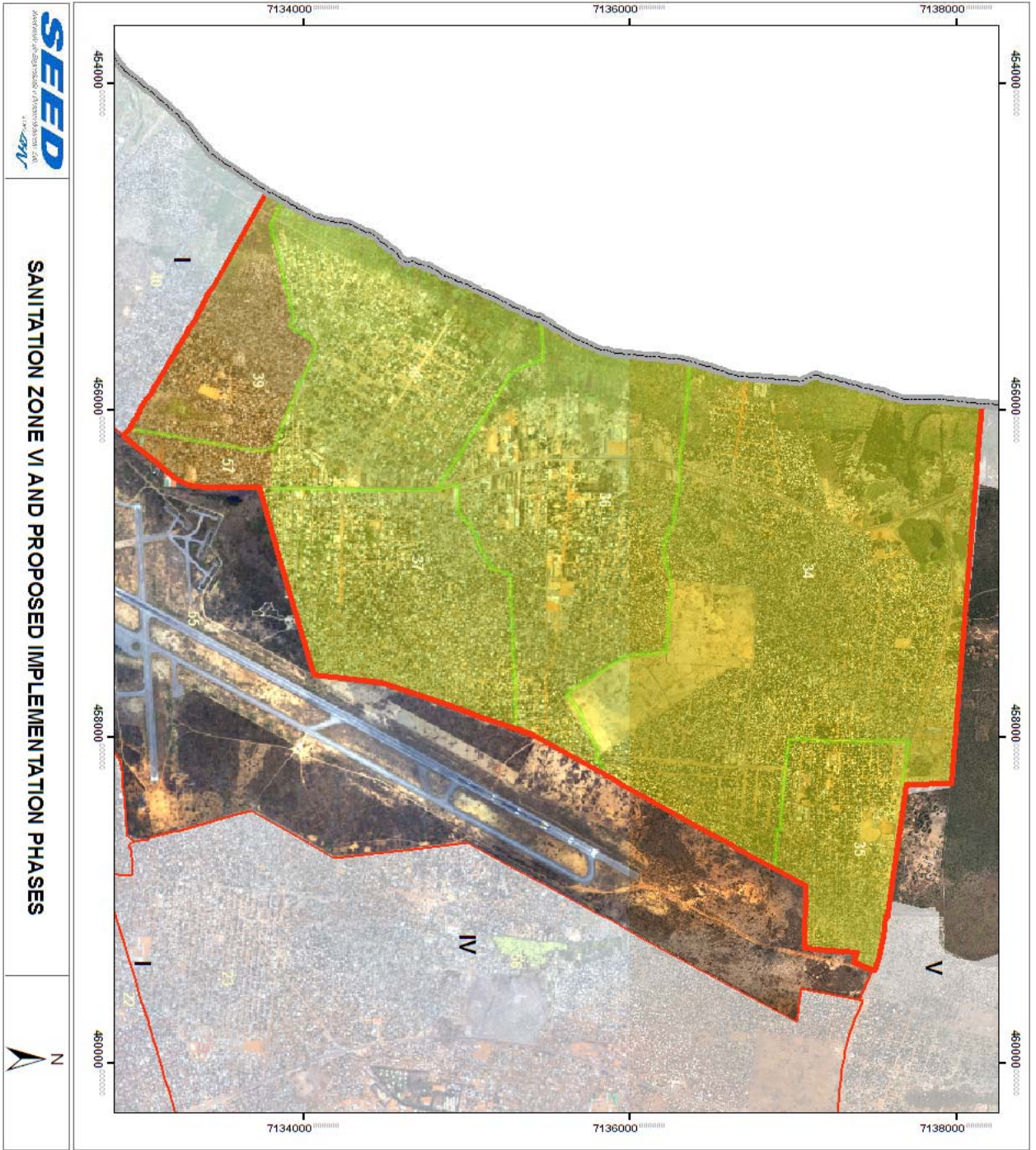


LEGEND

-  Maputo City boundary
-  Proposed sanitation zones
-  Proposed implementation phasing
-  Short term
-  Short to medium term
-  Medium to long term
-  Long term
-  Maputo City Bairros boundaries

- | | |
|----------------------|-------------------------|
| 1. Polana Cimento A | 28. Costa do Sol |
| 2. Central C | 29. Albasine |
| 3. Alto Maé B | 30. Magoanine B |
| 4. Alto Maé A | 31. Magoanine A |
| 5. Central B | 32. Magoanine C |
| 6. Polana Cimento B | 33. Zimpeto |
| 7. Sommershield | 34. George Dimitrovo |
| 8. Central A | 35. Malhazine |
| 9. Malhangalene A | 36. Begamio |
| 10. Coop | 37. 25 de Junho B |
| 11. Malhangalene B | 38. 25 de Junho A |
| 12. Matialala | 39. Inhagoia A |
| 13. Urbanização | 40. Inhagoia B |
| 14. Maxaquene A | 41. Jardim |
| 15. Maxaquene B | 42. Luis Cabral |
| 16. Maxaquene C | 43. C.F.M |
| 17. Polana Cantico A | 44. Malanga |
| 18. Polana Cantico B | 45. Chamanculo B |
| 19. Maxaquene D | 46. Chamanculo A |
| 20. Mavalane A | 47. Minikadjuine |
| 21. FPLM | 48. Munkhuna |
| 22. Mavalane B | 49. Xipamanine |
| 23. Hulene A | 50. Chamanculo C |
| 24. Ferroviário | 51. Chamanculo D |
| 25. Lauiane | 52. Unidade 7 |
| 26. 3 de Fevereiro | 53. Aeroporto B |
| 27. Mahotas | 54. Aeroporto A |
| 58. Paioi | 55. Aeroporto de Maputo |
| | 56. Hulene B |
| | 57. Nsialene |





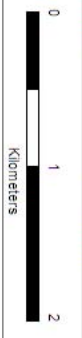
SANITATION ZONE VI AND PROPOSED IMPLEMENTATION PHASES



LEGEND

- Maputo City boundary
- Proposed sanitation zones
- Proposed implementation phasing
- Short term
- Short to medium term
- Medium to long term
- Long term
- Maputo City Bairros boundaries

- | | |
|----------------------|-------------------------|
| 1. Polana Cimento A | 28. Costa do Sol |
| 2. Central C | 29. Albasine |
| 3. Alto Maé B | 30. Magoanine B |
| 4. Alto Maé A | 31. Magoanine A |
| 5. Central B | 32. Magoanine C |
| 6. Polana Cimento B | 33. Zimpeto |
| 7. Sommershield | 34. George Dimitrovo |
| 8. Central A | 35. Malhazine |
| 9. Malhangalene A | 36. Bagamotio |
| 10. Coop | 37. 25 de Junho B |
| 11. Malhangalene B | 38. 25 de Junho A |
| 12. Matialala | 39. Inhagoia A |
| 13. Urbanização | 40. Inhagoia B |
| 14. Maxaquene A | 41. Jardim |
| 15. Maxaquene B | 42. Luis Cabral |
| 16. Maxaquene C | 43. C.F.M |
| 17. Polana Cantico A | 44. Malanga |
| 18. Polana Cantico B | 45. Chamanculo B |
| 19. Maxaquene D | 46. Chamanculo A |
| 20. Mavalane A | 47. Minikadjuine |
| 21. FPLM | 48. Munkhuna |
| 22. Mavalane B | 49. Xipamanine |
| 23. Hulene A | 50. Chamanculo C |
| 24. Ferrovário | 51. Chamanculo D |
| 25. Lauilane | 52. Unidade 7 |
| 26. 3 de Fevereiro | 53. Aeroporto B |
| 27. Mahotas | 54. Aeroporto A |
| 58. Paioi | 55. Aeroporto de Maputo |
| | 56. Hulene B |
| | 57. Nsialene |



APPENDIX G

Workshop Results

OUTLINE SANITATION STRATEGY FOR MAPUTO CITY

Results of the Workshop (5th March)

Group 1

Topic: Which is the sanitation services more needed in the “bairros”? Waste removal, waste disposal, drainage and hygiene promotion.

Densely populated?

- Local production of components for the improved latrines
- Ecological latrines subsidized
- Primary collection of solid waste
- Construction of drainage channels: secondary and primary
- Informal financial services
- Dissemination good practices of hygiene

Where there is a conventional sanitation system?

- Municipal services to clean and maintain the system (private companies)

In the intermediary areas?

- Municipal services, private companies and particulares.
- There are service providers to latrines (slab, bricks and assembly). Some make just slabs but there is others doing the whole latrine including the emptying when it is full.
- There are services of education in emergencies periods

How does the services / packages / providers can be improved in the future? Short term, medium term and long term?

Short term:

- Training of staff
- Implementation of low cost sanitation technologies

Medium Term:

- Emptying services
- Elaboration of specific plans for each areas

OUTLINE SANITATION STRATEGY FOR MAPUTO CITY

Long Term:

- Territorial organization

Group 2

Topics: A service on site directed to the familiar level comprises part of a more wide solution that includes for instance, sanitary communal blocks, condominium approaches, etc.

Therefore:

1. Who takes the main decisions related to the levels of service?

- Rules and procedures are defined by the Municipality and the Public Works and Housing Ministry.
- The decisions are taken by the individuals and families.
- Variants:
 - Linked to the public system or not – where it exists
 - Building own infrastructures, according with the capacity
- Critical factors: bureaucracy, delay response
- The future: the Municipality as the decision making, improving the supervision, communication and decentralization.
 - Monitoring of new constructions
 - Survey and corrective measures to existing cases
 - Training and responsabilization of local authorities

2. Which are the roles and more significant actors needed to provide services to the residents of the neighborhoods?

- Roles: DNA (regulation, policies and strategies), Municipality (implementation, supervision and service provider), NGOs/OCBs/Private sector (service providers)
- In short term: define the strategy to obtain external funds
- Middle/long term: implementation of the strategy and collection of sanitation taxes

Densely populated?

- Family, Municipality, National Directorate of Water and the Private Sector

OUTLINE SANITATION STRATEGY FOR MAPUTO CITY

- OCBs and NGOs

Where there is a conventional sanitation system?

- Family, Municipality, National Directorate of Water and the Private Sector
- Administration of the condominiums

In the intermediary areas?

- Family, Municipality, National Directorate of Water and the Private Sector
- OCBs and NGOs

Group 3

Topics: Which are the more viable steps that can be taken on the way of more autonomous sanitation services in Maputo?

Short / medium / long terms? Consider the inside and outside of Municipality options.

Unique / Multiple?

Which are the key factors that have to be taken in order to assure the sustainability?

- Creation of a one company with financial, administrative and patrimonial independency.
- The sanitation sector should be considered as the health and education sectors
- For this reason, it should be subsidized by the State, mainly on the first periods
- To accelerate the process of creation of the company, besides the Municipality, it should be assured the participation of strategic partners as NGOs, OCBs, private and others
- Constraints:
 - Introduction of the sanitation tax
 - Define which services first- availability, use, type
 - Dependency and management of the funds of donors / investors
 - Delay in the transition / institutional transfer – decentralization
 - Physical access / provide the services

OUTLINE SANITATION STRATEGY FOR MAPUTO CITY

Results of the Workshop (1th July)

Group 1

Who takes the lead, what is needed to sustain planning and implementation?

1. *Leadership*
 - a) *Municipality (strategic plan)*
2. *Sustain and Implement*
 - a) *Master Plan*
 - b) *Public/Private*
 - c) *GDEI*

Group 2

What do users want, can afford and are able to maintain?

1. *What does the users want?*
 - *Basic Sanitation, Safe and Sustainable*
 - Requalification of the bairros, creating space for the communal sanitation infrastructure construction*

2. *Can afford?*

Through the following way:

- *Paying for the services*
- *Direct participation on the construction and maintenance activities*
- *Creation of minimum rates for the urbanized areas*

Micro-credit for the construction of septic tanks

It should be ensured the legal compliance

Group 3

The way forward: Sanitation development vision - Fund mobilization - Implementation scenarios

Vision: Ensure safe and sustainable sanitation for all residents of the city of Maputo

Safe Sanitation is: easy to manage, financially bearable, clean, stable

Implementation Scenarios

Priority Districts

1 e 3

5 e 6 – CMM must ensure that the development is not destroyed

2 e 4 – Start the collection of the maintenance taxes

OUTLINE SANITATION STRATEGY FOR MAPUTO CITY

1

- *Reordering*
- *Condominal systems that can be connected to the system*

3

- *Ecological Sanitation*
- *Condominal Sewage*

Fund Mobilization Strategy

- *Dissemination of the Strategy at all levels (Central Government, Civil Society, NGOs)*

1st approach

Investments through the AIAs –Central Government

2nd approach (which can be implemented in parallel)

- *Negociar com parceiros (ONGs) Negotiate with partners (NGOs) to invest in sanitation districts*

The investment must be done in raising awareness of the citizens

- *Dissemination of the Strategy at all levels (central government, Civil Society, NGOs)*

