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Economic Instruments in Solid Waste Management

Case Study Maputo, Mozambique

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Abbreviations

AGRESU	Apoio à Gestão de Resíduos Sólidos Urbanos na área de Grande Maputo, Assistance in Solid Waste Management in the Greater Maputo Area
CMM	Conselho Municipal de Maputo, Maputo City Council
DMSC	Direcção Municipal de Salubridade e Cemitérios, Municipal Directorate for City Cleansing and Graveyards
EDM	Electricidade de Moçambique
FRELIMO	Frente de Libertação de Moçambique
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
MICOA	Ministerio para Coordenação de Acção Ambiental, Ministry for the coordination of Environmental Action
Mt	Metical (Mozambican currency)
PROMAPUTO	Maputo Municipal Development Program
SWM	Solid Waste Management
TA	Technical Assistance
USD	United States Dollar

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Executive summary

Solid Waste Management poses a challenge for Municipalities in developing countries not only because of the technical or organizational difficulties of waste collection and disposal. In most cases the available public funds are not sufficient to provide for an adequate and extensive service provision. Lacking funds result in technical (enough equipment, proper maintenance) and organizational (insufficient and under qualified staff) hazards that then cause poor service delivery with severe consequences for public health and the environment.

Economic instruments for Solid Waste Management have the objective to increase the capacity of Municipalities to secure sufficient financial resources for adequate service provision. Cost recovery is an important requirement for sustainable approaches to SWM, but it is not the only aspect of economic instruments. Incentives for behavioral change (e.g. waste reduction) and economic activities (e.g. recycling) can result in an even bigger impact on SWM sustainability.

The GIZ sector Project “Concepts for sustainable waste management” analyzes experiences from several countries where economic instruments have been implemented with international support. Questions such as what were the necessary preconditions, successful approaches and measures to guarantee sustainability and impacts had the instruments on the SWM system.

Solid Waste Management in Maputo

Maputo is the capital of Mozambique. GIZ supported the Municipality from 2002 to 2010 in the implementation of a sustainable waste management system through the Technical Assistance project AGRESU. The 1,2 Mio inhabitants of Maputo produce about 1.000 ton of waste per day. It costs approximately 5,4 Mio US dollar to collect and dispose of the city’s waste per year. Every family would need to spend roughly two dollars per month to finance the system, which is less than 0,6% of their available income. It seems that it should be easy for the Municipality of Maputo to raise enough money for sustaining adequate waste management services. But is it really so easy?

One answer why it is not easy at all lies in the history of the city. A long civil war and a rushed decentralization process left organizational structures that were not prepared for their tasks. Central government maintained control over most of the revenues. In a struggling economy tax increases became a political minefield independent of the financial demands of Maputo. Due to the lack of funds services got worse, stressing even further the patience of a disappointed public.

In a desperate move Maputo introduced a waste fee in 2002, only to cancel it a few months later. Poor service performance and no public information about the fee caused a storm of protest that led eventually to the fee’s withdrawal. With first support from the TA project a broad and thorough awareness campaign prepared the second introduction of the waste fee only a year later. The fee is charged through the electricity bill and has therefore a wide and relatively efficient distribution network. The reintroduction was successful; people paid their waste fee and the key economic instrument for a sustainable waste management system was introduced.

Economic instruments

The fee for household waste is not the only instrument to help the Municipality of Maputo to improve its financial standing in SWM. It is, however, the most important one. With TA support the waste fee developed over the years and is now the key income source for financing waste collection and transport. When introduced everybody with an official electricity connection paid a flat fee of roughly \$0,8 per month and family. The system has two big advantages: it uses an established revenue collection system covering more than 90% of all households (2011) and it attaches the waste fee to a basic facility, electricity in this case, which greatly increases the motivation to pay the waste fee.

With the revision of the fee in 2007 consumption related tariffs were introduced. Linked to energy consumption higher income households paid up to two times more than regular energy consumers. The Municipality, despite significant political and society opposition, successfully defended the logic that energy consumption is a valid social-economic indicator and therefore a suitable reference for waste quantities. This adjustment of the fee marked the introduction of the polluter pays principle and social criteria for public tariff setting.

Non-household waste producers were also included in the same system, but with higher fees. Revenues from both fees increased from \$50.000 in 2004 to \$310.000 in 2012. Significant increases were implemented in 2007 and 2010. An increase planned for 2012 has not been introduced yet.

In close cooperation with the TA project AGRESU the Municipality started in 2006 with the introduction of a licensing and registration system designed for waste producers who generated too much waste to be allowed to use the public waste collection. The system is called “Proof of Service”. Every non-household waste producer has to register, but only producers with an estimated average of

more than five times above the family average (equivalent to 25kg or 50l per day) need to follow the procedures. Above this limit the responsibility for waste collection and disposal lies with the actual waste producers. They have to contract a licensed service provider and pay an additional contribution to the city's cleaning services. The system is operational since 2008 but its financial contribution is still below expectations. Resistance from the commercial sector and organizational challenges are the main reasons.

Other revenue sources include private service provision by the Municipality for "Proof of Service" clients, a disposal fee at the official disposal site in Maputo for private operators and a set of fees and fines for additional services or illegal waste disposal.

The combined revenues of all economic instruments cover currently (2012) about 69% of the total costs. Costs are mainly service provision contracts but also the Municipality's own expenses for investment, salaries and operational costs of the solid waste sector.

Tools for the introduction of economic instruments

Economic instruments cannot be simply applied in any given environment. It is extremely important that they respond to the specific circumstances and demands of a Municipality. In the Maputo case several tools helped the Municipality to frame the adequate and economically feasible solutions that would guarantee a self-sustained service provision in the long run.

These tools were:

- Strategy on financial sustainability including the cost calculation model
- Analysis of capacity to pay
- Revenue collection system
- Legal instruments, such as the Municipal by-law
- Awareness campaigns

The strategy on financial sustainability and the underlying cost calculation model provide an answer to the following questions:

- What are the most efficient and cost effective services for the different areas of Maputo?
- How much do these services cost? How much will the costs increase when the services are extended to all areas?
- What are the expected total costs of SWM in Maputo for the next ten years under the objective to achieve full service provision in 2013?
- What are the expected/ planned revenues and how big is the financing gap between costs and revenues?
- What are the necessary increases in revenues to achieve full cost recovery by 2017?

The analysis of the capacity to pay provides the Municipality with a relation between financial demands to finance service improvements and the actual capacity of Maputo's population to pay for these. It shows whether the city can actually afford the chosen system.

The revenue collection system through the electricity provider and the "Proof of Service" as well as the legal instruments have then been adjusted to provide the necessary infrastructure, both in financial as in legal terms in order to implement the improved waste collection system.

Finally and out of bad experience public awareness campaigns guaranteed that the public is informed about the Municipality's plans to adapt or increase the waste fee and about how these increases contribute to improved service provision.

Impacts

With the application of economic instruments the city of Maputo managed to improve drastically its revenue base and consequently its service provision.

Table: Indicators for SWM performance in Maputo (actual data in normal, calculated data in italic)

Item	2004	2007	2010	2012	2016
Collected waste quantities	250 ton/day	400 ton/day	600 ton/day	<i>760 ton/day</i>	<i>850 ton/day</i>
Population with access to regular service	< 40%	< 40%	65%	82%	100%
Total costs of SWM system	<\$1 200 000	\$2 406 167	\$4 026 041	<i>\$5 945 529</i>	<i>\$9 749 180</i>
Total revenues	\$600 000	\$1 289 063	\$2 484 000	<i>\$4 110 000</i>	<i>\$8 862 983</i>
Cost recovery	< 40%	54%	62%	69%	90%

The numbers indicate that Maputo could realize constant service improvements with a trajectory to reach full service delivery before 2016. The constantly increasing costs are covered to a significant extent by revenues from the sector. Currently external financing is closing the remaining gap, but will phase out end of 2015.

The big challenge for the Municipality is to maintain the drive and commitment that allowed for above-mentioned impacts to be achieved. The main success factors were:

- Strong political commitment for change and consistent leadership guaranteed that the strategy and tools were approved and implemented.
- Overall effort to improve CMM's performance used the SWM first as an example and driver for success, then provided the necessary support, for example through efforts towards institutional and organizational development.
- Substantial increase in Human Resources and the effort to create an attractive, positively perceived work environment, shift towards younger employees with higher qualifications
- Decentralization and delegation of responsibilities, which opened a way to modern management approaches in CMM and the SWM sector.

From the perspective of the technical assistance there is a fragile line of development success: The crucial point comes when strategies, tools and change management become integral part of the Municipality's own institutional thinking. Its internal motivation and incentive system for decision makers and technicians needs to accommodate the idea of sustainability and the adequate tools to pursue it. Therefore, the continuous development of the institution and its leadership is the key factor for a long-term success of the sector.

Conclusion

The Maputo case demonstrates how economic instruments can deliver a significant contribution to improve service provision in Solid Waste Management, even when the starting conditions are quite demanding. The trajectory and the application of the instruments and supporting tools are transparently outlined. The main task is now to maintain momentum and direction to surpass upcoming new challenges and achieve a long-term sustainable waste management system in a developing environment.

1. Introduction

Maputo is the capital of Mozambique and home to about 1.2 Million people. It is estimated that the population produces about 1.000 ton of waste per day. It costs between 10 to 25 USD¹ per ton to just collect and remove this waste. This is an estimated 15.000 USD per day, 450.000 USD per month or 5,4 Million USD per year. Divided by the population figure it means that every family in the city would need to spend about two USD per month to keep the city clean. The average monthly income per family in Maputo is estimated to be 380 USD (2011). Families would have to spend less than 0,6% of their available income to sustain SWM in Maputo.

We will have a closer look at the Municipality of Maputo and on its way to achieve the objective of financially sustaining waste collection services and waste management in general. We start from the beginnings, where the overall budget of CMM did not exceed 2 Million USD per year, then go to the introduction and evolution of the waste fee and finally to the current situation of financial sustainability (Chapter 1). The instruments that have been designed and put in place will be described in detail in Chapter 2.



Figure 1: Evening view over the commercial district of Maputo

Therefore it should be relatively easy to achieve financial sustainability of this necessary and basic public service based on Maputo's own resources and revenues. Is it really so easy?

¹ The numbers represent the actual contracted values for the Suburban and Inner City Service providers. The suburban is serviced by a Hooklift Container system (around 10USD/ton), the Inner City by a Compactor truck system with publicly placed containers (20 to 25 USD/ton).

The study will analyze the historical, political and technical circumstances that led to where CMM is now. It will draw a shot at the remaining challenges of implementation and strategy and will look into risks and potential reasons for failure of the economic instruments in the future (Chapter 3). Chapter 4 will present the actual impacts of the various instruments specifically for Solid Waste Management in Maputo and analyze the perspective of long-term sustainability of the system.

1.1 Objective of the Case Study

The economic viability of solid waste management systems is one of the greatest challenges in low- and middle-income countries. Cost recovery is an important requirement for sustainably implementing solid waste management systems, but it does not always correspond to political priorities, the willingness of the population to pay for the services or the capacities of the administration to implement it. Fees to cover solid waste management costs do not always exist, or the authorities in charge cannot raise existing fees effectively.

However economic instruments in SWM include more than just fees or taxes. They can be used to cover costs, but also to create incentives for waste reduction, recycling or particular treatment and disposal options. The broader range of economic instruments for solid waste management is rarely used in low- and middle-income countries until now.

In several partner countries, development cooperation projects have addressed aspects of financing and economic instruments in solid waste management. But most of the time, this topic was not in the focus of the joint activities.

Therefore, the GIZ sector project “Concepts for sustainable waste management” aims to analyze the economic instruments that could be used in solid waste management, compare their effects and the pre-conditions for their implementation. For this purpose the sector project initially wants to analyze the experiences from several countries where bilateral SWM programs have worked on the implementation of fee systems or other economic instruments.

Aim of the case studies is however not to analyze the characteristics and effects of different economic instruments in general, but rather to focus on answering the questions:

- What have been the preconditions necessary to treat economic instruments within the cooperation?
- Which conditions have had to be created to secure the effective use of the selected economic instruments?
- Which approach has been followed to implement certain economic instruments?
- What are the currently prevailing effects of the measures?

1.2 Approach

“The definition of economic instruments varies in the literature. However, there appears to be some general consensus in the definition of an economic instrument as a policy, tool or action which has the purpose of affecting the behavior of economic agents by changing their

financial incentives in order to improve the cost-effectiveness of environmental and natural resource management” (UNEP 2005).

“In the case of solid waste management, economic instruments are meant to:

- Reduce waste generation;
- Lessen the amount of generated waste that is hazardous;
- Segregate hazardous waste for special handling and disposal;
- Optimize recovery, reuse and recycling of wastes;
- Support cost-effective solid waste collection, transport, treatment and disposal systems;
- Minimize adverse environmental impacts related to solid waste collection, transport, treatment and disposal systems; and
- Generate revenues to cover costs.

There is a strong relationship between economic instruments and the polluter-pays principle. That principle involves allocating costs of waste management services, resource consumption, and pollution control to consumers and producers. Inherent in this principle, the polluter bears all internal and external environmental costs, with the goal that all subsidies for resource use, production and waste management services are eliminated.” (IDB 2003)

Economic instruments in Solid Waste Management cover a great variety of possible applications, but can be distinguished in three categories (IDB 2003):

- Revenue generating instruments (Charges, taxes or subsidies reductions)
- Revenue providing instruments (Subsidies, grants, tax credits, etc.) and
- Non-revenue instruments (Trade-off arrangements, liability measures, performance disclosure, etc.).

Revenue generation instruments provide the financial basis for improving solid waste management operations and induce a financial aspect to the choices polluters and service users make. Revenue providing instruments add a financial incentive to improved SWM activities of the private sector, e.g. by encouraging investments in new technologies or pollution reduction measures. Non-revenue instruments include a huge variety of applications, but motivating behavioral change, extending producer responsibility or inducing disincentives against pollution are some important applications. Other models use different categories, such as cost recovery instruments and incentive creating instruments.

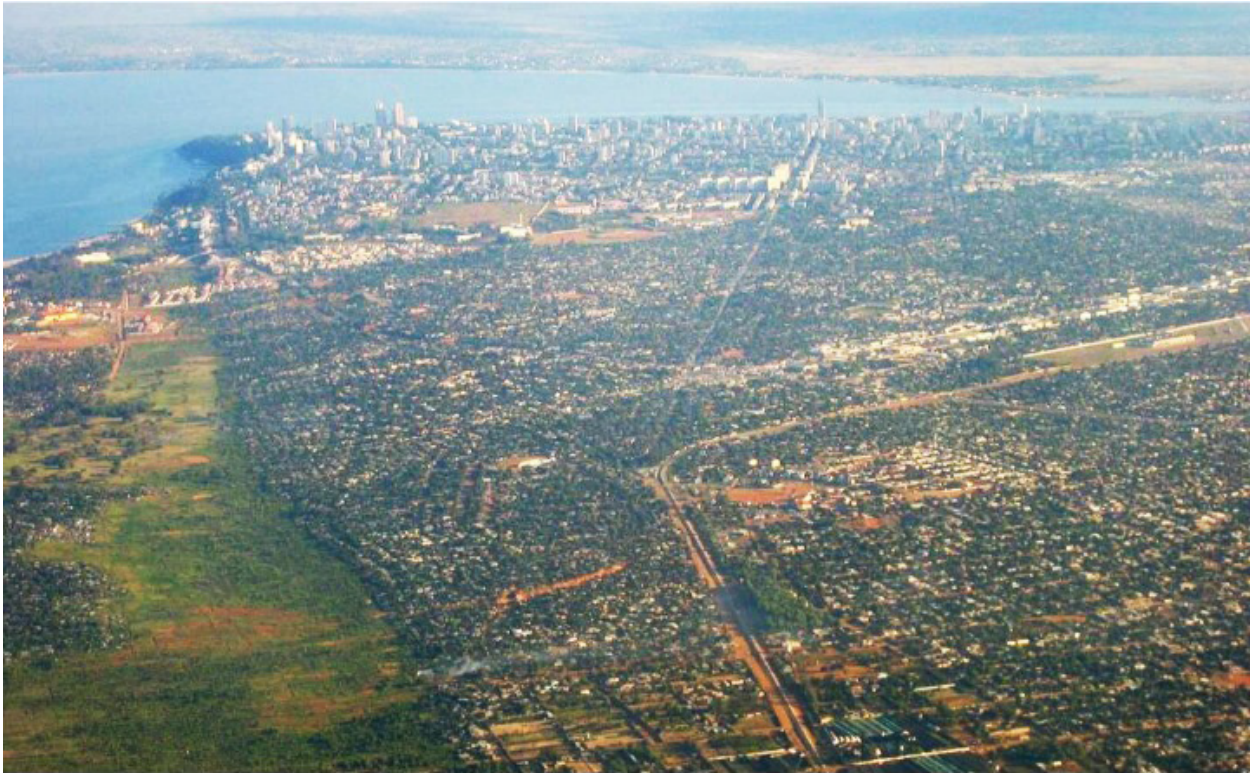


Figure 2: Aerial view of Maputo with the bay and city center at the top © Silke Drescher 2004

The Mozambican reality defines a quite narrow window for the application of economic instruments. The main priority has been to establish a sustainable system, first of waste collection for all citizens, then of environmentally adequate disposal. Aspects such as waste reduction or separation have been of a lesser priority during the last 10 years.

Therefore, the Maputo Case Study focuses on revenue generating and to a lesser extent on some revenue providing instruments. The analysis of the existing instruments will not only document their implementation and functionality, but will also investigate the underlying approaches and tools that have been used for their adequate application. To some extent the combination of these tools might be the main ingredient for a success story.

1.3 Methodology

This document is based on a desk study of the experiences of the implementation of the GIZ project AGRESU Assistance to Solid Waste Management in the Greater Maputo Area. The consultant has been Technical Advisor and Team Leader of a component of the project from 2004 to 2010. The available data contains the project documentation as well as substantial material from the project partner Conselho Municipal de Maputo. Since 2010 he is working as Advisor for SWM directly for CMM in the context of the Municipal Development Program ProMaputo with support from the World Bank.

1.4 Municipality of Maputo

The city of Maputo is often referred to as the Pearl of the Indian Ocean or the City of Acacias, which becomes obvious when approaching the city by plane. Located at a large bay with the clear waters of Inhaca Island as a border to the Indian Ocean the city shines in white and green. The white reflects from old and modern buildings concentrated in the city center along the bay, most of them from colonial times. Trees line up in almost all the roads and they cover vast stretches of the suburban settlements.

But, when landing from the right side the view over the bay and its deep green waters is disturbed by smoke rising from a large greyish brown patch of land. The official Municipal Disposal site Hulene is located just 700m from the runway. And it is completely surrounded by houses with sometimes just a 5m road between the waste and the fence of the garden. The site exemplifies very well the problems of urbanization and public service delivery that Maputo Municipality with its colonial past, the pressure of the civil war and the rapid and uncontrolled growth thereafter has been facing for the last 37 years.

Mozambique became independent in 1975 after 13 years of struggle for independence. Before that Maputo had a very well organized urban center that hosted mostly white residents of Portuguese origins. As the capital and important sea port, the then called Lourenço Marques had well developed infrastructure and qualified staff for public services. Also, population figures were low compared to today. The Inner City was not densely populated.

After independence the great majority of Portuguese residents left the country almost overnight. FRELIMO, the liberation front, had to manage the economy and administration without adequately qualified staff or sufficient resources. Consequently, the new government struggled to maintain the extensive infrastructures and to provide the basic public services.

The long and consuming civil war (1977 – 1992) and then the extraordinary floods in 2000 forced many people to the cities. They were relatively safe and offered access to basic care and aid. This meant that Maputo's suburban areas around the city center grew very fast, leaving no chance for the city's management to organize the settlements or sustain basic service delivery.

Four years after the first national elections (1994) 32 cities became formally independent and municipal elections were held. The decentralization process transferred significant responsibilities from central to local government, but without being accompanied by the necessary financial and institutional resources.

These first years were characterized by a steady decline in service provision despite several trials of external support. Equipment could not be maintained and trained personnel left early for better-paid employment in the private sector. As a result, frequent and severe emergency situations lifted waste management to a hot topic in public discussions. The continuous growth of the widespread suburban areas and the large informal markets did not contribute to improve the situation.

1.5 Solid Waste Management

Solid Waste Management is the sole responsibility of the Municipality of Maputo with the exception of Hazardous waste (MICOA, Environmental Ministry) and Biomedical waste (Ministry of Health).

It is represented by the Vereador de Salubridade and operated by the Directorate of Salubrity, which is responsible for the execution of collection services, contracting, supervision and disposal site management. Street sweeping has been handed over to the urban district administrations. The key legal instruments are the Municipal By-law on Solid Waste Management and a set of operational regulations to support its implementation (approved and published in 2008).

An urbanized city center and vast suburban areas characterize the city. The center has approx. 120.000 inhabitants and the main concentration of public administration, commerce and institutions. The suburban areas (980.000 habitants) can be divided in the older neighborhoods around the city center and the broader, better organized settlements further away. The key problem in these areas has been access to collection services.

The current collection system comprises adequate solutions for the different characteristics of the inner city and the suburban areas. Private companies provide for the main part of services. The inner city has one contractor to collect either plastic bags in the residential areas or 1,1 cbm containers located in public places and along the streets. The suburban areas have a two-step collection: Locally based small scale enterprises collect the waste twice a week from households (door to door) and transport it to larger containers (usually 6 to 12 cbm containers), which are placed in easily reachable locations closer to the main roads. These are then collected by a private company and transported to the municipal disposal site.

The Solid Waste sector of Maputo has been receiving periodic support from different donors. This support focused initially on equipment donations or specific training measures (example mechanics). This brought its own set of complications as the make and type of trucks varied widely, making stock management and maintenance costly and complex tasks.

Since 2002 the German Bilateral cooperation supported the project AGRESU (Assistance to Solid Waste Management in the greater Maputo area), which focused on technical assistance (provided by GIZ) and helped to shape the strategic orientation of SWM and extend actual service delivery in Maputo. In 2007, a Municipal Development Program (ProMaputo) started with financial backing from World Bank. This program cooperated closely with AGRESU and a joint approach on SWM was designed and implemented.

The key instrument for the development of the SWM sector has been the strategy for improved service provision and long-term financial sustainability, which is also the conceptual backbone of the SWM Master Plan (Plano Director), approved by the Municipality of Maputo and published in 2008. All economic instruments discussed in the study are designed according to this Strategic Plan.

Maputo SWM Facts

- 1.168.315 inhabitants
- Waste generation Inner City: 1,0 kg/pp/d
- Waste generation Suburban areas: 0,56 kg/pp/d
- Significant fine fraction (sand) from suburban areas
- Total HH waste production: 676 ton/day (without fine fraction)
- Total waste production: 980 ton/day (without fine fraction)
- Collection coverage (Households) in 2012: 82%
- Average collection of 760 ton/day (March 2012)
- Private sector service provider for waste collection
- 120 ton of recyclables per month

2. Economic instruments in SWM in Maputo

Considering the broad range of existing economic instruments the Maputo case does not offer a specifically wide selection of applied solutions. But it does showcase the process of implementing a few of the more basic instruments, such as a household and commercial waste fee, a quantities related fee for large producers and user fees for the disposal site, in an environment with little resources and no local experience at all. This chapter will give first a brief historic overview presenting the relevant development steps and interactions with other developments and processes. It will then explain the functionality and mechanisms of each instrument.

2.1 Starting point for the development of economic elements

In 1997 in the context of technical support to SWM in Maputo by the Spanish development cooperation the suggestion was made to sustain waste management by introducing a waste fee. The Ministry of Finance did not approve the proposal, arguing that public services are considered a citizen's right and should be financed through the general budget. The actual financial situation of the Municipality and the financial demand for adequate service delivery have not been considered in this argument.

The Municipality found itself in the constant position of having insufficient service that was insufficiently funded. In most cases donations solved only the problem of available working equipment, but the lack of preventive maintenance and hard working conditions reduced operation times drastically. The impact of insufficient funds for public services of the municipality became visible in 2001 as the fleet of collection vehicles of the waste department deteriorated quickly. The waste heaps in the streets grew, since the waste department did not manage to maintain a regular service. Public pressure rose and forced the municipality to react.

SWM in 2004

- The Municipal budget for Maputo was estimated 6 Mio USD
- Annual expenses for SWM up to 35% of total budget
- Only 10 out of 30 collection vehicles operational
- 46% of operational costs covered by first generation waste fee
- Service coverage only 25 to 30% of the estimated total waste quantity

Various attempts to involve the private sector in waste collection failed. The service contracts had been prepared poorly and no clear performance measures had been defined. Above all, the municipality failed to pay the private service providers on time. This experience left two important impressions on the city's administration: Any cooperation with the private sector was deeply mistrusted, and the municipality recognized the need of additional revenues to sustain their public services.

The legal framework for the Municipal authorities defined that the Municipalities could levy service related fees. These fees have to be cost related. The fee value should not exceed the actual costs of service provision. Waste collection and transport is mentioned specifically for the application of service related fees.

The problem however, was that the legal basis was not used for discussion of the implementation of a waste fee. Furthermore the city had no experience and technical capacity to evaluate the actual costs of collection services. The management systems in place did not allow for the elaboration of cost structures based on operational experiences.

In conclusion the weak revenue base, but cost intensive responsibilities and fast urban growth without proper support or compensation from central government caused the Municipal services to deteriorate to unacceptable levels.

2.2 From first experiences to integrated approaches and solutions

As a first reaction against the worrying financial situation, the Municipality decided, almost overnight, to introduce a city-cleaning fee ("taxa de limpeza") in the beginning of 2002. While the concept and the necessity of a waste fee have been discussed in preparation of the technical cooperation project AGRESU, it was introduced too quickly and without an adequate information and public awareness campaign. Consequently, more and more people refused to pay and the private sector questioned the legal basis of the city-cleaning fee. There was no immediate response from the administration. By May 2002 the revenues dropped almost to zero and the state owned Electricity Company refused to continue collecting the fee through their electricity bills.



Figure 3: Neighborhood campaign for the waste fee (road show) in 2003

In order to restart the waste fee collection, an information and awareness campaign was thoroughly prepared. Television and Radio spots aimed on the contribution and responsibility of every citizen for the cleanliness of the city (“treat your city like your home, contribute by paying the waste fee”). Articles and advertisements in the newspapers tried to explain the necessity of the municipality to raise a fee for the services provided.

So called road shows with music, theatre and animation distributed this information in the suburban neighborhoods where the normal media did not reach the people.

The campaign was a success and the people returned to pay their fee of about 80 US Cents per month and household. The fees for commercial users dropped from 400 Mt. (16 USD) to 200 Mt. (8 USD) per month. The fee was charged through the electricity bills and collected by “Electricidade de Moçambique, EdM”, the Electricity Company. The city’s revenues reached 50.000 to 60.000 USD per month.

The initial objectives were to create revenues to support the increasing costs of service delivery and thus improving service coverage and consistency. CMM understood the linkage between insufficient funds and poor service delivery, the need to increase revenues to improve services and the dilemma of increasing fees while service delivery is still inadequate. The project AGRESU then supported the process for CMM assuming that economic instruments are an essential part of the solution for improved SWM services as part of the official approach.

With the team of the new mayor taking power in 2004 the analysis of available funds and actual (and future) costs led, with the support of AGRESU, to the elaboration of a new strategy on SWM, which included economic aspects (the idea of cost recovery and long term sustainability).

The first strategy that was presented to the municipal assembly was rejected based on its approach to privatize

service delivery. There was a strong resistance against handing over the responsibility of service delivery to the private sector. The main reason was the bad experiences made during emergency times, where a general misunderstanding between public and private sector about roles and responsibilities led to conflicts and finally to the end of contractual agreements.

But it was obvious to CMM that increasing the revenue base was the key to financing improvements in service delivery. The numbers presented in the strategy triggered a process where several activities for improving the financial component of SWM were initiated.

2.3 Municipal strategy on SWM in Maputo

The strategy was revised, the municipal legal framework was adjusted and a larger revision of the municipal by-law initiated. The old by-law, which was based on the colonial SWM system, was replaced by a new modular legislation with producer responsibility, participation and 3R as guiding principles. Revenues from the waste fee were allocated to expenditures of the sector. The World Bank bought in on the idea of financial sustainability (and the necessary support to achieve it) and integrated that concept into the planning process for the upcoming municipal development program (PROMAPUTO I).

In 2006 CMM managed to pass the revised strategy that contained:

- The first official data about waste quantities,
- The adequate collections systems for the different waste streams,
- An overview on existing economic instruments that would need to be adjusted,
- An analysis of the capacity of the citizens to sustain services through a dedicated waste fee,
- The Proof of Service system for non-household waste producers and
- A detailed proposal for the introduction of a revised, consumption oriented waste fee.

The strategy then compared the estimated costs for service delivery for three different implementation models:

- Public sector operations with easier access to investment funding, but less efficient operations
- Private sector operations with higher investment costs, but increased efficiency and
- A mixed model, where the public sector would facilitate investment for the private sector through his access to funds (contract-in model)

The most feasible and efficient model for each type of service was selected, effectively creating a mix of all three approaches for the Maputo case. Services such as the dumpsite management and the door to door collection in the high income areas remained with the public sector, while the inner city and suburban areas were handed over to private operators. The analysis also provided CMM with a strong argument for the decentralized waste collection in the suburban areas with microenterprises.

The strategy defined specific implementation phases to assure a stepwise increase of service delivery followed by adjustments of the waste fee to subsequently cover the cost increases. The following table shows the phases and main parameters.

Table 1: Main parameters of Solid Waste Strategy of Maputo 2006

Item	Unit	Current	End of 1st phase	End of 2nd phase	End of 3rd phase
Timeframe	[year]	2006	2006 - 2008	2009 - 2012	2013 - 2016
Public collection services	[ton./day]	< 266	602	997	1.098
Total collection ²	[ton./day]		773	1.331	1.490
Total Costs	[Mt/ year]	30.096.220	85.553.254	151.403.490	168.298.130
Total Costs	[USD/ year]	1.203.849	3.422.130	6.056.140	6.731.925

The costing included all investment and operational costs necessary for service provision, including capital costs and salaries of public servants. Contract fees for the private service providers are also included.²

The significant increase in costs at the end of the second phase was due to the start of a new sanitary landfill site, planned for 2012. Due to operational costs of the new site and longer hauling distances costs were estimated to increase by at least 35%. In 2007 new service provision was tendered (private collection), the new waste fee was successfully rolled out and additional revenue systems such as Proof of service and a gate fee at the disposal site were introduced according to the approach on economic instruments defined in the strategy.

In 2008 the new Master Plan and Municipal by-law were approved and published documenting CMM's intention to sustain improved service delivery through (increasingly) sufficient revenues. The PROMAPUTO program helped to bridge the gap between actual costs for service contracts and trailing revenues. This support was suggested to solve the problem of justifying fee increases. However, the key reason for the World Bank to sustain operational costs (through private provider contracts) was the perspective that along the three phases CMM's own revenues would gradually increase and sustain all service costs by the end of the last phase (2016). This plan for financial sustainability became the main tool for monitoring implementation

progress in SWM within the PROMAPUTO program and basis for discussing the financial contributions from the Bank.

The new fee increased revenues dramatically. From around 50.000 USD per month in 2004 the revenues increased to approximately 200.000 USD per month in 2007. Due to the higher revenues CMM managed to renegotiate the terms of the contract with EDM and reduce the commission from 22,5% to 15%.

From 2009 onwards no significant new instruments have been introduced. Focus shifted towards monitoring and accompanying changes in the sustainability model and to prepare waste fee increases with the necessary measures, such as studies on willingness to pay.

In 2010 the next increase was implemented without problems and a process to revise the baseline data for the model was initiated. 2011 saw the extension of services to almost 85% coverage. The service contracts were retendered as the three-year duration of the first tender came to an end.

Together with several cost increases such as fuel, labor and spare parts the former comfortable margin of error in the model was reduced and 2012 will need the next increase to maintain the original timeline for achieving sustainability. This year will also see the contracting of new service providers.

The following figure shows the main steps of the implementation of economic instruments from 2000 to 2012.

² Total collection includes private waste collection services for non-household waste, such as from commercial or industrial sources.

Figure 5: Timeline for the development of economic instruments in Maputo 2000 to 2012

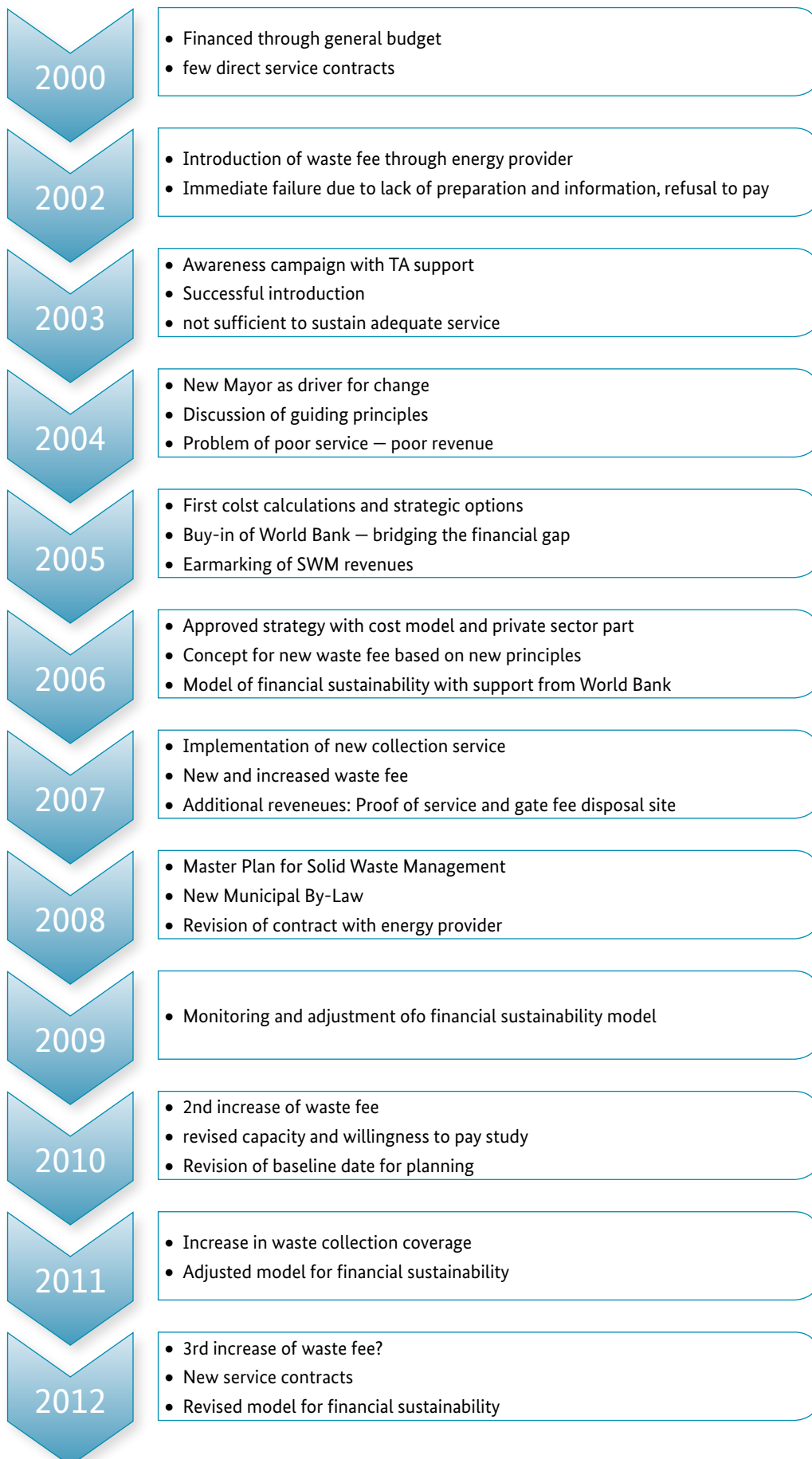




Figure 4: Example outdoor from the campaign for the 2007 revision of the waste fee (Text: I paid my waste fee and I live in a cleaner and healthier city!)

2.4 Functionality of economic instruments

The main economic instruments applied in Maputo are the

- Household waste fee
- Proof of service (for large scale non-household waste producers)
- Revenues from commercial services provided by CMM
- Disposal fee for the current and future disposal sites
- Other fees and fines

This chapter explains how these instruments work and what their main objectives and functionalities are.

2.4.1 Household waste fee

The household waste fee is defined as a monetary contribution of all individual waste producers to public cleansing and waste collection services. It is collected through the invoicing system of the public energy provider (state company) EDM and in its current implementation progressive according to the energy consumption (see Table 2). All households of Maputo Municipality connected to the Electricity grid pay the waste fee, independent of service type, frequency or other quality or quantity criteria.

The initial fee was a simple flat rate per household, a higher rate for commercial EDM clients and with very few households benefiting from the social tariff. Its main problem was the fact that many households, who did not receive any service at all, actually subsidized service provision for the high to middle income inner city areas.

The introduction of the new fee showed the significance of EDM as a fee collection tool. CMM did not have any comparably effective revenue collection system in place. The linking of energy supply and public fee guaranteed a high payment rate (above 80%) right from the beginning. The costs calculated in the strategy allowed for a more specific design of the different fees. The initial proposal was a fee directly linked to the energy consumption (0,15 Mt/kWh for households and 150Mt/month for non-household producers) in the first step. While the Municipal Assembly approved that fee, EDM refused to introduce a consumption related fee. The official reason was that the payment system of EDM was not capable of computing different values for each invoice and that such a system would not be transparent and as such confusing for their clients. EDM therefore refused to take the risk of rejection (as during the first introduction of the fee). The solution was a fee in four levels related to the progressive tariff system of EDM. Only few households actually subscribed and used the social tariff.

While data from the analysis of waste quantities in Maputo (and other places) showed clearly that high-income areas produce up to 4 times more waste per capita than low-income areas, there was a strong political opposition to link the fee to energy consumption. Detailed analyses and a lot of political work were necessary to achieve the required majority for approval in the municipal assembly. This would not have been possible without the complete buy-in from Maputo Council's side. In the end the issue was discussed by the Council of Ministers and finally approved. The project AGRESU provided the necessary technical arguments³ and the theoretical background, while

³ The technical justification was based on the strategy and the model for financial sustainability, both developed with TA support.

the Council and the Mayor used all their influence to push the revised fee. The expected financial support from the World Bank was to some extent tied to the stepwise increase of the revenue basis according to the sustainability

model. This created sufficient external justification and pressure to help the Mayor to push the approval of the waste fee.

Consumption class	Energy consumption per month	Waste fee 2007- 2008	Waste fee 2009 - 2012	Waste fee 2013 - 2016
Social tariff	0-100 kWh	10 Mtn	10 Mtn	10 Mtn
Low consumption	0-200 kWh	30 Mtn.	35 Mtn.	40 Mtn.
Average consumption	201-500 kWh	45 Mtn	50 Mtn	55 Mtn
High consumption	>500 kWh	65 Mtn	70 Mtn	80 Mtn

Table 2: New waste fee for households according to SWM strategy 2006, approved and implemented 2007

After the successful implementation in 2007, the fee has been adjusted in 2010. Due to cost adjustments and revised calculations the waste fee differs in its current

version slightly from the proposed fee in the strategy. Current values are:

Consumption class	Energy consumption per month	Waste fee 2010 (current)
Social tariff	0-100 kWh	10 Mtn
Low consumption	0-200 kWh	35 Mtn
Average consumption	201-500 kWh	55 Mtn
High consumption	>500 kWh	80 Mtn

Table 3: Current household waste fee (2010)

With the revision in 2010 higher consumption and thus income classes suffered bigger increases of their respective waste fee, compared to the initial draft of the revised fee. A reason for this is that public and political perception changed with the success of the new fee and social aspects gained more attention in the internal discussions about the fee. Nevertheless, the political environment and perceptions of cost recovery changed with the new leadership of CMM since 2009. The latest discussions indicate that the waste fee is not longer perceived as the long-term sole source for financing waste management. The planned increase for 2012 has not been implemented yet and internal discussions indicate that other internal revenues, such as property taxes, will support the waste sector.

2.4.2 Non-household waste fee

The basic waste fee for non-household waste producers was introduced with the revised fee for households and works basically along the same lines. The initial objective has been to charge a fixed amount as energy consumption for commercial users is not linearly linked to waste production. Nevertheless, there are small-scale businesses that would have been overcharged with a fixed fee, thus a scaled fee was put in place. All commercial energy consumers have to pay at least this amount of waste fee independent of the actual waste production.

Consumption class	Energy consumption per month	Waste fee 2007 (initial)	Waste fee 2010 (current)
Low consumption	0-200 kWh	50 Mtn	60 Mtn
Average consumption	201-500 kWh	100 Mtn	120 Mtn
High consumption	>500 kWh	150 Mtn	180 Mtn

Table 4: Initial and current non-household waste fee (2007 and 2010)

The non-household waste fee is collected through the same EDM-based system and guarantees that the commercial and industrial sector contributes to the city cleaning.

2.4.3 Proof of service

According to the municipal by-law the waste fee covers all non-household producers, but so-called large-scale producers have additional obligations regarding their individual waste production and management. The system is called Proof of Service and should register all non-household waste producers.

If a non-household producer has an average daily waste generation of more than 25kg or 50 l, he is not allowed to use the public collection system put in place by CMM. The amount of waste is considered too significant for an individual producer to be catered for by the public system. Orientating waste production figures are established to identify the large-scale producers. Waste production per employee for service oriented companies, square meters of shelf space for commerce or seats/beds for restaurants/hotels are used to estimate waste production. Additionally a team of controllers is monitoring waste production with on-site visits or other measures.

Once identified, the large-scale producer has to contract a private operator to remove his waste. Additionally he has to pay a fee as contribution to the general cleanliness of the city on top of the regular non-household waste fee. The fee increases with the total amount of waste produced. It is important to note that this fee does not pay for the actual waste collection. The large-scale waste producer has to contract a licensed service provider or register with CMM its own waste transportation activities.

Health institutions are excluded from the system. Smaller units use the public waste collection; larger units organize their waste treatment independently under the supervision of the Ministry of Health.

Category (in kg or liter per day)	Monthly fee (Metical)	Monthly fee (USD equiv.)
> 700kg / 2000l	4.000 Mt	148 USD
> 350kg / 1000l	2.000 Mt	74 USD
> 200kg / 500l	1.000 Mt	37 USD
> 100kg / 250l	500 Mt	18,5 USD
> 25kg / 50l	250 Mt	9,3 USD

Table 5: Proof of service tariffs (2010)

The fees paid through the general EDM system are deducted from the values above.

The private operators have to be licensed by CMM and have to confirm the waste quantities declared by the large-scale producer. CMM can then crosscheck the records of producers and service providers with the register at the

disposal site in order to identify suspicious discrepancies in weight or frequency for the service providers.

The Proof of Service is not designed primarily as a revenue generating system, but there is a significant potential if broadly introduced. The main objective is to regulate the former informal market of private SWM services. Before the introduction of the system there was no legal basis for private services as the full responsibility laid with the Municipality. The Proof of Service introduced a licensing system for the private operators and gave the necessary legal framework for them to operate in the city.

The large-scale waste producers should be registered and the significant commercial waste stream directed away from the overburdened public system. As the waste producer can deduct recycled quantities from the total waste quantities the system has the potential to create a financial incentive for waste separation and recycling. Licensing allowed for better control and penalties on illegal dumping (loss of license as consequence).

In 2011 out of estimated 10.000 non-household waste producers around 2.000 have been registered by the system. 500 large-scale producers are identified and contribute an average of 14.000 USD per month.

2.4.4 Revenues from commercial services provided by CMM

The introduction of the Proof of Service increased significantly the local market for private collection services. While CMM has been providing such services to different clients (mainly government related) before, the actual fee was not related to costs for service provision. With the introduction of the cost calculation model and the increased demand CMM was able to establish service related fees according to the specific type, volume and frequency of the provided services. While the transition was not always smooth and some clients left for private operators, CMM managed to maintain an acceptable client base.

The current prices are based on actual cost calculations and include a small profit with the objective to create a subsidy for other, still underdeveloped services. Strategically, CMM will reduce its activities in what it believes should be a privately organized market.

2.4.5 Disposal fee

The current disposal site is also charging private providers or individuals a small fee for the utilization of the disposal site. It is around 3 USD/ton. Licensed providers register their trucks with the weighbridge and receive a monthly invoice for their disposed of quantities. Individual deliveries are charged directly.



Figure 6: The weighbridge at the disposal site is a key requirement for contract management and disposal fees

Cases of uncontrolled disposal occur either in existing informal disposal sites or into the public containers of CMM. As a countermeasure the containers in the suburban areas are controlled by the neighborhood administration and the primary waste collection service. Additionally the urban districts as well as the Solid Waste Department have controllers in place to minimize these illegal activities. In several cases service providers had to pay significant fines or lost even their license due to such activities.

2.4.6 Other fees and fines

While basic fees for other services, such as the removal of bulky or construction waste have been taxed before, the revision of the municipal by-law improved transparency and relation to actual costs for this kind of services. Without proper knowledge about the actual price structure of CMM's services, the fees for these specific services covered sometimes less than 30% of the occurring operational costs. Compared to the public collection these services are still very underdeveloped and not adequately equipped, therefore not very relevant in terms of revenue generation. The strategy for financial sustainability defines that these services have to be self-sufficient. Fees will have to match actual costs, including investment.

Fines are collected by a team of controllers specifically attached to the SWM unit of CMM. The municipal by-law specifies the different penalties. While all sorts of transgressions are defined, the unit focuses on compliance of public and private service providers and fights the proliferation of illegal dump sites.

3. Preconditions and challenges for economic instruments

Within the strategy for financial sustainability there are several aspects and instruments to be implemented. All are linked through the SWM Master Plan and legally supported by the new Municipal By-law. While Chapter 2 explained the development of economic instruments over time and their key functionalities, this chapter describes first the approaches and tools that have been used to support the implementation of the economic instruments. Then, the specific preconditions and challenges for each of the economic instruments are displayed and discussed.

While the strategic decisions and outlining are already available, the various instruments are not necessarily on the same implementation level. Each of them is linked to various aspects of CMM's institutional development, thus encounters specific difficulties.

Several approaches and tools supported the introduction of economic instruments. The main framework for the waste fee and the financial demands has been developed already at an early stage of the strategic planning process. Over time all tools evolved and became more elaborated and specific for their particular purpose. The most important tools that will be presented here are:

- Strategy on financial sustainability including the cost calculation model
- Analysis of capacity to pay
- The EDM revenue collection system
- Legal instruments
- Awareness campaigns

3.1 Model on financial sustainability including cost calculation

The most important tool for the implementation of the various economic instruments is the calculation model that produces the necessary results for the strategy on financial sustainability.

The model uses population figures, estimated waste quantities and planned service provision levels for all existing waste streams to calculate the total expected costs of service provision for any given year within the planning horizon. The calculations use a system analysis of collection and transportation costs for different collection types based on regional/international experience and local calculations. Results of public tender processes and

internal cost monitoring give further input to improve the quality of the data and calculation parameters. The most critical points are the calculation of productivity (ex. quantity of waste collected in ton/day for a given equipment or collection system) and financial parameters such as amortization time and capital costs.

The result is the total costs of the SWM system for each year of the strategy. It is a linear cash flow analysis, which does not include economic analyses or discount factors.

The model processes the expected revenues in a similar fashion. The main revenue streams are the waste fees, proof of service, disposal fees and specific service related fees. Fines are not relevant, because they are partly channeled to the general budget, partly to the benefit of the controlling unit. The model does not specify the amounts that have to be charged in different service areas. The process of tariff setting uses the expected revenues of the model as a reference for the total amount. Then the individual tariffs are established according to the existing client base of EDM.



Figure 7: In 2011 primary waste collection finally covered all suburban neighborhoods

The progression of revenues is based on annual growth factors and service oriented specific increases. Growth factors are the extension of EDM's client base, economic growth (increase in energy consumption) and population growth. The service oriented increases are determined by the extension of services according to the SWM strategy.

The basic principle is that the fee follows service. In other words, if more neighborhoods are included in the collection system or more containers guarantee a better service, the fee will be adjusted after implementation to recover

the cost increases.⁴ In a developing system revenues are always trailing the costs, as service levels are low and quality poor, so both have to be improved first in order to justify any increase in taxation. If service levels reach what could be considered a reasonable coverage (the virtual 100%) the waste fee will slowly catch up.

The model is then fed with the actual revenues as transferred by EDM in order to maintain a consistent database and allow for a comparison of expected and actual revenues.

The model produces then a simple annual comparison between costs for the desired service level and the expected revenues. The difference has to be covered by other financial sources, such as the general municipal budget or external funding. This theoretically relative simple instrument allows for a detailed presentation and analysis of the actual financial demands of SWM and has great use for decision making on political level as well as for monitoring purposes. Actualizing the model on regular basis allows for better and more refined results over the years.

Preconditions

- Consistent and fairly reliable base line data (waste quantities, current coverage, current costs)
- Technical competence
- Acceptance as planning instruments and confidence in presented data

Important actors

- CMM with commitment to apply tool, used as decision making tool
- TA (AGRESU) for developing tool, doing baseline data surveys, providing technical competence
- World Bank buy-in and integration of module strengthened position of tool

Approaches and obstacles

- In a first step a relative simple model⁵ collected all initially available data. The model was tailored to deliver the basic information on different service options, operator models (contract-in, contract-out and public operator) and total expected costs. It was used as decision-making tool on strategic level. Previous activities of the TA project guaranteed a good availability of baseline data, but nevertheless many efforts were put into data collection, improving consistency.

Still many parameters had to be estimated to achieve first results.

- In a second stage the model was detailed according to service delivery objectives and designed for long term analysis with variable parameters such as service coverage, unit costs and specific revenue calculation. This model brought a service related analysis of cost coverage.
- A key obstacle was that there has been few comparable data either from proper or similar regional experience that allowed validating assumptions and controlling the final results. This, together with the general poor quality of data exacerbated the margin of error for any calculation. As a result some of the cost calculations had to be adjusted over time for more accuracy.
- Therefore, and as a third stage the model has been adjusted, improved and actualized according to the availability of proper experience or new data. It is still the main tool for CMM to analyze the future financial situation of the sector and to decide on waste fee increases. It is also part of the agreement between CMM and World Bank and as such a condition/ indicator for the approval and success of this sector.

Perceptions

The approach of cost calculations and the sustainability model developed and applied by the TA project had two key effects in the given situation in Maputo: first, it helped to gain access to CMM's core decisions and to deliver not only options but their potential long term impacts as well.

It helped to create a clear vision of a solution that is adequate and realistic to implement. Second it helped to convince the World Bank, first to integrate the existing planning process and work into the Municipal Development Program and second to bridge the gap between service costs and revenue increases for the duration of their invention and aiming at a full cost recovery at the end of the program cycle.

3.2 Capacity and willingness to pay analysis

The first analysis was integrated in the strategic decision making process. The concept is to validate the economic capacity of a given population (here the citizens of Maputo) to sustain the costs of a public service such as Waste Management. The ideal situation would be to have such an analysis before any planning takes place. In reality the first analysis came after developing the first strategy. After that it became element of the sustainability model.

CMM is assuming that it can charge up to 1,5% of the available average family income of its citizens to cover the

⁴ At start many areas contributed already while not receiving a service yet. The resulting political pressure encouraged CMM to push for a quick extension of services to all settlement areas.

⁵ This initial model gradually developed into the model currently used by CMM.

costs of SWM. This is a politically established limit based on comparable data from World Bank studies. Technical solutions or systems that are exceeding this cost limit would in theory not qualify to be further evaluated as they are too expensive for the current or projected economic potential. This approach adds the dimension of affordability to the necessary analysis of a new waste management system.

This is a theoretical exercise in first place and not directly linked to the willingness to pay for waste services. Even if it would be possible for CMM to charge higher fees the limit of 1,5% should not be surpassed. The first willingness to pay study presented an interesting result. The poorer people are generally more willing to spend for service improvements compared to the richer areas. The explanation is that poorer people are more used to pay for everything, while richer classes assume that they “deserve” free service delivery.

Important actors

- CMM assuming the logic and necessity of the tool, acceptance as planning approach
- TA (AGRESU) for ToR, technical guidance and support for decision making
- Locally available consultants for study

Approaches and obstacles

- The capacity to pay has been computed using statistical data about the average available income for Maputo.
- The willingness to pay surveys were conducted by local consultants according to Terms of Reference produced by the TA and harmonized with CMM.
- The quality and consistency of local consultancies in this relatively specialized field of expertise needed additional input from the project’s side.
- In Mozambique, people are relatively reluctant to share their opinion about topics such as public services. There was a now declining mistrust that such information might have negative direct or indirect consequences.

Perceptions

- On a political level the willingness to pay is not considered as a necessary tool. The willingness is evaluated through a political perspective. The local administration and party structures are also used to provide the necessary information for decision making on political level.

- The capacity to pay is accepted as an approach for strategic planning. As numbers have been so far under the defined limit, political attention has been reduced. Specifically the discussions about large-scale projects such as waste treatment or sanitary landfills are not necessarily using this approach for decision-making.

3.3 The EDM System

Electricidade de Moçambique or EDM is the state owned, sole energy provider in Mozambique. The company is operating the electricity distribution network and street lightning in Maputo. Compared to the other utility provider, Aguas de Moçambique (ADM), EDM has a significantly wider distribution network and higher expansion rates.

Its billing system was relatively effective, which made it the obvious partner for CMM when the waste fee was first introduced in 2002. A fee for the public radio served as an example for a fixed rate monthly fee. At that time neither CMM nor any other service provider had a comparable billing system in place. The majority of EDM’s clients had post-paid contracts facilitating the integration of the waste fee.

The option to build its own revenue collection system was unrealistic for CMM. The standard post services were not reliable and an own distribution network would have exceeded CMM’s organizational capacities by far.

Both sides signed a service agreement with few obligations for EDM besides the transfer of the collected revenues. System failures would bear no liabilities for EDM, outstanding payments, etc. were completely on CMM’s account. The commission for the revenue collection was designed to be progressive. Starting with 12,5% in the first year, an annual increase of 2,5% up to a total of 25% was contractually agreed upon. It reached already 22,5% according to the contract when negotiations between CMM and EDM then reduced the fee to the current 15%.

Despite the unfavorable contract conditions (most likely due to the weak position in negotiations because of the lack of alternatives) the EDM system provided almost overnight (and after the successful second introduction) an effective tool for revenue collection. Its impressive coverage of estimated 75% in 2004, currently above 90% of the total municipal population, the high collection rate of 90 to 95% of invoiced fees guarantees a widespread, fair revenue system. The transition to a prepaid-system (introduced around 2005, now more than 60% of all clients) guarantees a 100% collection rate. The payment points for the pre-paid system are linked and verify the consumption for each contract. Consumption is averaged on a monthly basis and the appropriate fee (according to energy consumption) is charged with the next purchase.

After initial problems⁶ with the timely exchange of information between the payment points the system is now fully functional and reliable.

During the last years EDM showed a consistent increase of newly connected households of around 10% per year, supporting continuous increases of the waste fee. As the growth of the city and the electricity network are reaching their geographical limitations that rate will reduce over the next years.

CMM is developing and expanding own billing systems, for example for property taxes. These systems use normally annual bills and are therefore not directly suited for a monthly waste fee. An annual fee does not seem likely to be accepted by the population due to the required higher monetary values. Other facility providers, such as water or cable television do not have the same service parameters and generally lower invoicing values, thus are no real alternatives.

A big step to consolidate the waste fee through EDM was the mandate (approved by central government) to cut energy if the waste fee is not paid. The adherence to a basic facility assures that CMM is not experiencing any shortages or cuts in revenues. Even with the increases in 2007 and 2010 no significant problems with payment have occurred.

The main difficulty with EDM is the transparency of the revenue collection and the money transfer to CMM. Legally there should be a full transfer of all revenues (public Money) and then the payment of the commission. In reality, EDM does deduce its commission before transferring to CMM general budget. It is then processed as an earmarked budget for expenses of the SWM sector and managed by CMM's central finances. There are no reliable control mechanisms in place and some fluctuations in the transfers are not fully explained. EDM did not provide a detailed client database. Reasons, such as non-payment or payment delays were used to explain these fluctuations.

There has been extensive discussion as to whether CMM should insist on a fixed commission (for example related to the number of clients covered by EDM) instead of a percentage that increases along with each adjustment of the waste fee. But so far even high-level negotiations (Mayor to CEO) did not change the current approach. Nevertheless, CMM managed to reduce the commission to

currently 15%. Negotiations are underway to reduce further down to 5%, taking into consideration the significant increases of the waste fee.

There is also no reliable control tool for CMM to monitor the actual revenue collection. While such a tool (software tool in accounting system of EDM) has been outlined and budgeted no further progress was made in the last four years.

It has been difficult for the TA to support the improvement of the relations between CMM and EDM. Despite the access to discussions on a technical level, the topic is very politicized and TA's influence on decision making relatively limited.

3.4 Legal background for economic instruments

The legal background for the waste fee is the municipal by-law (in its current version approved in 2008). The mandate for CMM to raise service related fees is established by the "lei das autarquias" (Municipalization law). Solid waste management, or more specifically waste collection and transport is explicitly mentioned as one of the services to be charged for. An important aspect for the tariff setting and financial management is that by legal definition service fees are not allowed to exceed actual costs of service provision. The earmarking of revenues for SWM follows the logic of service related fees and has been established as internal administrative procedure.

3.5 Awareness campaigns

In preparation of the introduction of the waste fee, first in 2003 and then for the revised fee in 2007 the TA project supported extensive awareness campaigns, covering all available media and communication strategies. Television and radio spots, newspaper announcements and interviews, street theater and events in schools were used to communicate the importance of a waste fee in order to improve service delivery. While the first was mainly organized and monitored by the TA project, the second large campaign in 2007 and subsequent activities were jointly developed and implemented. The instrument of a financing agreement was used by the project to transfer full ownership and capacity to CMM.

3.6 Analysis of the economic instruments in Maputo

The tools and approaches that have been presented above supported the introduction of the economic instruments in Maputo. The following chapter will summarize the preconditions, actors, obstacles and perceptions that accompanied each of these instruments. Relevant tools for implementation will also be indicated.

⁶ As the waste fee is increasing with consumption, the system has to register previous purchases and balance them over a monthly period. This worked initially when the client purchased his/her energy at the same EDM store. But the different stores were not connected online and did their balance only once or twice a month. In the case that the client purchased in several different locations he/she was charged several times. This created a lot of protest and at a certain point the fee was questioned. Finally EDM updated the system to correct this error.

Aspects of implementation	Waste fee for households and non-household waste producers
Preconditions	Existing fee collection system (EDM), economic and political pressure, example of comparable fee (radio fee), then adequate introduction and communication strategy, strategic support
Relevant actors	CMM as implementer, EDM as suitable partner for revenue collection, TA (AGRESU) as strategic and financial support (information campaign), the general public with pressure and acceptance
Obstacles	Unprepared introduction leads to rejection, strong position of EDM leads to high commission, legal situation subject to different interpretations, political resistance to increase or consumption related fee
Perceptions	Political Change results in shift in perceptions, new mandate questions approach to financial sustainability, political pressure interferes with strategic planning
Relevant tools	Model on financial sustainability, capacity to pay, EDM revenue collection system, Municipal by-law, awareness campaigns

Table 6: Analysis of waste fee (Households and non-households)

Aspects of implementation	Proof of Service
Preconditions	Recognition of regulatory problem with the integration of the private sector, Baseline data about non-household waste producers, Development of new system
Relevant actors	CMM for implementing, providing staff, approve legal framework TA (AGRESU) for concept development, software development, technical equipment (computer, vehicles), capacity building (training, OD, institutional setup)
Obstacles	Difficult start with limited resources and inexperienced staff, complex system required long time to work properly, lot of learning by doing, difficulties to maintain qualified staff, limited resources delayed roll-out and broad implementation, difficulties in controlling and enforcing new system
Perceptions	Initially perceived as TA project with the Waste management department of CMM, therefore no substantial commitment, potential as revenue generating tool not fully understood, enforcement is historically and culturally not well accepted
Relevant tools	Municipal by-law and awareness campaigns

Table 7: Analysis Proof of Service

The main challenges for the Proof of Service were (and are) the process of registering all non-household waste producers and to establish practical rules and guidelines to quantify the average waste production in a reliable and enforceable way.

The political approval was less complicated and the system is generally accepted, but not yet broadly introduced.

The system is relatively new and available capacity and resources limit the development of its full potential. Other aspects, such as cultural habits and relatively complex administrative procedures contribute to its limitations.

The sector is still below its potential, with understaffing, technical problems and slow growth rate, indicating that the revenue potential is not yet considered worth additional investment, besides the support from the TA.

Aspects of implementation	Disposal fee
Preconditions	Entrance control at the disposal site, mechanisms to determine waste quantity (weighbridge), existing control/enforcement of illegal dumping
Relevant actors	CMM as implementer, approval of fee, TA only as support and advisor
Obstacles	Illegal dumping off-site or illegal use of public containers by private service providers, incentive for transporters and CMM staff to skip the formal payment process
Perceptions	System is generally accepted, facilities for payments (registered providers pay on a monthly basis), fee is sufficiently low for most providers not to risk fines or the withdrawal of their license
Relevant tools	Model on financial sustainability, Municipal by-law

Table 8: Analysis of Disposal fee

Other fees and fines are determined more as administrative procedures. Price levels for service provision are based

on the cost model. Fines are determined according to the severity of the transgression.

4. Impacts of the economic instruments in regard to the functionality and sustainability of the whole solid waste management system

There is always a gap between plan and reality, between “want” and “can”. And no measure can achieve impact without a shift in the overall system. This chapter tries to find the sweet spots of success, the lack of change of the system and the general economic aspects that defined the story of Solid Waste in Maputo so far. It will look into the future potential, both in positive and negative sense, of the different models. It will also try to analyze the sensitivity of the instruments to changes within CMM and threats from outside.

4.1 Cost calculations and strategic planning

One of the primary findings of the Maputo case is that tools for strategic planning, specifically for the financial aspects of SWM are essential to establish a clear and common understanding of current challenges and the mechanisms of proposed solutions. Here it was specifically the cost calculations, which opened the eyes of the Municipal administration to the real dimension of the problem “solid waste”, even after first steps have been taken (such as the waste fee, which in its first instance was insufficient in terms of cost recovery).



Figure 8: The analysis of waste composition and quantities form the first step in understanding the problem of SWM.

Before, the lack of reliable information about actual costs and spending and a constant emergency management did not provide the necessary understanding or vision to assume the scale of the problem and the implications potential solutions would have. As a receiver of donations the Municipality has not been too motivated to monitor costs or calculate what should/ could be affordable.

Efficiency is a general problem of the public sector, but is aggravated by the fact that donors react more to emergency situations than to long-term strategic improvements. Another aspect is that the lack of knowledge about costing and dimensioning of services obscures the real demand for financial resources. Management of services and fees is therefore reduced to a trial and error approach that promotes poor service delivery and client dissatisfaction.

The approach of Maputo shows also that economic instruments are an integral part of sustainable waste management and cannot be detached from other aspects such as adequate technical solutions and capacity development. The process of strategic planning is therefore essential to combine all aspects of SWM on Municipal level.

A related positive effect was that CMM had a clear understanding of expected costs, thus budgetary needs, of service provision by private operators. Budget lines were drawn according to these calculations and mostly met by the competitive bidders. The cost calculations were then adjusted according to the development of actual costs.

4.2 Revenues of the economic instruments

The following table shows an overview of the development of the different economic instruments from 2004 to 2011. Not all information is available for all years. Commercial revenues (from service contracts) are not included. All numbers are in USD per month; only the last line is a gross amount per year.

Revenue	2004	2007	2010 ⁷	2012 (estimate) ⁸
Household and non-household waste fee	\$50.000	\$182.000	\$194.000	\$310.000
Proof of service	n.a.	\$10.000	\$12.000	\$15.000
Disposal site	n.a.	n.a.	n.a.	\$16.500
Fines and other	n.a.	\$1.000	\$1.000	\$1.000
TOTAL	\$50.000	\$193.000	\$207.000	\$342.500
TOTAL per year	\$600.000	\$1.289.063 ⁹	\$2.484.000	\$4.110.000

Table 9: Development of revenues of SWM in Maputo (2004 to 2010)

The table shows that CMM managed to increase its revenues significantly over the years. Considering an annual budget of 6 Mio USD in 2004 the waste fee became one of the most important revenues sources for the Municipality.

Nevertheless, revenues are still trailing costs. Without the current financial support of PROMAPUTO, CMM would not yet be able to sustain its current service provision (82% coverage, increase to over 90% planned in 2012).

Item	2007	2010	2012 ¹⁰	2014	2016
Total costs of SWM system	\$2 406 167	\$4 026 041	\$5 945 529	\$9 558 236	\$9 749 180
Total revenues (as planned)	\$1 289 063	\$2 484 000	\$5 519 195	\$6 434 309	\$8 862 983
Cost recovery	54%	62%	93%	67%	90%
Waste fee implementation	New fee	20% increase	40% increase	(new landfill)	20% increase

Table 10: Cost recovery Maputo SWM 2007 to 2016

The percentage of cost recovery has been improving constantly since 2007. With a planned increase in 2012 almost full recovery could be achieved. The significant increase in 2012 would have trailed new service contracts (in 2011) with better coverage of the city (reaching 91% of all household and commercial waste). With better service as justification the relatively high increase should create a buffer for the expected cost increase in 2014, when the new sanitary landfill would show its impact on the transportation costs. A final increase in 2015 would then have brought the system back into the above 90% area. Considering the uncertainties of cost estimates this is considered sufficient. If the economic and population growth factors were taken into account, in 2019 the 100% cost recovery would be achieved.

Currently, the new service contract for the Inner City is still delayed and service provision not improved. CMM has not yet increased the fee. Because several services had been rolled out sooner than planned current spending is

higher than expected and CMM is already accumulating a deficit despite the 50% contribution of PROMAPUTO to the larger waste collection contracts.

Ongoing internal discussions indicate that for political reasons the planned increase of 40% of the waste fee might not be approved at all. CMM suggests that there will be other sources available to guarantee cost coverage, but no detailed information has been presented so far. A final decision will be taken after the new service provider becomes fully operational and service delivery improves visibly in the city center. This is supposed to happen before the fourth quarter of 2012.

⁷ 2010 showed a dramatic change in the Exchange rate Metical/ USD from 26,5 in mid 2009 to 35 by the end of 2010. Therefore, the significant increases of the fee in Metical were "consumed" by the exchange rate. Rates in 2011/ 2012 are comparable to 2008/ 2009, therefore reflect the impact of the increase.

⁸ Current data, without the planned increase of 40%, see table below.

⁹ The revised fee was introduced only in May/June 2007, which is reflected in the annual value.

¹⁰ Data for 2012 to 2016 are results of the model for financial sustainability, other data is based on actual results.

4.3 Impact on the solid waste management system and beyond

The introduction and improvement of economic instruments with the substantial support from technical and financial assistance proved to be a big step forward for the Municipality. The approval of a long-term strategy opened access to financial support from the World Bank (PROMA-PUTO) and the significant increase of revenues enabled CMM to expand service delivery to all citizens of Maputo.

The main success indicators are:

Indicator	Development 2004 to 2012
Revenues	From 600.000 USD to 4,1 Mio USD per year
Service delivery	From 250 ton/day to 760 ton/day
Population serviced	From less than 40% to 85% with regular service

Table 11: Development of performance indicators 2004-2012

The economic instruments are not only important for the sustainability of the system, but proved essential in negotiating support and technical solutions. It was not only the support from the World Bank that has been conditioned to the implementation of the model for sustainability. Other donors felt more supportive, when CMM could show its long term strategy. Even in discussions about technical solutions, such as waste treatment or incineration, the financial model serves as guidance and reference point of what is suitable for Maputo's specific situation. Many less serious proposals were withdrawn when being confronted with actual costing figures.

At the beginning of ProMaputo the waste fee was the single largest revenue source for CMM. Slowly other, more traditional revenues such as property and commercial taxes are becoming more efficient and collect more revenues than the waste fee. CMM is evaluating the feasibility to attach the waste fee to one collected internally. This would guarantee independence from EDM's strong negotiation position and eventually reduce the costs of collecting the fee. There is one major drawback. Most of the taxes and fees are currently collected annually or every six months, because of the limited capacity of the revenue collecting units. Attaching the waste fee on an annual basis would increase dramatically the total value and would have a significant impact on acceptance and willingness to pay.

4.4 Evaluation of expected long term sustainability

The approach that has been taken by CMM resulted in significantly improved service delivery and multiplied revenues of the SWM sector within a timeframe of 8 years. The success of the economic instruments is a consequence

not only of the strategy and the tools that have been used for implementation. It is a result of a series of factors that created the adequate environment for these substantial developments. The main factors were:

- Strong political commitment for change and consistent leadership guaranteed that the strategy and tools were approved and implemented.
- Overall effort to improve CMM's performance used the SWM first as an example and driver for success, then provided the necessary support, for example through efforts towards institutional and organizational development.
- Substantial increase in Human Resources and the effort to create an attractive, positively perceived work environment, shift towards younger employees with higher qualifications
- Decentralization and delegation of responsibilities, which opened a way to modern management approaches in CMM and the SWM sector.

While the influence of these factors is difficult to measure, they have been the main drivers for change and are the institutional indicators for a long-term sustainability of the economic instruments and SWM in Maputo in general.

So, the key question for the future development of the sector is, whether CMM is able to maintain these factors active and to constantly improve their drive for change. The strategy allowed developing a collection system that is actually servicing all citizens. But further challenges lie ahead. Strategic decisions need to be prepared for final disposal, recycling and the perspective of an integrated waste management that explores waste as a resource. The institutional capacity needs improvement and a metropolitan approach to SWM management could yield logistic and economic benefits.



Figure 9: CMM internal workshop on the ProMaputo development programme

From the perspective of the technical assistance there is a fragile line of development success: The crucial point is when strategies, tools and change management become integral part of the Municipality's own institutional thinking. Its internal motivation and incentive system for decision makers and technicians needs to accommodate the idea of sustainability and the adequate tools to pursue it.

Therefore, the continuous development of the institution and its leadership is the key factor for a long-term success of the sector. On the other hand, if the commitment on political and management level shifts, the achieved progress is easily lost and the institution might lose its potential to maintain its drive for change.

Economic factors are also relevant for the sustainability of SWM. If costs are drastically increasing and economic growth is not capable to keep up, CMM won't be able to collect sufficient revenues. In 2009/2010 the economic crisis caused soaring prices and a depreciation of the local currency. The metical lost almost 40% to the dollar. Service costs are influenced by imports (equipment, spare parts, etc), while revenues are in local currency. This has been a stress test for the financial model. Fortunately, the exchange rates came back to normal and revenues kept up with expenses. Nevertheless, there is a very limited capacity of the system to compensate such economic impacts in the long run.

5. Conclusion

Economic instruments play an important role in the efforts of the Municipality of Maputo to improve service delivery and quality in Solid Waste Management. Without the significantly increased revenues CMM would not have been able to sustain the improvements to service delivery that have been achieved in the last years. The experience shows that the goal of adequate waste service provision can only be accomplished when the three main components are developed together. These are suitable, locally apt technical solutions, the economic instruments to sustain the services and the capacity of the institution to implement and sustain both.

Herein lies the biggest risk for sustainable development. If one of the three components fails to develop the other parts will be influenced and finally the goal will not be achieved. For the economic instruments the main challenges are to maintain the political commitment for a continuous implementation of the strategy and to improve the range and efficiency of the instruments.

Maputo serves as an example for the effectiveness of attaching the waste fee to a public facility, in this case electricity. Only this adhesion guaranteed from the beginning a high percentage of contributors on whom the system could be developed on. It also shows that the way of collecting the fee is as important as the fee itself.

Important as a concept and in practical terms is a thorough analysis of the economic capacity of a city to finance Solid Waste Management solutions. A municipality like Maputo does not have many other sources of revenues and depends on the capacity of its citizens to sustain its services. That means that quality and quantity of services are determined by their affordability. While Maputo introduced this concept only during the development of the SWM strategy, it should be the starting point for any discussion about the economics of a SWM system. The idea of affordability also helped CMM to analyze and decide on proposals for waste treatment facilities. Here the sustainability model and the cost analysis worked as a protective barrier against unsuitable, unaffordable solutions.

In an ideal world and in a perfect institution such analyses should be standard procedure. In the reality of developing organizations with limited resources and technical experience, reliable knowledge about costs, options and capacities are vital for competent decision-making.

The Maputo case shows that Technical Assistance plays an important role in setting up a sustainable waste management system. Considering the complexity of the three

interlinked components any intervention has to be tailored to the specific needs of the partner. The results show that some areas yield substantial success (waste fee and increase in revenues), while others would require more resources or time to become an equal success. The newly established Proof of Service system still trails behind expectations due to a certain lack of willingness to enforce it against resistance of the commercial sector. Here stronger political commitment and more public awareness would be required. It will develop further when the main issue of public waste collection becomes satisfactorily managed. TA alone cannot achieve any improvements. Thus, it is vital that the partner becomes the driver for change and support is given to strengthen his capacity in this regard. If such a commitment does not exist any progress will become very difficult.

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