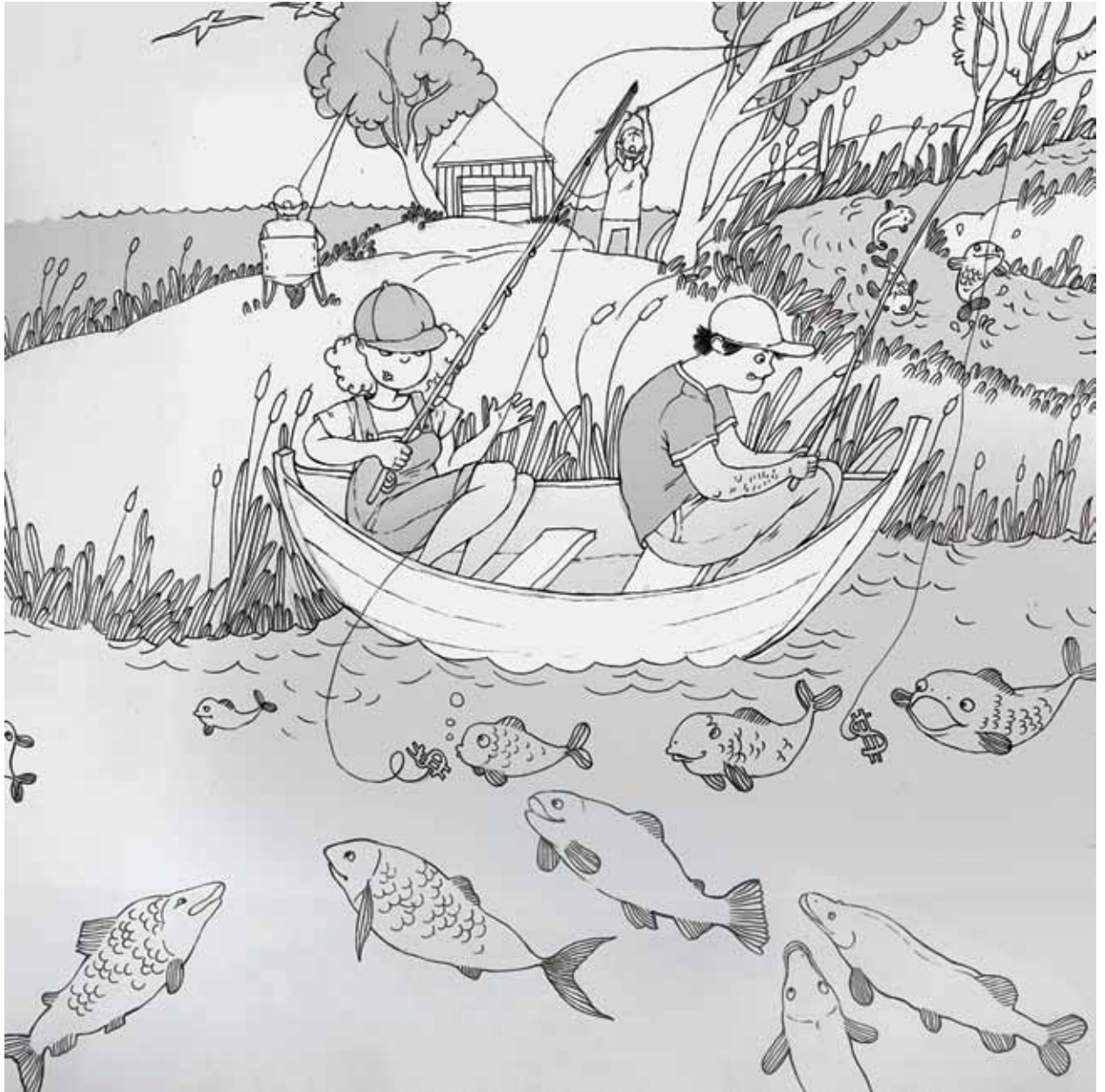


Operator Models. Respecting Diversity

Concepts for Sustainable Waste Management



Cartoon 1: Fishing is in many ways similar to choosing an operator model.

There are many types of ISWM operators & models - just like there are many types & species of fish. Skilled people know how to catch the fish they want to sell on the market. Similarly, skilled ISWM practitioners know how to attract the right kind of operators to provide and sustain the local services that people need.

The quality of the catch depends on the condition & capacity of the ecosystem; which is affected by how well fishing rights are managed, the cleanliness of the water, access to suitable equipment, as well as the skills and experience of the fishing community. Similarly, a healthy environment for ISWM requires management, transparent non-corrupt practices, technology, sustainable financing and professional capacity.

Foreword

The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH is Germany's leading provider of international cooperation services. As a federal enterprise, GIZ supports the German Government in achieving its objectives in the field of international cooperation for sustainable development. GIZ is commissioned with the execution of the sector project "Concepts for sustainable waste management". One of sector project's three thematic focuses is operator models in integrated sustainable waste management (ISWM).

GIZ's activities are geared towards sustainability, as a combination of social responsibility, ecological balance, political participation and economic capability.

As part of commitment to environmental protection, addressing climate change, and sustainability, GIZ commissioned a study on operator models for integrated sustainable waste management (ISWM), and awarded the study to Environmental Resources Management (ERM) and Wasteaware, part of the Resource and Waste Advisory (RWA) Group.

The challenges in developing waste management systems in all the diverse regions of the world are very specific and localized and it is necessary to develop and implement the best local solutions regarding ISWM in order to achieve desired levels of health and environmental standards.

Western European countries have moved through several organisational and technological stages in developing their waste management systems. Factors that influence the development of solid waste management services are not purely technological; rather the particularities of the systems implemented are heavily influenced by the institutional framework and socio-cultural situation in a country.

This study on operator models for integrated sustainable waste management (ISWM) aims to understand and classify the diversity of ways in which waste management services are organized across the world. The study has involved in-depth case studies in 5 cities in different parts of the world, and research into 23 other secondary cases.

The book looks at the range of ways ISWM is organized at a local level and understanding the conditions and capacities that influence decision-making on different model-types implemented. It illustrates the importance of understanding and integrating local objectives when implementing projects under development cooperation programmes.

The authors would like to thank GIZ, and in particular, Sandra Spies, Ellen Gunsilius, Sofia García-Cortés, Barbara Ölz and Johannes Frommann for their direction, support and collaboration in preparing this publication.

We would also like to thank the entire project team for their excellent contributions: Michael Cowing, Joachim Stretz, Sanjay Gupta, Borislav Mourdzhev, Nikola Doychinov, Rami El Sherbiny, Thilo Schmidt, Jennifer Kanjogera, Sonya Yankova, Daniel Ros, Cristina Rus, Flaviu Petean, Beth Baylay, Monir Chowdhury, Shafiul Ahmed, Kevin Kerwin and Sonia Dias.

We hope that our work helps to develop ISWM systems around the world.

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List of Acronyms and Abbreviations

3Rs	Reduce, Reuse, Recycle	IRS	Informal Recycling Sector
BOT	Build-Operate-Transfer	IWB	Itinerant Waste Buyers
BMZ	German Federal Ministry for Economic Cooperation and Development	ISO	International Organization for Standardization
CCC	Castries City Council	ISWM	Integrated Sustainable Waste Management
CBEs	Community Based Enterprises	JSWMC	Joint Solid Waste Management Council
CBOs	Community Based Organisations	KfW	German Development Bank (KfW Entwicklungsbank)
CCCTV	Closed-Circuit Television	KKPKP	Kagad Kach Patra Kashtakari Panchayat
CDB	Caribbean Development Bank	MBT	Mechanical biological treatment
CEHI	Caribbean Environmental Health Institute	MICOA	Ministerio para Coordenação de Acção Ambiental or Ministry for the Coordination of Environmental Action
CIGRES	Inter-municipal consortium for solid waste management (Consórcio Intermunicipal de Gestão de Resíduos Sólidos)	MSE	Micro Scale Enterprises
CMM	Maputo City Council (Conselho Municipal de Maputo)	MSEA	Egyptian Ministry of State for Environmental Affairs
CMUs	Contract Management Units	MSP	Micro-Service Provider
COM	Common Operator Model	MSW	Municipal Solid Waste
DBO	Design-Build-Operate	MSWM	Municipal Solid Waste Management
DBOFT	Design-Build-Operate-Finance-Transfer	NGOs	Non-Governmental Organisations
DBOT	Design-Build-Operate-Transfer	NIMBY	Not In My Back Yard
DFBO	Design Finance, Built and Operate	OECS	Organisation of Eastern Caribbean States
DFID	Department for International Development	OM	Operator Model
EIA	Environmental impact Assesment	PS	Product Stewardship
EPR	Extended Producer Responsibility	PSP	Public Service Partnership
ERM	Environmental Resources Management	PPE	Personal Protective Equipment
EU	European Union	RDF	Refused Derived Fuel
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH	PMC	Pune Municipal Corporation
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit GMBH	3R's	Reduce Reuse Recycle
IPLA	International Partnership for Local Authorities	RWA	Resources and Waste Advisory Group
IRRC	Integrated resource Recovery Center	SIDS	Small Island Developing States
IRRF	Integrated Resource Recovery Facility	SMEs	Small and Medium Enterprises
		SLSWMA	St. Lucia Solid Waste Management Authority

SPG	Strategic Planning Guide for Municipal Solid Waste Management	Measurements units: Km Kilometre m3 Cubic meter
STS	Small Transfer Station	
SWWC	Solid Waste Management in the World's Cities	
SWM	Solid Waste Management	
SWaCH	Solid Waste Collection and Handling or, officially, SWaCH Seva Sahakari Sanstha Maryadit, Pune	
TPD	Tonnes per day	
UN	United Nations	
WB	World Bank	
WEEE	Waste Electronics and Electronic Equipment	

1. Introduction

1.1 Where we are coming from?

There have been many publications documenting and analysing the experiences of communities, governments, development organizations and practitioners in the field of solid waste management in developing countries. The list of some international publications that were used in the preparation of this book is included in the bibliography of this manual.

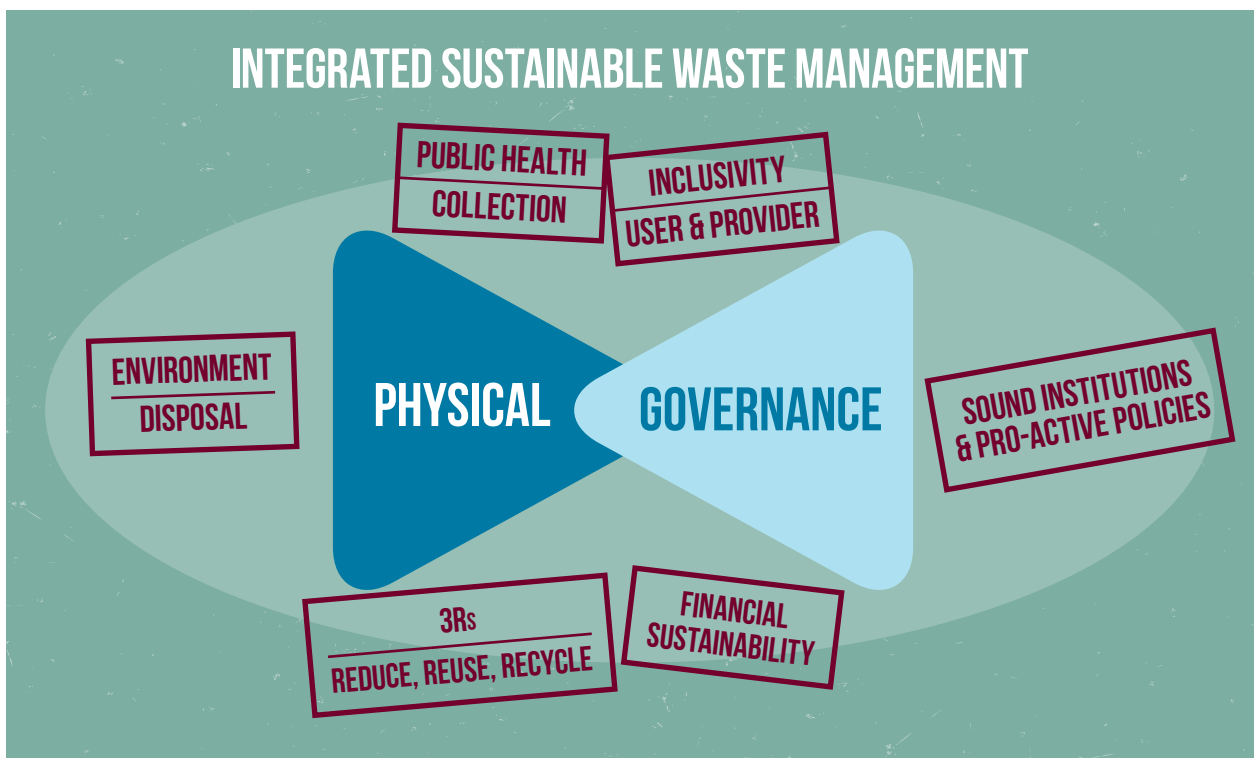
The most recent and comprehensive publication on waste management in developing countries is the UN Habitat publication Solid Waste Management in the World Cities (SWWC) (Scheinberg A., Wilson D., Rodic L. et al 2010). SWWC provides the most recent update on the state of waste management globally. Collecting information and data from 20 reference cities across

the world and synthesising this to find out what drives change in solid waste management, the book gives a wealth of insight into how cities find local solutions and what approaches and systems work best under different conditions.

The research behind SWWC uses the Integrated Sustainable Waste Management (ISWM) framework (van de Klundert & Anschutz, 2001) to capture and analyse waste management related data and information from all over the world. It also develops the original ISWM approach further, into a framework for analysis; and represents the ISWM concept into “Two triangles” - each showing the essential component parts of the ISWM concept.

Figure 1: The ‘Two triangles’ ISWM representation

Source: ©David Wilson, Costas Velis and Ljiljana Rodic.
Concept adapted from: Scheinberg et al. (2010)



The ISWM ‘two triangles’ illustrates the complexity of waste management using three key physical, ‘hardware’, components on the one hand and three main governance or ‘software’ strategies required to deliver a well-functioning ISWM system on the other hand. This structure instructs a comprehensive and consistent approach that takes into account all facets of waste management.

SWWC was a groundbreaking publication. It shone light on the diversity of different solid waste management systems in place around the world. It provided a wealth of fresh data, insight and opportunity for exchange of experience between different cities and countries. It highlighted the importance of building on existing waste management systems, promoted recognition of the valuable role played by the informal sector in recycling, and touched on the institutional and governance complexities inherent in the sector.

SWWC has provided a platform for further work. In this book we hope to build on that award winning publication, by looking deeply into the mechanisms and methods by which the practical activities of waste management are organised in different parts of the world.

Another previous publication on which this book has been based is the *World Bank’s Strategic Planning Guide (SPG) for Municipal Solid Waste Management* (Wilson D.C, Whiteman A and Tormin A), published in 2001.

The SPG wasn’t widely publicised, however, it has been widely used. Based around the principle of stakeholder participation in the planning of waste management programs and projects, it seems on reflection that, after 11 years, the participatory spirit of the SPG is still as relevant as it was at that time. Indeed, it is happily even more relevant, because the research into best practices carried out while preparing this book consistently brings to light the importance of local, stakeholder driven, processes in defining and refining ISWM practices.

Key components of the “Two triangles” approach:

A. Physical Indicators

1. **Public health:** maintaining healthy conditions in cities through a good waste collection service.
2. **Environment:** protection of the environment throughout the waste chain, especially during waste treatment and disposal.
3. **Resource recovery – 3Rs:** ‘closing the loop’ and returning both materials and nutrients to beneficial use, through preventing waste and striving for high rates of reuse, materials recycling and organics recovery.

B. Governance indicators

1. **User and provider inclusivity:** providing transparent spaces for stakeholders to contribute as users, providers and enablers.
2. **Financial sustainability:** being cost-effective and affordable.
3. A base of **sound institutions & proactive policies.**

1.2 What is an operator model?

To help you understand what is meant by the term ‘operator model’, we need to turn to some ISWM institutional theory. The SPG set out a theoretical framework to help understand and present the six “institutional functions” inherent in a waste management system, namely the regulator, policy maker, planner, client, operator and revenue collector.

This concept was further developed by Wasteaware in its Policy Paper no. 2 – Institutions and Governance, which identified the existence of a seventh institutional function, that of ‘change agent’, recognising the importance of people making change happen, regardless of their formal role in the system.

Clearly, the most important people in developing waste management systems are those who make decisions about the allocation of public resources and finances. And the time constraints generally mean that decision makers rely on advisors, professionals in the field of ISWM, to help them formulate their policies, strategies and operational practices. It is these stakeholders, professionals working in the design and implementation of ISWM developments that this book is intended to help.

Understanding institutional roles and responsibilities brings focus onto the critical influencing factors that underpin reliable, cost effective, ISWM services.

In most countries ‘responsibility’ for ensuring the provision of waste management services rests with local and regional public authorities. In some cases these responsibilities are delegated to other subordinate public bodies such as municipal associations or public utility companies. These are the *clients* and often the *revenue collectors* for the ISWM system.

However, the scope of activity of these municipalities and regions is defined within a national framework of sectorial policy, *regulation and planning*.

All along the waste management chain, public and/or private operators carry out their day-to-day collection services, operation of transfer stations, maintenance workshops, scrap yards, resource recovery facilities and

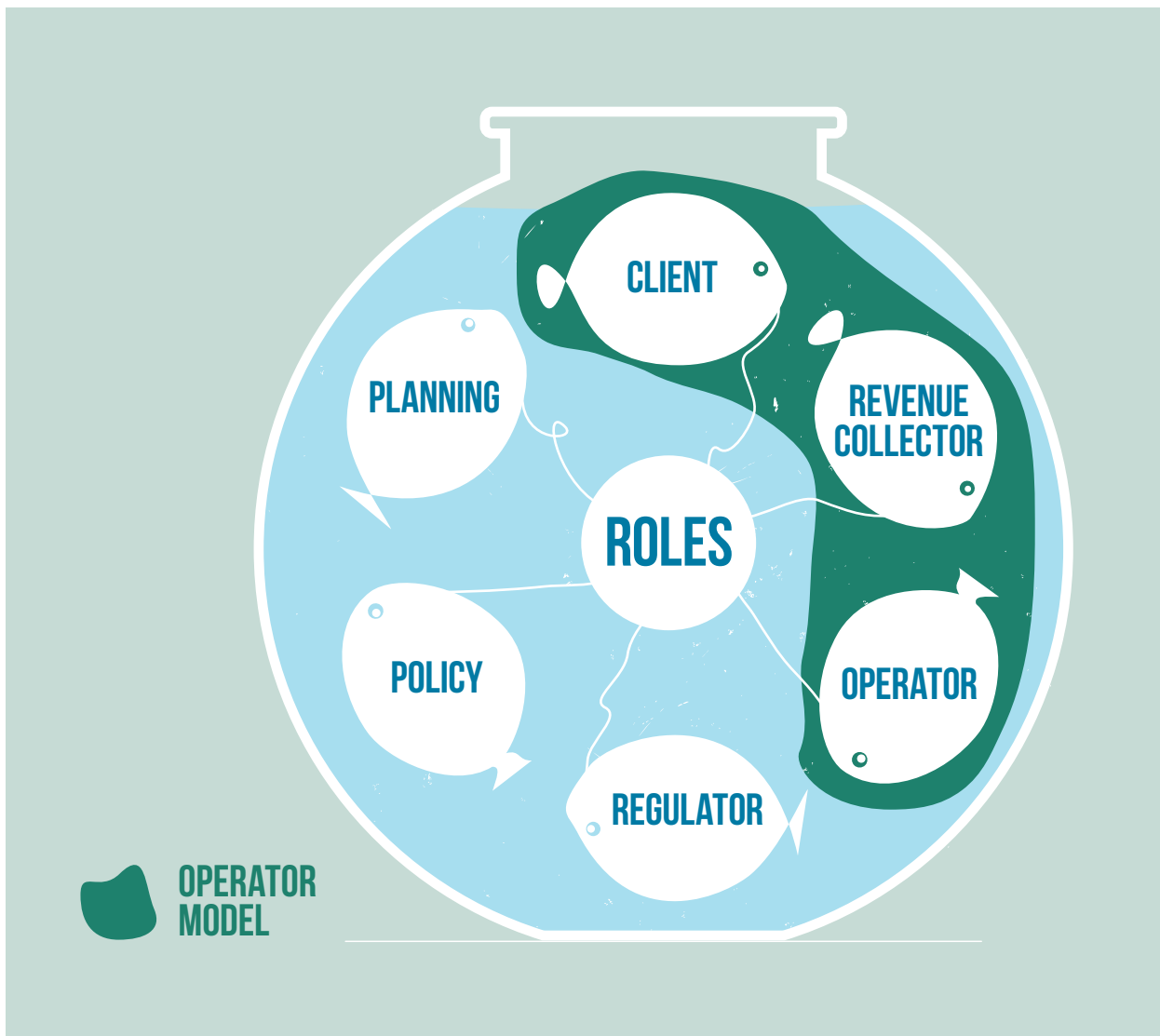
landfill. Waste management systems vary greatly - they can be monopolist, oligarchic or competitive markets based on the number of operators and service providers and the way contracting is carried out.

So, whilst new systems or *operator models* are established under the institutional functions *regulator, policy maker* and *planner* (the framework conditions for operator models), the specific operator models themselves are determined at the local level.

The inter-relationship between ownership, decision-making, responsibility, contracts and agreements, management and money flows between the **operator, client** and **revenue collector** define the operator model itself.

This book focuses on the interaction between these three local institutional roles that together define the operator model.

Figure 2: Roles and responsibilities in providing solid waste management services (Adapted from Wilson et al, 2001)



CLIENT: responsible for ensuring the provision of a reliable ISWM system meeting the required standards

OPERATOR: responsible for delivery of the MSWM service on the ground

REVENUE COLLECTOR: responsible for collection of revenue for ISWM

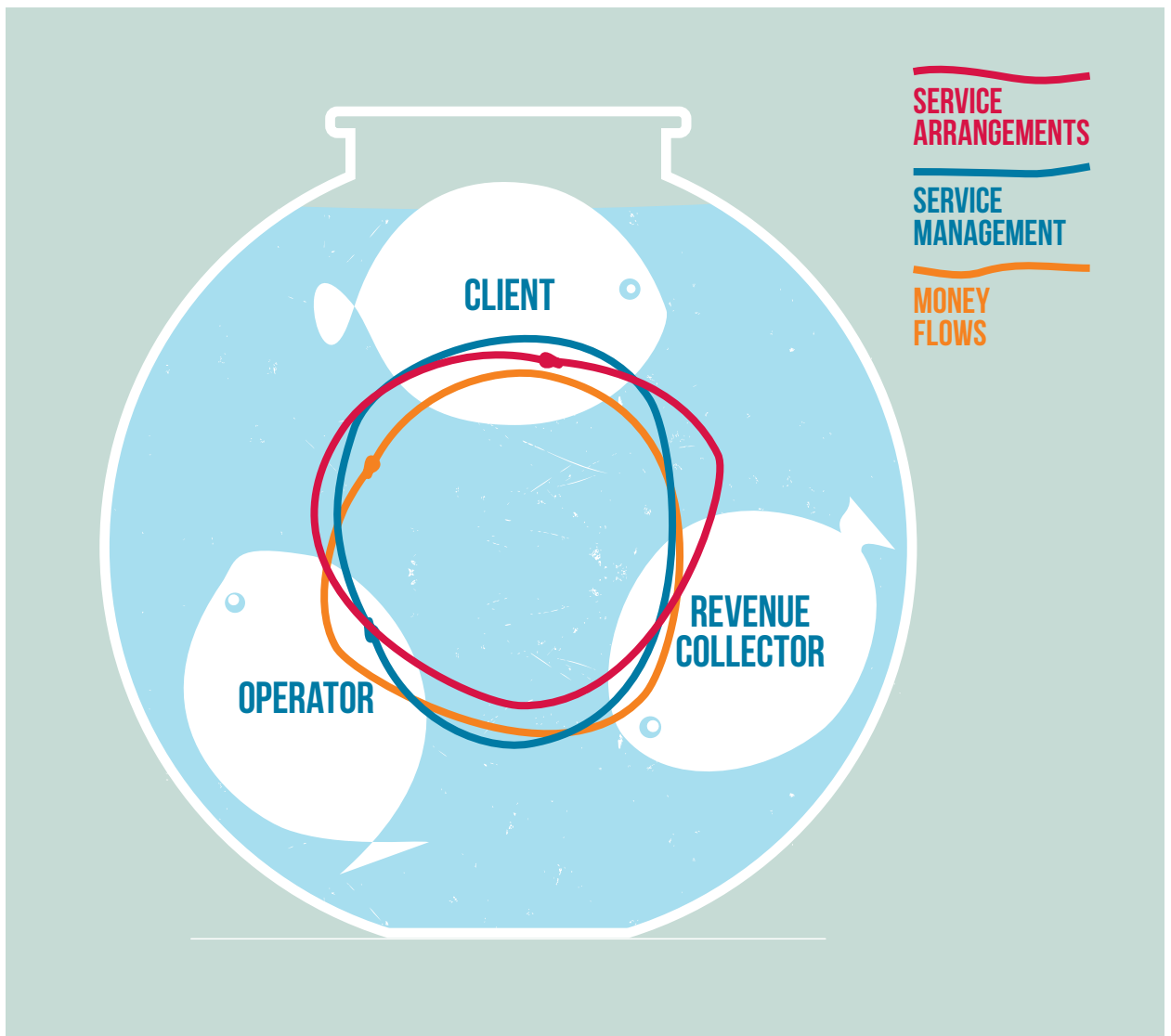
REGULATOR: responsible for monitoring and compliance with legal standards for environmental protection with respect to ISWM

POLICY: the framework set at National level and implemented at Regional and Local levels within which ISWM are delivered

PLANNING: responsibility for strategic and operational planning and general programming and control

CLIENT + REVENUE COLLECTOR + OPERATOR = OPERATOR MODEL

Figure 3: Components of an Operator Model



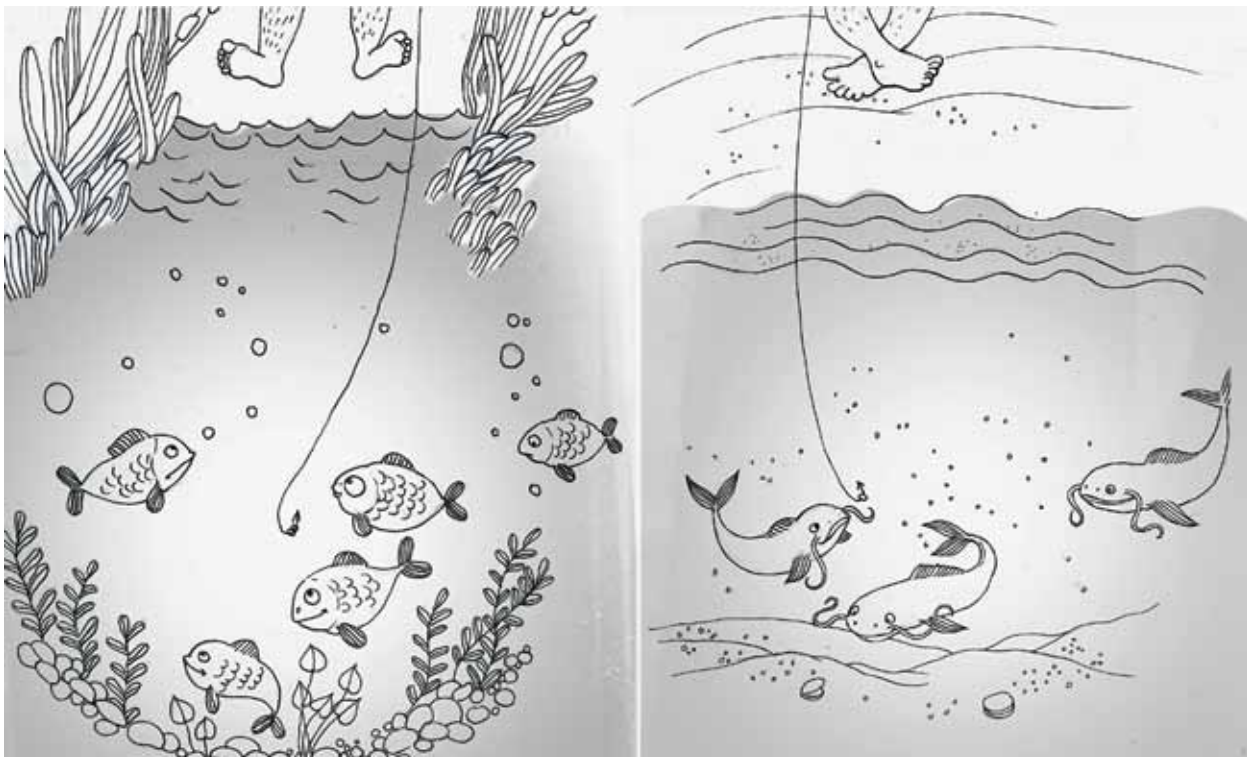
1.3 Generic categories of operator model

We have classified operator models under three primary model categories. Four generic model groups of operator model can be identified which differ in their ownership structure and decision-making responsibility: public, private, municipal and inter-municipal. In addition to the main operator models there are sub-models that fall under the generic models but are different from each other in terms of contracts/agreements, control & management and money flows. It is also possible to distinguish between integrated models and models that work

with any, some or all elements of the waste management chain. This book examines the process, systems and relationships between the three functions that together define an operator model, across a diverse range of operator model types. It also examines the conditions for the setup of different operator models, identifying the regulatory frame within which they function, capacities needed to sustain them, and institutional setup in which they are implemented.

Table 1: Generic model categories

Ownership/ Responsibility	Municipal	Inter-municipal
Public	Municipal	Inter-municipal
Private	PSP	Inter-municipal PSP



Cartoon 2: Different model types are suitable for different local conditions, just like different fish breed in different habitats.

1.3.1 Public versus Private operator models

A lot has been written on private sector participation in municipal solid waste management services, and some excellent publications can be referred to for further detail. One of the most detailed of these is a 2005 GTZ publication authored by Adrian Coad, *Private Sector Involvement in Solid Waste Management*. Other important publications are listed in the bibliography.

Whether or not the service is run by organisations under public or private (or mixed) ownership, waste management is an essential service to the public, and a highly visible indicator of good governance.

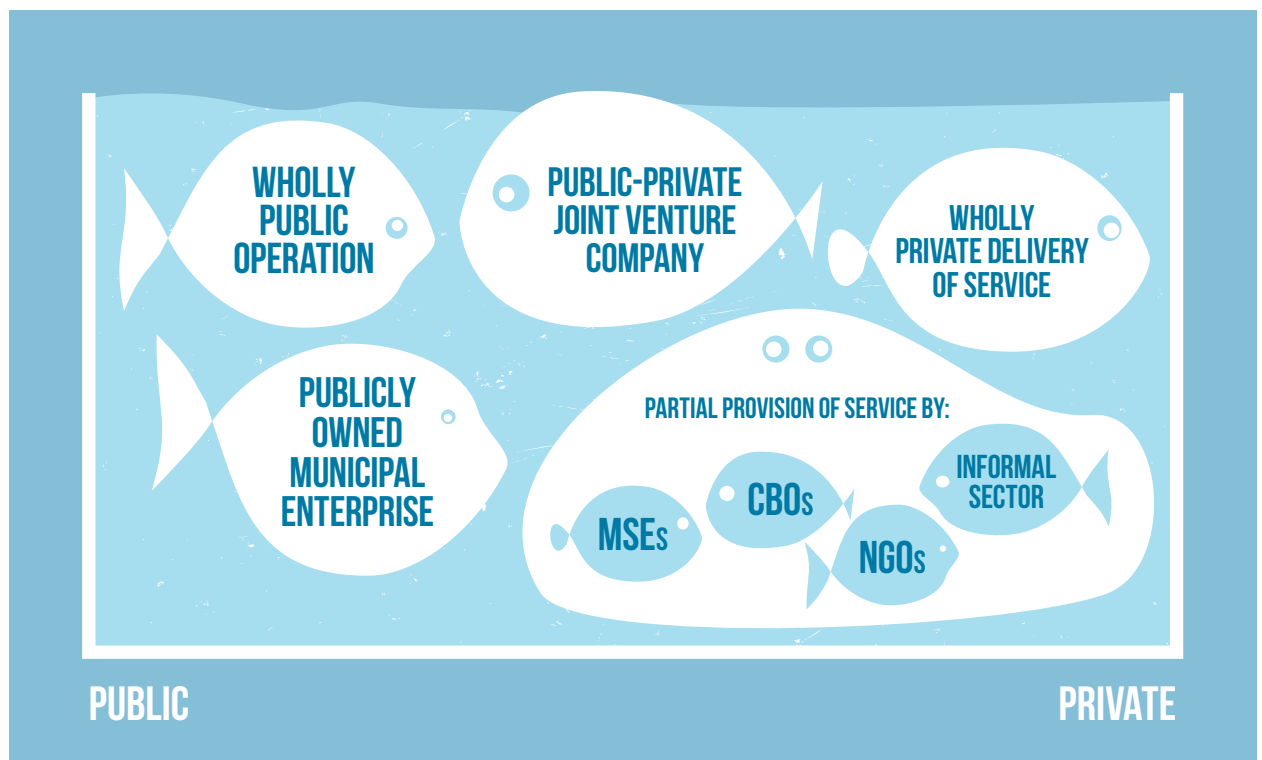
So, regardless of the specific model type used, all of them require oversight from the public sector, the ‘client’ function. It is the job of elected representatives and civil servants to protect the public interest. In the case of waste management this means ensuring that public

health and environmental conditions are protected, and that services are carried out at a level of quality required, and cost that can be afforded.

However, services may be actually provided on a day-to-day basis by a range of different organisations, the ‘operator’ function. In practice few operator models are purely public or purely private. Rather there is a continuum of options between the public and private as illustrated graphically in Figure 4 (David C Wilson and Jennifer Kanjogera, 2012).

Looking at Public Private Partnerships alone, these may take an abundance of forms of cooperation between the private and the public sector depending on whether these are based on a short term service contract, a concession, a joint venture or contracting out a thin slice of the service such as interim management.

Figure 4: Continuum of public-private sector operator models



1.3.2 Municipal versus inter-municipal operator models

In the developing world, 'waste' is largely an urban phenomenon. As the world urbanises, and more people move into towns and cities for better employment and life opportunities, the by-products of human consumptive behaviour concentrate. As urbanisation also removes the spaces that could be used for the management of this refuse, transport becomes a necessity. The necessity to cooperate varies depending on the specific geo-political situation.

The result of this process is that waste from towns and cities must very often be processed, treated or disposed in places which are distant from the urban area, and may be administered under a different local government unit. This factor introduces the need and potential for inter-municipal cooperation.

Once again, few operator models are purely municipal or purely inter-municipal. The differentiation between municipal and inter-municipal model types can be understood by the extent to which different local government units cooperate in a structured way for the contracting, management and financing of waste management services.

There are some cases where there is no particular need for one local government administration to cooperate with another. This could happen for example when the administrative territory of a municipality stretches in a sufficiently wide radius from the urban concentration, for treatment and disposal facilities to be locatable within the same administrative territory as the zones of waste generation.

Inter-municipal partnership may be necessary as a means of expanding the geographical boundaries of a waste management system, easing the planning and physical location of waste management facilities, joint operation and management systems. This offers benefits of economies of scale (i.e. making public services cheaper for everyone) and upgrades of performance indicators (i.e. improving public services). Hence inter-municipal waste management associations or consortia/companies may be an appropriate operator model even without joint treatment facilities.

This applies for example for vast municipalities with low population density, as in the Brazilian Amazon region.

However, different municipalities have different reasons and desires to cooperate. For example, where one local government unit (zone of waste generation) is far more politically and financially powerful than a neighbouring municipality (where the waste management facilities are to be located), the desire for a structured cooperation from the lead (dominant) municipality may be very low. In such cases, although there is in fact some inter-municipal partnership, this may not be recognised at all in the contractual, management or financing arrangements.

From the field

One innovative experience of consortium is of the *Quiriri* Consortium in Santa Catarina State, south of Brazil formed in 1997 and benefitting 125,000 inhabitants.

The main driver for the formation of this consortium between 4 municipalities: São Bento do Sul, Rio Negrinho, Campo Alegre, and Corupá, was the risk to water source pollution from lack of appropriate final disposal of waste.

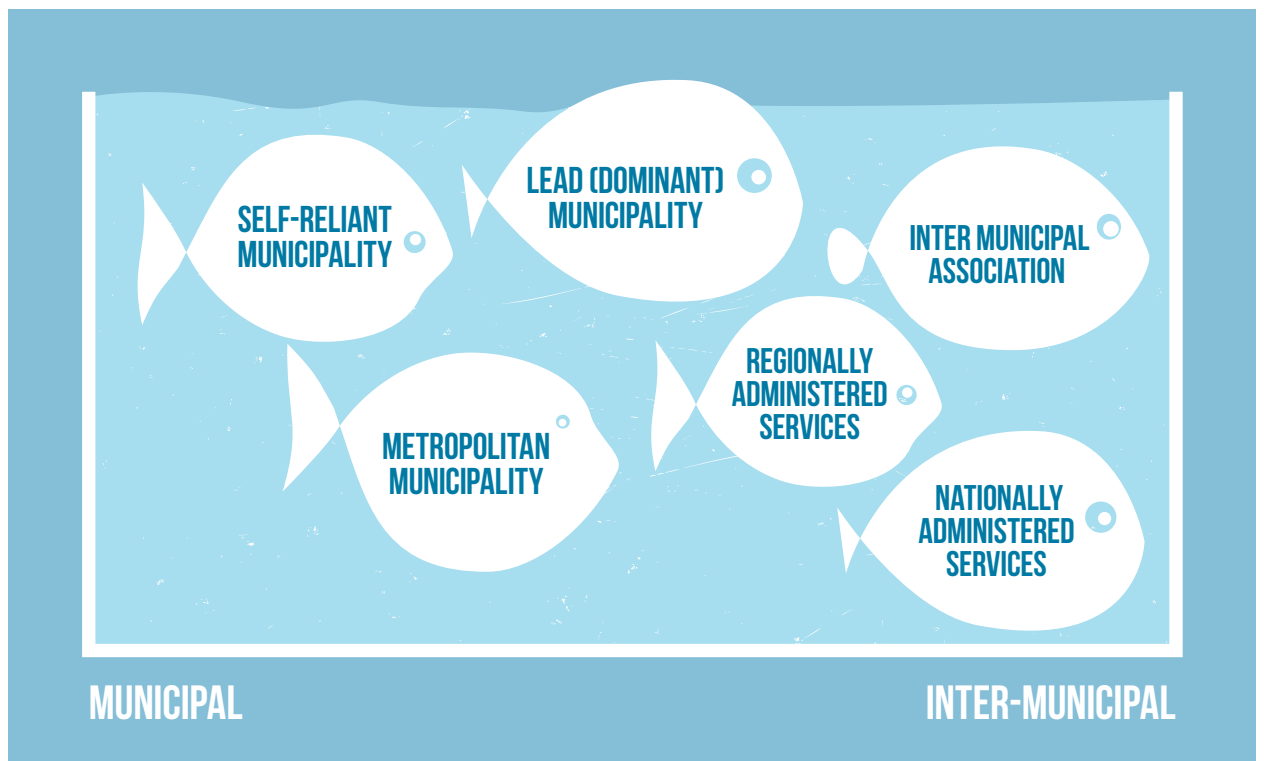
In cases where there are two or more similar sized municipalities, the rationale for a structured inter-municipal partnership may be more keenly felt. Once again, the need and desire for cooperation is very much dependent on the specific geo-political situation.

In some (larger) countries where there is a functioning tier of regional government, the regions may be the legal authority functionally responsible for ensuring the provision of some part or all of the waste management service, and not the local government unit. In this book we group regionally organised and inter-municipal waste management systems into the same generic model category.

Other countries, usually countries which are relatively geographically small, go one step further and have a national ISWM organisation in place to invest in, construct, and operate (or contract-out) the local services. Often these national organisations have a specific remit for the transfer/treatment/disposal (and also sometimes

recycling) aspects of the waste management, ie. leaving collection to remain organised at the local level, and in essence creating an institutional and functional separation between the collection (& recycling) and treatment & disposal services.

Figure 5: Public vs. private sector operator models



2. Aims and objectives

2.1 Who is this book for?

This book is for practitioners in the field of solid waste management working in developing countries. The field of work has grown-up, from its beginning in the 1970's and 1980's, into a global theatre of practice, with thousands and thousands of practitioners from many different specialist backgrounds and from all over the world entering the profession of 'garbology'.

This profession sounds rather mystical, and is certainly not listed within most countries' industrial workers classification systems, but it is nevertheless a very real and fascinating sphere of work. The recently launched International Partnership for Local Authorities (IPLA) network and the fruitfulness of the exchange between experts that is currently happening in this network further reinforces the development of the expert-sector.

Garbologists typically aspire to improve standards of public health, environmental protection, and resource efficiency, at the same time as applying good governance, promoting economic development, civic pride and personal awareness, and tackling thorny issues such as social inclusion, rights and respectability for the millions of professional waste workers who clean up our planet on a daily basis.

Many garbologists work on the front line of development. Over the last 30 years, the level of policy interest and practical intervention from the international development community in the resources and waste management sector has ebbed and flowed. Mostly, the sector has found itself a poor cousin, or orphan, of one or another of the mainstream development sectors, water and sanitation, governance, health and climate change.

Many development initiatives have been able to deliver new or improved services, infrastructure and policy frameworks. However, many others have been blighted by difficulties, such as endemically poor governance, inappropriate application of technology and service models, financial unsustainability, and corruption.

Nevertheless, the number of people working in the profession continues to grow and the scope of work continues to increase. This is because there is a real demand for people to work in this sector, to apply their minds and creative solutions to helping solve one of the most intractable issues faced in the development of human civilisation.

How indeed do we put in place a more resource efficient economy, apply the most appropriate of skills and technologies, and ensure the reliable delivery of the waste management services we need to ensure that our living environment is clean and healthy, and the degradation of the natural environment is reversed?

There is now a widespread understanding amongst the international development agencies and many national, regional and local governments that modernising waste management takes a lot more than the simple transfer of technology. If you are not interested in the practice of integrated and sustainable waste management in developing countries, whereby operator models and technological approaches are tailored to the local situation, then this book is not for you. If you are, however, interested in exploring a cross section of the colour and complexity of how waste management services are delivered in different parts of the world, then read on!

2.2 What is the goal?

So this book is for practicing and aspiring garbologists. Drawing lessons from 5 in depth case studies, and analysis of over 20 others, it attempts to group together, differentiate and classify the many different ways of organising and delivering waste management services. Our aim is to sharpen understanding of the differ-

ent influencing factors that determine which operator models are selected, and unlock some of the reasons why different models work in a particular location, where this is possible.

The goal is also to provide practitioners with some of the information they need to advise decision-makers on optimal, locally appropriate, solutions.

This book provides information and onward links to guide you in your selection of the most appropriate and efficient operator models, or combination of models, for waste management service delivery. By focusing on operator models, we shed light on the practical and business approaches that shape the way waste management services are organised, monitored and controlled. Going deeper into some of the factors that cause certain approaches to be designed, preferred, selected, and be-

come normalised in different contexts. There is no such thing as a standard operator model appropriate for the very diverse contexts in which solid waste management has to be provided. The content of the book will hopefully enable you to adopt and adapt components and strategies that have been proven to work in particular circumstances and develop an approach tailored to fit your specific local conditions.

A guidance paper has been developed in parallel to this sourcebook, which acts as a decision aid for development agencies interested in investing, and practitioners assisting the design of new waste management systems.

2.3 Structure and content

Following the foreword, introduction and methodology (chapters 1-3), the book follows the sequence of the research questions below.

This book addresses and is structured around the following research questions:

- a. In what context and framework conditions are waste management services delivered?
- b. What arrangements are chosen for service delivery and why?
- c. How are services managed, monitored and paid for?
- d. What specific (local) conditions and capacities enable the choice of a model type? (“What is affordable? What is manageable / implementable?”)
- e. How can international and national development agencies select the most suitable operator models?

Chapters 3 to 5 present the information from the in-depth and secondary case studies answering in research questions a to c.

Chapter 3 discusses the framework conditions that influence the range of operator model options available in a country. Framework conditions are to do with physical, economic, legal, policy and infrastructure contexts in place in a given country and location.

Chapter 4 deals with the more practical aspects of what are waste management services; who provides these services and how service delivery is organised.

Chapter 5 deals with the management arrangements under which service delivery is organised, controlled and paid for and introduces 35 Common Operator Model (com) types.

Chapter 6 links context and conditions to selecting an operator model, and puts forward a set of 15 Local Objectives, one or a combination of which shape decisions making on operator models.

Chapter 7 presents the lessons learned from the case studies in an attempt to assist development agencies and practitioners to select the most suitable operator model.

The Guidance document contains implementation steps, guiding you on the path from understanding the general context, local objectives and assessing the enabling conditions and capacities that make one or the other option more feasible for a certain development initiative. It highlights the advantages and disadvantages that the implementation of a certain model can bring.

2.4 Methodology

The research for this book draws on 5 in depth case studies, 23 selected secondary case studies and many other short examples drawn from literature or the author’s own experience. The case studies demonstrate a range

of urban solid waste management systems and illustrate how solid waste management works in practice in various socio-economic situations, and at a variety of scales in low and middle-income countries.

2.4.1 Selection of primary case studies

In-depth case studies were conducted in the following locations:

- **The State of Rio Grande do Sul**, in Southern Brazil, specifically 30 Municipalities which form CIGRES inter-municipal waste management system;
- **The city of Castries** on the island of St. Lucia in the Caribbean;
- **The city of Surat**, Gujarat state, in Western India;
- Qena in Upper Egypt, specifically **Qena Markaz** comprising of Qena city, 7 mother villages, 17 villages and 210 small settlements
- **Maputo**, capital city of Mozambique

These case studies were selected to illustrate a cross section of the diversity of operator models throughout the waste management chain, so as to capture the essential features of primary operator models in a handful of low and middle-income countries.

As can be seen from the overview table below all generic model types are covered in the case studies, with the exception of an inter-municipal public private partnership (PSP). Moreover, the detailed cases illustrate a cross section of the model types in place along the different stages of the waste management chain.

Table 2: Basic model types in the in-depth case studies

	Sweeping	Collection & transfer	Recycling	Treatment	Disposal
Maputo (Mozambique)	Municipal	PSP & Municipal	PSP		Municipal
Qena (Egypt)	Municipal	Municipal & PSP	Municipal & PSP		Municipal
CIGRES (Brazil)	Municipal	Municipal & PSP	Inter-municipal	Inter-municipal	Inter-municipal
Surat (India)	Municipal & PSP	PSP & Municipal	PSP	PSP	Municipal
Castries (St. Lucia)	PSP	PSP	PSP	Inter-municipal	Inter-municipal

The models we have studied are all hybrid systems of the three basic model types, although in some the public service and in others private participation is more dominant. Each case has a feature that is predominant, but all are hybrid models of at least two of the basic model types. The client is generally the Municipality, or District Administration, or in the case of St. Lucia an agency within national government. The role of revenue collector and operator are taken up by various organizations.

In Maputo and most of Qena the revenue collector is the Electricity Company except for three semi-urban areas where NGOs deliver the service and also collect the fees. In Surat and the municipalities belonging to CIGRES, the municipality collects user charges and local taxes. In St. Lucia there is no fee collection, and waste management is financed from the national budget.

It is important to note that the case studies have been carefully selected to represent as much diversity in operator model configurations as possible within the scope of the study. The scope for analysing and comparing the

specific variants of a single operator model type is therefore somewhat limited, but sufficient information has been able to be gathered to illustrate Common Operator Models and to provide examples of each.

2.4.2 Data collection in the in-depth case studies

The data collection methodology and the set of indicators chosen for presentation of the case studies in a structured way draws upon the ISWM two triangles approach introduced in Chapter 2 used in the SWWC book. The data collection template is presented in Annex 1, and the benchmark indicators methodology presented in detail in Annex 2.

Case study information has been gathered from fieldwork, interviews and site visits, supported by photo-documentation. Field data has been collected using pro-forma case study templates and collated into standard

case study report formats. The full case study reports are available in Annexes 3-7. Each in-depth case study follows the same presentational structure. Firstly, the conditions, socio-economic context, policy and institutional framework in which waste management services are provided; followed by the waste management profile of the case study and a description of the operator model.

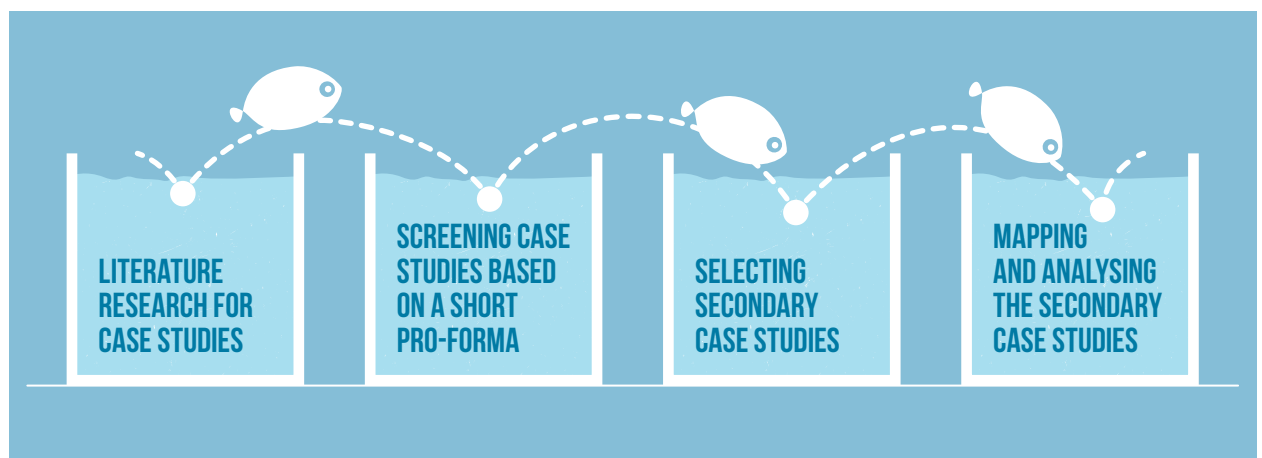
Each case concludes with lessons learned and the advantages and disadvantages of the operator model implemented.

2.4.3 Selection of secondary case studies

The information that could be drawn from the 5 in-depth case studies was not sufficient to capture the full diversity of operator models, nor is it sufficient to sustain insights that arise from analysis and comparison.

To strengthen the evidential base of the book, a set of secondary case studies was selected to diversify the information and sustain the evidence for lessons learned.

Figure 6: Selection and use of secondary case studies



133 published case studies were reviewed using a 2 page pro-forma template to assess their relevance to this research. The databases researched included case studies published by GIZ, UN Habitat, World Bank, project reports, various scientific journals and students' master theses. The case study information was entered into an excel database and the short list to be analysed in more detail was chosen based on fulfilling three criteria:

- The case should have been written about a development initiative which has already been implemented so that lessons learned could be drawn from it;
- Detailed information was available about the operator models in use;
- The physical elements of the solid waste management system are described.

Table 3: Secondary case studies selected for in-depth analysis

Criteria	Category	Selected cases
Operator Model Types	PSP	17
	Private	2
	Public	3
	Inter municipal	1
Geographical Location	Africa	9
	Asia	7
	Europe	2
	Middle East	2
	Central / Latin America	3
Source	Journals	4
	Theses	3
	UN - Habitat	10
	GIZ Project	4
	Other	2
Developing country		All cases
Total		23

Criteria	Category	Selected cases
Population	Above 10 million	3
	2 - 10 million	8
	1 - 2 million	7
	Below 1 million	5
World Bank ranking	Upper middle income	8
	Lower middle income	8
	Low income	7
Total		23

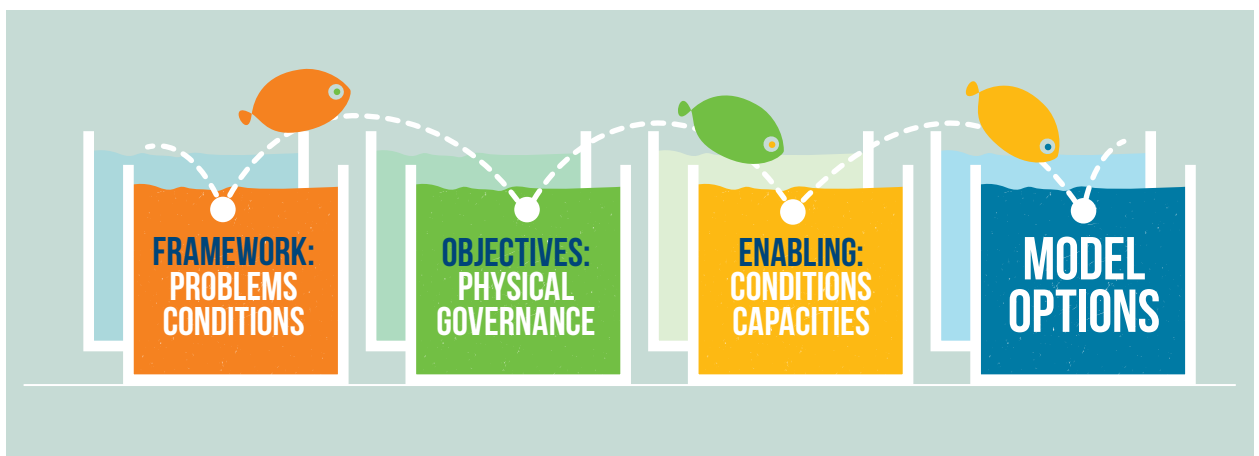
2.4.4 Analysis of the case studies

Both in depth and secondary case studies were mapped out in excel tables in order to uncover potential links between the context in which development initiatives are undertaken and the selection of operator models. Taking the case studies apart, following the research questions and comparing them, resulted in revealing a pattern in the way operator models were selected, going from framework conditions and problems, to formulating

local objectives, and then to selecting models depending on the local enabling conditions and capacities.

When looking deeper into a model to understand the role of the operator, client and revenue collector and how these work together, the analysis focused on learning lessons about how a certain set of service delivery, management and financing arrangement works, or not as the case may be.

Figure 7: Selecting operator models



Through the analysis, it has been possible to identify Common Operator Models (coms) which can be distinguished from each other, either for their:

1. Institutional location of the client function (eg. Municipality/inter-municipality);
2. Character of the operator function (eg. Public vs. private, *micro-service vs. medium/large service provider*);
3. Revenue collector responsibility;
4. Bundling/combination of service elements (ie. street sweeping, collection, transfer, recycling, treatment & disposal).

In theory, there are a very large number of possible combinations of the above variables, and resulting from this a bewildering range of operator models possible. In Section 5 we summarise and distinguish those coms that have identified from the primary and secondary case study research, giving examples.

2.5 ISWM indicators

2.5.1 The ISWM performance indicators

ISWM performance indicators originally developed in the SWWC have been further developed in this book in order to capture more of the influencing factors, facets and complexities of integrated sustainable waste management (ISWM). This has provided a basis of a methodological approach to assessing the level of development of the waste management sector in a particular location.

7 indicator-sets covering 3 physical elements and 3 waste governance aspects have been applied to analyse the development status of waste management in the particular case study locations. The indicators are described further in boxes throughout the book, allowing you to ‘dip in’ to them, and gradually build up your understanding of these ISWM fundamentals.

Table 4: Performance Indicators of ISWM system

Performance Indicators of the ISWM system	
Public health (Collection and sweeping)	The performance of waste collection and street sweeping services, in terms of coverage and quality of services.
Environmental control (disposal)	The performance of waste disposal services in terms of the level of environmental protection assured.
Resource management (3R's)	The resource efficiency performance of the system, focusing on the materials extracted for re-processing and resale, and materials recovered for energy.
Provider inclusivity	The extent to which the economic niches in service delivery and valorisation are open and accessible to non-state actors.
User inclusivity	The extent to which the users of the system have access, control and influence over how the system works.
Financial sustainability	The financial performance of the waste management system in accordance with a range of criteria.
Institutional coherence	The institutional performance of the waste management system in accordance with a range of criteria.

Two-three page summary boxes present the information on the in-depth cases and results of the benchmarking assessment. We start with CIGRES case in Rio Grande do Sul in Brazil.

In-depth case study - CIGRES, Rio Grande do Sul, Brazil

In 2001, thirteen (13) prefectures of the State of Rio Grande do Sul, in Southern Brazil, met to form the **Inter-municipal Consortium of Solid Waste Management** – referred to as the CIGRES. However, its effective operation started only in 2007, after six years of negotiations, initially treating solid waste of an initial three municipalities and by 2012 its operations have been extended to 30 municipalities.

Their aim was reported to be solving two pressing and inter-related problems: firstly, the distorted pricing of some private waste management companies perceived as operating waste collection and disposal services in a monopolistic fashion – referred to as the “Waste Mafia”. Secondly, to address the issue of final disposal sites with poor environmental conditions, for those municipalities who had not entered into contracts with the previously mentioned private companies. The creation of the Inter-municipal Association CIGRES, beside the governance goals arising from the local conditions, was motivated by the enabling conditions set up by the government to provide funds and tax breaks to Inter-Municipal Association. Throughout the 1980’s inter-municipal consortia were encouraged through an administrative reform of the State. In addition to this component of federal public policies, the historical and cultural aspect regarding the spirit of cooperatives certainly favoured the implementation of these policies in this region.



Harvest delivery in 1947, tobacco cooperative, Frederico Westphalen, Rio Grande do Sul, Brazil
 photo: File Wilson Aleixo Ferigollo

This is an inter-municipal model where the Association is the operator for the regional treatment and disposal facility. The collection services are delivered either by the municipality or private companies contracted by the municipalities and the revenue collector is the Municipality.

Waste management profile:

CIGRES presently operates a waste separation unit, including treatment by composting process, and a sanitary landfill with leachate treatment, while the waste collection continues to be run by the prefectures.

Primary collection: Out of 30 municipalities, 25 outsourced collection and five keep collecting on their own but in all cases, monitoring and control of the contracted collection services are within municipal responsibility. In 8 of the 25 municipalities, primary collection is performed by one middle sized company, contracted through tendering process and in the 17 left, municipalities contracted small local enterprises to execute collection service and transport to final destination.

Street sweeping: This service is usually performed only in the central town areas, by public municipal servants, while in the residential neighbourhoods, kerbside cleaning is done by the population, indicating that citizens feel and show responsibility for their neighbourhood, which is not a common situation throughout the country.

Secondary collection: Transport to the waste treatment facility is done in all cases through collection trucks, without transfer even though the distances to the treatment facility are considerable in some cases.

Due to the fact that it was not possible to convince the prefectures to invest in differentiated collection with the associated higher collection costs, collection is performed in the conventional way and mixed waste is delivered to the treatment centre where recyclable materials are manually removed and separated in marketable material fractions.

After sorting out dry recyclable materials and extraneous material, the mixed material is directly forwarded to the **compost yard** where it passes through a process of bio-stabilization. This is because a rotary sieve, employed at the end of the sorting conveyer, has repeatedly broken down – and ultimately it was removed.

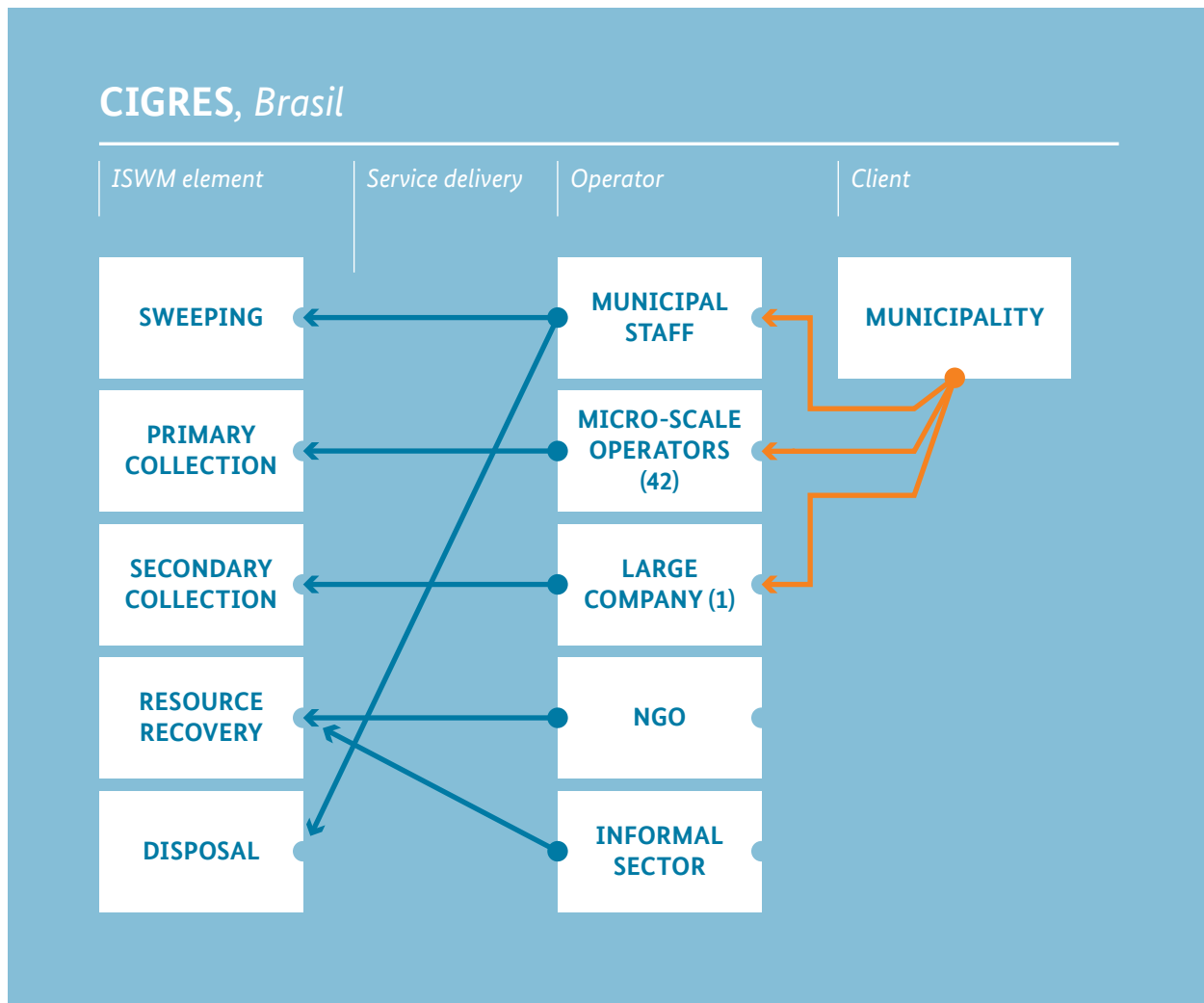
The waste is then disposed in the **sanitary landfill** with three cells and features a clay base with a leachate drainage system and where the landfill gas is captured by wells filled with broken rocks, but released to the environment without burning or energy use.

Within the framework of the consortium exists a system of apportionment of costs among the member municipalities, and on municipal level a service tax for urban cleansing to be paid by the served population.

Table 5: CIGRES Waste management performance indicators

City:		CIGRES (Association of 30 municipalities)		
Country:		Brazil		
G1	Country income level	World Bank income category	GNI per capita	
		Upper-middle income	\$ 11,630	
G2	Population	Total population	88,050	
G3	Waste generation	Total municipal solid waste generation (tonnes/year)	16,400	
No	Category	Indicator	Results	
Key Waste-related data				
W1	Waste per capita	MSW per capita (kg per year)	186	
W2	Waste composition	Summary composition of MSW for 3 key fractions – all as % wt. of total waste generated	-	
W2.1	Organic	Organics (food and green wastes)	59.5%	
W2.2	Paper	Paper	6.4%	
W2.3	Plastics	Plastics	7.3%	
Physical Components			Traffic light code	
1	Public health – Waste collection	Waste collection coverage	95%	● ●
1Q		Quality of waste collection service	Medium/High (80%)	● ●
2	Environmental control – waste treatment and disposal	Controlled treatment and disposal	100%	● ●
2Q		Environmental quality of waste treatment and disposal	Medium/High (80%)	● ●
3	3Rs – reduce, reuse and recycling	Recycling rate	14.6%	● ●
3Q		Indicator of the ‘quality’ of 3Rs provision	Medium (50%)	● ●
Governance Factors				
4U	User inclusivity	Degree of user inclusivity	Medium/High (65%)	● ●
4P	Provider inclusivity	Degree of provider inclusivity	Medium/High (70%)	● ●
5F	Financial sustainability	Degree of financial sustainability	Medium/High (75%)	● ●
6N	Sound institutions, proactive policies	Adequacy of national ISWM framework	High (83%)	● ●
6L		Degree of institutional coherence	High (87.5%)	● ●

Figure 8: The relations between the client and operator in CIGRES, Rio Grande do Sul, Brazil in-depth case study



2.5.2 Reading the benchmarking indicators

For each of the 5 case studies we have ranked the status of development status of the ISWM system applying a 'traffic light' code for easy visualisation.

There are 5 degrees of ranking:

- Green-green reflects a high status of development
- Green-orange reflects high-moderate development status
- Orange-orange, moderate
- Orange-red, moderate-low; and
- Red-red, low.

By using traffic lights, the aim is not to name and shame good and poor performance, but to highlight areas where improvements can be made, sometimes relatively simply with low investment, to improve the development status and attain a higher conformance with goals of ISWM. The thresholds for each category are presented in detail in Annex 2. In the case of CIGRES we observe a

waste management system with relatively well developed collection and disposal system, but struggling to perform on the 3R's. On governance factors, we see a well-developed institutional framework, with good rating on user and provider inclusivity and also on financial sustainability.

This is a case of an inter-municipal system, thriving within a maturing policy framework. Brazil itself offers much to learn on the importance of policy incentives to catalysing ISWM at the municipal/inter-municipal level, and also (whilst not completely relevant to this specific case) a policy frame which is progressive in that it addresses the social inclusion of the informal sector as well as the role of extended producer responsibility (and reverse logistics) in enhanced recycling of packaging and other recyclable waste streams.

Brazil is an exciting place to be working in the resource and waste management field at this time, with much to offer other developing waste management systems in terms of lessons to be learnt and experiences to transfer.

2.6 Where does this take us?

As you can see from the previous sections, we have tried to use a methodical approach in preparation of this book, especially for researching the primary and secondary case studies, and evaluating their relative performance character. Part of the challenge has been to make sure that we have selected a representative range of towns, cities, regions and countries on which to base the comparative analysis, and the conclusions that flow from it.

Given that there are a world of different operator models, and that we only have studied a cross section of them, we offer this book as an input into your practical work, but certainly not everything you will need. Further reading references are included in bibliography. The research we have been able to conduct reaffirms our belief that how waste management is organised is very specific to the locality in which you are living or working. Development is indeed very local.

What shapes the selection of the ways in which waste management services are organised and managed in a particular place are the Local Objectives. What in turn shape these objectives are the human biases, preferences, discussions and disagreements that emerge every day, and the different ways in which political and economic interests shape our societal organisation. We distil some common objectives, and link them to the processes in which they are defined.

We also are able to define Common Operator Models (coms). Whilst having to generalise and group together different similar models in order to keep the number down to a reasonable level, the identifications of coms both illustrates the different types of systems working in different cities around the world, as well as providing some instruction to practitioners on what is going on where?

Understanding the different coms, and then defining, designing and managing the Interfaces between them provides the essential basis for delivering the ‘Integrated’ in ISWM. Similarly, understanding the management arrangements needed to underpin continuity of system performance is the essence of the ‘Sustainable’ in ISWM.

Nevertheless, the diversity and multitude of combinations of ISWM Operator Models working in different parts of the world cannot possibly be captured in this book. What we illustrate is a representative sample, biased towards developing countries.

Figure 9: Primary and secondary cases



1 Accra	7 Castries	13 Ghorahi	19 Moshi	25 Varna
2 Bahrain	8 Cigres	14 Kolkata	20 Nairobi	26 Yaounde
3 Bamako	9 Curepipe	15 Kunming	21 Qena	
4 Belo Horizonte	10 Dar es Salaam	16 Lusaka	22 Quenzon	
5 Bengaluru	11 Delhi	17 Managua	23 Surat	
6 Bishkek	12 Dhaka	18 Maputo	24 Tangier	

3. Framework conditions

3.1 What are the elements of an ISWM framework?

At a national level (and in some federal countries at the state/regional level) policy, legislation, institutional systems, technical standards, money flows, and rules and regulations for the way in which municipalities are allowed to operate are set.

These combined together represent the ‘framework’ conditions for the development of ISWM in a particular country.

The ways in which policies are transferred into practice at the local level vary greatly between countries. National rules and regulations are necessary to shape the ways in which local practices develop, but can be more ‘enabling’ or more ‘prescriptive’ depending on the governance approach in a country.

Different countries have found different ways of turning national ISWM policy ambitions into local ISWM practices.

3.2 Policy and legal framework

Enabling conditions created through legislation, and the supporting frameworks for the economic activities in the sector, greatly influence the choices made at the local level about which operator models are taken up.

The cases studies selected provide a representative range of legal and policy frameworks in low and middle-income countries.

In upper middle income countries of Brazil and St. Lucia there are both national waste management legislation and policy in place.

In Brazil local authorities are responsible for implementing waste management legislation while in St. Lucia the implementation responsibility rests within a national-level St. Lucia Solid Waste Management Authority (SLS-WMA). The focus of the waste management legislation is slightly different in Brazil compared to that from the other 4 in-depth case study countries.

In **Brazil** the legislation is broad and detailed covering principles, objectives and planning processes for decentralised decision making. Sector development is framed within a concept of reverse logistics, meaning the logistical processes required to bring back unwanted materials into the production and consumption supply chains.

Brazil is well known for supporting the inclusion of the informal sector in waste management systems, but also provides incentives for formation of inter-municipal associations. Investment financing for ISWM systems is

provided through the National Environmental Fund.

The law on public associations allows Associations flexibility to function either under public or private law. The facilities include a tax exemption. These framework structures likely played a role in the choice of the CI-GRES member municipalities to join together and form an association.

The legislation in **most low and middle income countries** is rather more focused on technical obligations, requiring States and municipalities to provide the infrastructure and services with regard to collection, storage, segregation, transport, treatment, and disposal of municipal solid waste and implement best practices technologies in the sector.

Out of the cases studies, participation of the private sector in waste management activities is most diverse and widely implemented in India, including in the case study city of Surat. Indeed the PSP arrangements in place for waste management services in Surat were facilitated by the existence of legislation for establishing and operating public private partnerships (PSPs)¹.

¹ In this book we define PSPs in the broadest possible sense, including any operator models in which the private sector has a role in service delivery and/or financing equipment and infrastructure.

The legislation is accompanied by an implementation guideline for municipalities and companies entering a PSP agreement. Services are outsourced based on this legislation across all parts of the waste management service chain.

The local governments or operators of waste management facilities are responsible for obtaining environmental permits based on Environmental Impact Assessment. However, vagaries in the planning process can lead to different outcomes to those envisaged.

For example the sanitary landfill in Surat was permitted and built only for residual waste from processing of waste and other inert materials but is not presently in use as Gujarat Pollution Control Board refused permission for disposal of mixed unprocessed waste.

Complexities in the planning process are common across all countries, and an integrated planning process where policy ambitions are translated into practice remains a challenging area of work.

From the field

In many developing countries there is a deep scepticism about laws, because so many times in the past nice laws have been written but never implemented. This is a Catch 22 situation for the development of the waste management sector.

A legal frame is necessary to communicate policy, to provide signals and security to investors, and to develop waste management practices more evenly across different regions of the country.

In St. Lucia, the Waste Management Act of 2004 and the Waste Management Strategy developed based on this is comprehensive and ambitious, but never implemented.

The sweeping, collection and disposal elements are intact in the system and function at high standards, but there has been no progress in resource recovery and treatment and the initiatives started in these areas are sub-optimal. Sanitary disposal is, however, well developed on the Island.

In Egypt, there is no comprehensive waste management law at this current point in time, but GIZ is currently in the process of supporting the Government of Egypt on this. There is a Waste Management Strategy from 2000 that was partially implemented and is currently being updated. The legislation on environment is relevant and to some extent makes up for the missing waste management legislation as it prohibits waste burning and open dumping, but the legal framework is rather archaic and in need of reform.

In Mozambique there is no waste management legislation and the environmental legislation is at its early stage of development.

There is a municipal by-law in Maputo for city cleanliness and solid waste management that together with its regulations define the legal scope for all activities in waste management in the municipality. The by-law was developed by the GIZ project AGRESU.

3.3 Institutional frameworks

The organizations that have roles of policy maker, planner and regulator significantly influence the context in which the operator models function. These roles are often dispersed throughout different Ministries and/or not defined at all, adding to the complexity of the sector and the difficulties in tackling local problems in a coordinated way.

Clarifying roles and responsibilities, improving the policy, regulatory and planning frameworks, and connecting the national policy goals to local level improvements are important areas of focus.

The **policy maker** at national level is often the Ministry of Environment (in 3 of the 5 case studies), but can be entrusted within other line ministries.

In the case of Egypt it has historically been an inter-ministerial task (with 7 ministries involved), however, reforms that are currently in progress are looking to place the responsibility fully onto the Ministry of State for Environmental Affairs (MSEA), developing a ‘parent’ Ministry for the sector.

In Brazil, ISWM is also an inter-ministerial task where the Ministry of the Environment work together with the Ministry of Cities through the national secretariat for environmental sanitation.

The **regulator** role is classically viewed as the task of enforcement of compliance with legislation² and is the responsibility of an Agency of the Environmental Ministry at the national level in all of the cases, and this is typically the case throughout the world.

Only in Maputo is this task shared by the Ministry for Environment and the Municipality, because the Municipality has more capacity to handle the task. A key development in the national-level institutional framework is to separate the functions of policy maker and environmental regulator.

Implementation of policy is often incentivised by financing, and if environmental regulation is in the hands of the same organisation conflict of interest may constrain development of the sector. The stick and carrot is held in the same hand.

More information, examples and insights on the policy and regulator functions can be gained from *Wasteaware Policy Paper 2 – Institutions and Governance*.

² The regulator role is understood differently in different countries, depending on language and administrative culture. In addition to the environmental regulatory function, technical and financial regulatory functions are also important. In this book we include the technical and financial regulatory function as an integral part of the policy function, and treat the environmental regulatory function separately.

3.4 Planning frameworks

The role of waste management plans is to look strategically into the future, determining the physical investments, operator models, and associated ‘soft’ measures necessary for ISWM. Waste management plans are often developed in order to facilitate access to financing, and to provide a framework for more detailed feasibility studies and implementation activities.

The *planner* role is dispersed between different tiers of Government. However, **national waste management plans** play an important role in many countries, defining the principles and frameworks for sector development. Regional and municipal plans specify the sector developments in more detail, but typically hierarchically ‘report to’ the national waste management plan. The planning function at the national level is therefore one of the key building blocks for sector development. In **St. Lucia** the planning function is fully undertaken at the national level.

One of the requirements of the National Solid Waste Management Law of **Brazil** is the development of municipal or inter-municipal waste management plans. The existence of such municipal level plans is a condition for obtaining financing from federal resources. The State solid waste master plan of Rio Grande do Sul and the inter-municipal integrated plan for the member municipalities of CIGRES are currently being developed.

In **India**, plans for waste management services are prepared by Health and Sanitation Departments within Municipal Corporations. Legislation requires all Municipalities, or Local Government Units, to develop detailed plans in the form of detailed project reports, but in practice this is done only by the larger municipal corporations especially as a precursor to applying for financing or grants.

The national solid waste framework in **Mozambique** was not finalized when planning process for the current system started in Maputo. In Maputo the waste management plan became the master plan of the city facing potential public health problems due to deficient waste management. The objectives of this plan were the key objective of the projects that were financed by GIZ and the World Bank.

From the field

Planning is vital to long-term sustainability of waste management investments. It is, however, a complex political process, which involves making difficult decisions about the operator models, technologies and physical sites for management of waste.

Stakeholder participation is the key to success. Many planning outcomes have been seriously compromised by poor communication both within and between public authorities, and with the public and other stakeholders.

Often, there is an understandable portion of scepticism when initiating the discussion of waste management plans with the directly involved staff, due to long and unfruitful experiences with not implemented “plans in the drawer”.

In **Egypt**, there is presently no requirement for municipal or regional waste management plans. Planning for waste management is done at national level through the Executive Implementation Plan developed in 2005 to strengthen the implementation of the 2000 strategy.

The plan includes costs for implementation of waste management activities in each governorate. The local beautification plan in Qena was a local initiative unrelated to the national strategy that managed to transform waste management in Qena. In Surat, the local objectives for cleaning the city were set locally as a high priority when the city faced the pneumonic plague attributed to poor waste management.

In **St. Lucia**, in 2004, together with the introduction of the Waste Management Act, a Waste Management Strategy was developed for the island, but it was never implemented. The strategy was developed through a technical assistance project financed by the World Bank, and though it has no apparent flaws it lacked political

support. In Castries, St. Lucia, there was a demand in the mid 90's from the tourist industry, specifically the cruise-ship industry and the general public to clean the island and the surrounding environment but there were apparently no local goals formulated for the cleaning of the city.

3.5 Financial frameworks and ownership of assets

Development programmes that provide both capacity building and investment are a powerful catalyst for elevating services to a higher ISWM levels than previously existed. The act of public or development financing treatment and disposal facilities alone cannot guarantee the satisfactory operation of these facilities. On-going commitment to sustaining the operating and maintenance costs, coupled with strengthening of the client and operator functions is key.

The extent to which investment financing is available locally, nationally or from development agencies, or is to be attracted through foreign direct investment is a factor in determining what is possible for the development of the waste management sector in a given place and time. Moreover, the financial rules that govern how municipalities invest, prepare budgets, manage and account for expenditures, and recover the costs of services and infrastructure are critical factors.

Maputo benefited from development financing from GIZ and the World Bank. Finance was provided for capacity building of the municipality, in addition to buying equipment and supporting outsourcing of the collection services. Maputo opted for a simple and inexpensive manual primary collection system for the most part of the city. The required operational revenues for the service delivery contracts were shared between the City Council and the World Bank, with gradually reducing contribution from the World Bank over time. Maputo outsourced secondary motorized collection to a large private contractor that was able to make the necessary investment and keep tariffs at affordable rates.

The Municipality of Maputo maintained some equipment to deliver waste collection services in parts of the inner city and other restricted areas. Due to the externalization of services, the fleet of the Municipality has become over aged.

The strategy is to focus on planning and monitoring and increase external service provision, but experience shows that the availability of own equipment is important in emergency situations and in negotiation with service providers. The disposal site is managed and owned by the municipality, for the future sanitary landfill there is no decision yet about the ownership structure.

From the field

Waste is not gold, and public financing (for capital and/or operating & maintenance costs) will always be required for an ISWM system to be sustained.

Matching the scale and sources of finance to the specific investments needed is perhaps the greatest challenge in developing an ISWM system.

A mix of loans and grants offers the ideal solution, but either may be difficult to access unless the framework conditions in a country provide some stimulus and security to investors.

St. Lucia is another case that benefited from multiple sources of development financing firstly from the World Bank, followed by the Caribbean Development Bank and the UK's International Development Agency (DFID).

The equipment bought through the soft loans and grants became the property of the SLSWMA. Following the purchasing of the equipment and construction of the landfill, the SLSWMA was concerned that a private operator was not going to use and maintain the installation and equipment properly and opted to terminate the existing contract and take over the operation of the site.

From the field

As ISWM systems develop, not only do the amount of expenditure increase, but also the diversity of funding mechanisms. The most developed ISWM systems typically have a 'basket' of sources of revenue, some targeting general municipal waste, but others specific to individual waste streams such as packaging, waste electronics, batteries, hazardous waste, waste oils, tyres etc.

In CIGRES consortium, the municipalities or their respective operators own the collection equipment. The collection equipment is financed through a mixture of the state and local budgets. The investment funds for the treatment facility came from the federal government. The Association owns equipment and land of the treatment and disposal facility but depend for investments on national government funds.

The situation is similar in Qena where the investment funds for the vehicles and facilities are provided by a

mix of central government and governorates (regional government). Unfortunately, a culture of reliance on grant financing for equipment tends to under-value the need to ensure that the equipment is appropriate for the specific local application. When equipment fails or is inadequate there is no means for replacement. In Qena Governorate, the NGOs working in the mother villages benefited from initial grant financing support for obtaining the collection vehicles, however they had no funds for replacement. For replacements they rely on subsidies from the government and Qena Governorate.

From the field

Developing budgeting and accounting rules is a key step in developing ISWM systems. Only when current costs and revenues are fully understood can planning new systems and expenditures be established on a firm base.

In Surat, both the collection system operators and the municipality invest in equipment and, depending on the contract, either may own equipment or there may be a shared ownership. Transfer stations and disposal site are municipally owned. Surat Municipality recognized its limitations to re-finance investments and opted for attracting private sector investment. The site of the waste processing facility has been leased for a token price to the investor for 30 years. The investor is owner of the installation as long as the concession contract lasts. The design build operate finance and transfer (DBOFT) type contract for sorting, composting and RDF production seems to have worked out well, but it is creating a competition to recycling and might monopolize the waste stream if the planned increase in treatment capacity is completed.

3.6 From frameworks to local objectives

Solid waste management objectives may arise from the national planning requirements or be part of a local, independent initiative to clean, green or develop the city. Whilst policy and legal frameworks shape the range of options available to a municipality, local concerns trigger local objectives and these, in turn, trigger action.

Local priorities are diverse and can include goals related to physical elements or socio-economic aspects of service delivery depending on what is locally important. Cleaning the cities is the most common local objective. As cities become wealthier and the provision of basic collection services is largely covered, additional objectives come into play, including environmental protection & resource management.

Table 6: Socio-economic context if the primary case studies

	Maputo Mozambique	CIGRES Brazil	Qena Egypt	Surat India	Castries St. Lucia
Population	1,131,149	172,696	235,000	4,500,000	174,000
World Bank of ranking country	Low income	Upper Middle Income	Lower Middle Income	Lower Middle Income	Upper Middle Income

The first priority in terms of waste management is getting waste out of sight, out of the residential areas. This, in itself is often a challenge in places where rapid urbanization is coupled with low-income levels and poor urban infrastructure.

Maputo is an example of this situation, where until 2004 there were only few containers located in strategic places in suburban areas. Within the vast neighbourhoods, home to more than 90% of the city’s population, no waste collection service had historically been provided. Bad road conditions and narrow streets significantly limited access for larger trucks.

Waste management services in low and middle-income countries are as varied as the countries themselves are in terms of geography, climate, economy, society and culture. Economy, demographics, urbanization are linked to problems and priorities in the waste management sector.

Likewise in lower middle income Qena, the main focus of waste management related improvements was the cleaning of streets and extending the service, as dirty streets were perceived as a nuisance and as one of the causes for a deteriorating level of safety in the city.

Maputo Urban district 2 and 3:

There are only few basic infrastructure installations and access is limited for trucks or cars. Many houses can only be accessed by foot.

Commerce is mostly informal and living standards are low to medium. These areas are not slums or informal settlements and home to a large number of inhabitants.

Dirty streets became a problem in a time of political unrest and tension caused by tribal differences in the region. When going to higher income countries or large urban centres that are developing rapidly, the focus of development seem to be shifting from cleaning and collection to resource recovery and disposal.

In St. Lucia, efforts focused on improving disposal as well as cleanliness and waste collection services. St. Lucia relies first and foremost on the tourism industry, so the number one priority was to maintain a high level of cleanliness in public spaces and bays to retain the image of serene, natural beauty that attracts tourists.

Solid waste management has been moved from being a city council responsibility to be the responsibility of the national solid waste management authority, the St. Lucia Solid Waste Management Authority (SLSMWA).

The mandate of the authority is to take over all responsibilities related to municipal solid waste management except for sweeping which remains a municipal responsibility. The Authority is free to choose whether it acts both as client and operator for the delivery of services or it outsources to private sector. SLSMWA has opted to outsource collection services to private operators and to deliver waste treatment and landfill operation services itself.

In CIGRES the main objective was improving resource recovery and improving disposal, this is in part due to the fact that Brazil is a upper middle income country where the first order priorities of collection and sweep-

ing are widely resolved for the urban population and the rest of the system elements come into play.

In Surat, the Indian case study, an integrated approach prevailed to the development of the sector, including all physical elements and at the same time improving management and control.

Though India is ranked as a lower middle-income country, the urban centres in India are experiencing rapid economic growth and urbanization. Therefore in the periphery of the city, representing about 10% of the population, the attention needed to be on extending collection.

At the same time the waste generation rate reached amounts that made resource recovery activities feasible for private investors. Disposal was also improved, Surat being able to attract national funds to invest into sanitary landfills.

Table 7: Local objectives set by the authorities in the 5 case study cities

Maputo Mozambique	CIGRES Brazil	Qena Egypt	Surat India	Castries St. Lucia
Financial Sustainability defined as the objective of full cost recovery without surpassing the economic capacities of the citizen	Resolve the problem of distorted pricing of private actors offering services in a monopolistic fashion;	Regular cleaning of streets	Cleaning the city	Cleaning the public spaces and bays that are damaging the tourist industry
Full collection service provision	To improve waste treatment and disposal facilities;	Regular collection of waste	Economic and efficient service	
Promote recycling	To increase efficiency of resource use	Increased employment, social inclusion		
Improve disposal				
Citizens actively involved in improving waste management services				

In-depth case study - Qena, Egypt

The case study reflects the situation not only from the city of Qena but also from Qena Markaz, one of the nine Markaz comprising Qena Governorate. Qena City is the largest city and capital of Qena Governorate. Within Qena Markaz, there are sub-levels of administrative division: Qena City; 7 mother villages (semi-urban areas); 17 satellite villages; and 210 smaller settlements. The population of Qena Markaz is about 530,000, while in Qena there are more than 200,000 inhabitants.

In order to improve social conditions, Qena governorate administration launched an ambitious programme for beautification and cleaning of the city ten years ago, aiming at improvement of the city infrastructure and the introduction of regular cleaning of streets and collection of waste from households. Due to this, Qena was referred as an exemplary city in Egypt, obtaining the ISO 14001 certification. Qena city is predominantly a municipal model, where the client and operator is the municipality for the city of Qena (Egypt). In the semi-urban areas, NGOs deliver waste collection service. The revenue collector for the fees is the Electricity Company in Qena city and the NGOs in the semi-urban areas.

Waste management profile:

When the existing waste management scheme was adopted a decade ago, it was directly linked to improvement of social conditions in the city, including increase of employment. Many people became employed at low salaries to implement the city cleaning and beautification plan.

Municipal solid waste collection, transportation and disposal are responsibilities of governorates and local government units. Waste remains in the public domain of services provided to the population, whenever and however the administration can afford to provide them. Political upheaval, which the Revolution of January 25, 2011 brought to the country, has had its impact on Qena as well. Since then, people became increasingly reluctant to pay for the utility services they receive from public authorities. Collection of a waste collection fee has dropped dramatically and thus the system, which used to be partially state-subsidised, became predominantly state-subsidised.

Waste collection in Qena Markaz is performed without containers. There is a Governorate decision prohibiting the use of containers due to bad previous experience. At present, the waste collection is directly linked with street sweeping as people are delivering their waste to the street sweepers. The entire population of the City of Qena city is covered by waste collection. These services are provided by the municipality in Qena city and by three NGOs in 3 mother villages. At the moment, there is no waste treatment; a composting plant was constructed in Qena in 2001, but it's no longer functioning due to lack of interest from farmers to buy ready compost. The site, where composting took place, is currently used as a dumpsite, with limited separation of recyclable materials – plastics, cardboard, glass, metal and textile.

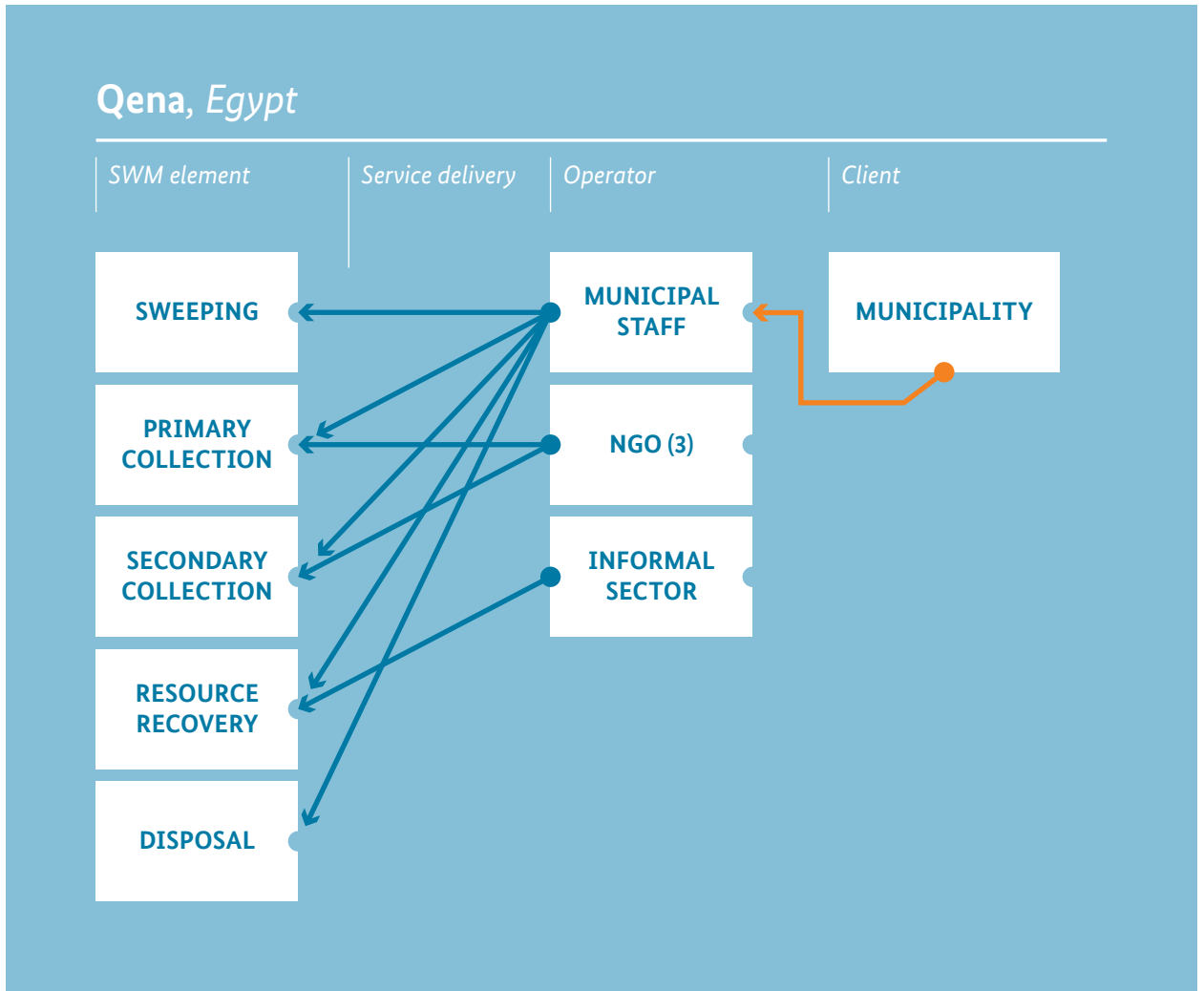
Disposal of municipal waste is currently conducted in two main open dumpsites in Qena Markaz and additional smaller open dumpsites that serve villages. Dumpsites are not managed and fires are common

Qena authorities have not, to date, pursued the involvement of the private sector in delivering waste services to the population. There are no apparent prejudices on the part of the authorities on private sector involvement although there is a sense that their involvement would result in higher operating costs.

Table 8: Qena Waste management performance indicators

City Country		Qena Egypt	
G1	Country income level	World Bank income category Lower-middle income	GNI per capita \$3,000
G2	Population of city	Total population of the city	530,000 (Markaz) 210,000 (the city)
G3	Waste generation	Total municipal solid waste generation (tonnes/year)	Approx. 38,000 t/yr in the city 80,000 t/yr total
No	Category	Indicator	Results
Key Waste-related data			
W1	Waste per capita	MSW per capita (kg per year)	180 kg/cap/yr in Qena City 150 kg/cap/yr in mother villages (semi-urban areas); 110 kg/cap/yr elsewhere
W2	Waste composition	Summary composition of MSW for 3 key fractions – all as % wt. of total waste generated	-
W2.1	Organic	Organics (food and green wastes)	50 - 60%
W2.2	Paper	Paper	8 - 12%
W2.3	Plastics	Plastics	10 - 15%
Physical Components			Traffic light code
1	Public health – Waste collection	Waste collection coverage	64% in Qena markaz ● ●
1		Waste collection coverage	100% in Qena City ● ●
1Q		Quality of waste collection service	Medium-High (65%) ● ●
2	Environmental control – waste treatment and disposal	Controlled treatment and disposal	0% ● ●
2Q		Environmental quality of waste treatment and disposal	Low (20%) ● ●
3	3Rs – reduce, reuse and recycling	Recycling rate	<5% ● ●
3Q		Indicator of the ‘quality’ of 3Rs provision	Medium/Low (25%) ● ●
Governance Factors			
4U	User inclusivity	Degree of user inclusivity	Medium/Low (35%) ● ●
4P	Provider inclusivity	Degree of provider inclusivity	Medium/Low (35%) ● ●
5F	Financial sustainability	Degree of financial sustainability	Medium (42%) ● ●
6N	Sound institutions, proactive policies	Adequacy of national ISWM framework	Medium/Low (29%) ● ●
6L		Degree of institutional coherence	Medium/Low (37.5%) ● ●

Figure 10: The relations between the client and operator in Qena, Egypt in-depth case study



In the case of Qena we observe a waste management system with a well-developed collection system in the major urban centre of the Governorate (Qena city, and Markaz), but very limited collection service coverage outside of these areas, poor standards of waste disposal, and low 3Rs performance despite the existence of an old (broken down) composting plant. Distance from the business network of informal recyclers, is an additional factor in the low 3Rs performance.

This is a case of a municipal system performing well in the context of other Egyptian cities/Governorates, but struggling due to a lack of policy, legal, financial and institutional framework at the national level.

Qena is one of the cleanest cities in Egypt, and regarded within the country as an example of best practices. However, waste management in Egypt is commonly only viewed as waste collection and informal recycling, with waste disposal, 3Rs and governance factors under-represented.

Egypt's revolution has brought political change to the country. An initiative of the Government of Egypt, supported by KfW/GIZ/EU, is underway to address the lack of national framework for the waste management sector. It will be interesting to see how Qena's waste management system is performing in a few years time.

4. Service arrangements

4.1 Learning from diversity

Although on first glance the way we experience waste management services seems obvious, something we come to rely on and expect, in practice the way they are delivered are rather dependent on where we live.

In this Chapter we look in detail at the service arrangements from the primary and secondary case studies, presenting some of the diversity of practical arrange-

ments that have been put in place for ISWM around the world. **We are specifically looking at the arrangements and interactions between the client, service provider and revenue collector, as they relate to the practical delivery of services.**

4.2 Collection and transfer

4.2.1 Methods of collection

In this section we illustrate some of the ways in which waste collection and transfer is organised.

The term waste collection is used in its broadest sense, including all physical and mechanical activities undertaken in order to remove waste from the point of waste generation, and move it to the place of transfer, resource recovery, treatment or disposal.

We include street sweeping as a part of waste collection. This is helpful because in many parts of the developing world the services of street sweeping and waste collection are one and the same thing.

We can differentiate among three basic contract types that lay down the rules of cooperation, divide responsibility and ownership quite differently:

- **Service contracts**
- **Concession contracts**
- **Joint Ventures**

Inside these main types of contracts there is a lot of variation, depending on factors such as scope of activities, bidding process, length of contract, performance monitoring, service payment methods, and enforcement methods.

It is important in the context of developing waste management systems to distinguish between **primary and secondary collection**. Primary collection is the service

of collecting waste from door-to-door or block-to-block, and transporting it to a physical location where it can be picked up by 'secondary collection' vehicles, for more distant transport.

From the field

Door to door collection, and separate collection, is always a good practice, especially as it gives extra-service to people and allows valuable materials to be separated at source. Whether this is possible is constrained by practical realities, but it is one of the most important service elements to focus on.

Door to door waste collection is one of the few public services that provides a frequent, regular and face-to-face contact between citizens and municipal services. Primary collection is therefore both an opportunity to demonstrate good governance and a conduit for environmental communication.

In other systems waste collection is organised as a **one-step service**, either because waste is delivered to communal containers or collection points by the waste generator themselves (with no primary collection

service provider employed for this task) or because the service provider goes from door by vehicle and transports directly to a transfer station, resource recovery facility, or landfill.

There are several methods of collection that may be used to carry out either primary collection or one step collection. The methods are different based on how they interact with the user (Coffey and Coad, 2010):

- *Communal collection* where waste generator takes waste to receptors at fixed locations in the neighbourhood or locality³;
- *Block collection* where a vehicle travels a regular route at pre-determined frequencies and alerts waste generators to bring their waste to the vehicle;
- *Door-to door collection* where the service provider collects waste at pre-defined frequencies directly, from the premises of the waste generators;
- *Kerbside collection* where waste is stored in standardised containers and taken out to the kerb for collection at pre-defined frequencies.

In all of the primary cases studies, collection coverage is above 90% in the urban areas and low to non-existent in the rural areas. In all cases service arrangements for collection are operated at the district level.

In terms of method of collection total, 46 different types of collection systems have been identified in the total of 28 case studies analysed, illustrating the wide diversity of different practical systems applied in the different districts of the cities. Kerbside collection is a rarity; communal collection and block collection are more common, especially for lower income areas with poor infrastructure areas.

³ In this book we define PSPs in the broadest possible sense, including any operator models in which the private sector has a role in service delivery and/or financing equipment and infrastructure.



Cartoon 3: Diversity is beautiful, not only biodiversity but also diversity of operators.

The following tables present the methods of collection used in the primary and secondary case studies. The primary case studies present a lot of variety, as several collection methods may be done manually or with motorized equipment, various solutions are used as collection points and in some districts both primary and secondary collection is needed while in others collection is done in one step.

From the field

The best operator model is what works well in the local situation. Fine judgements need to be made to determine which of the available service arrangements are most attuned to the local dynamics. If it works, don't fix it!



Photo 1: Block collection performed in suburban areas of Maputo (© GIZ-AGRESU)

Table 9: Comparison of solid waste collection methods (Coffey and Coad, 2010) (Adapted from the original)

Description	Communal collection	Block collection	Kerbside collection	Door-to-door collection
Householder cooperation in carrying waste bins or bags	Yes	Yes	Yes	No
Householder cooperation in emptying waste bins	Yes	Optional	No	No
Level of service	Low	Fair	Good	Good
Frequency of the service	Daily or every 2nd day	Every 2 or 3 days	> 1 per week	Daily to 1 per week
Collection cost per household	Low	Medium	High	Very high
Potential for direct measurement of collected waste per household	Low	Low	High	Low/ medium

Table 10: Methods of collection in the primary case studies

Case studies	Districts	Primary collection	Collection point	Secondary collection	Transfer station
Maputo	Maputo inner city		1.1 - 2.5 cm containers	Motorized communal collection	
	Maputo residential inner city	Motorized door to door collection in one step			

Case studies	Districts	Primary collection	Collection point	Secondary collection	Transfer station
	Maputo suburban areas	Manual block collection	large containers	trucks	
	Maputo Catembre rural area	self-service	unmanaged drop-off point	Motorized communal collection	
CIGRES	CIGRES urban area		1.1 - 2.5 cm containers	Motorized door to door collection in one step	
Qena	Part of Qena East	Manual block collection	collection trucks	trucks	
	High income Qena East	Manual door to door	collection trucks	trucks	
	Qena West	Manual door to door	collection trucks	trucks	
	Qena semi-urban areas	Motorized door to door collection in one step			
Surat	Most of Surat city	Motorized door to door	large containers	trucks	transfer station
	Surat low income areas	Motorized and manual block collection	collection trucks	trucks	transfer station
St. Lucia	St. Lucia (Castries)	Motorized door to door collection in one step			
	St. Lucia (other)		large containers	Motorized communal collection	

The Table below provides an overview of the diversity of collection systems within the primary and secondary cases. Table 11 shows the different primary and secondary cases that employ door-to-door (primary), kerbside (with individual containers), communal points (roadside communal containers) and block collections (neighbourhood collection points).

Table 11: Diversity of collection systems in primary and secondary cases

Door-to-door	Income level	Road Infrastructure
Yaoundé (Cameroon)	Lower-middle	Good or accessible in the centre
Bishkek (Kyrgyz Republic)	Low	Good in the city centre
Benin	Low	Good
Accra (Ghana)	Lower-middle	Good in the city centre
Belo Horizonte (Brazil)	Upper- middle	Good in the city centre
Curepipe (Mauritius)	Upper- middle	Good
Dar es Salaam (Tanzania)	Low	Good in downtown area
Lusaka (Zambia)	Lower-middle	Good in the Franchised areas

Door-to-door	Income level	Road Infrastructure
Nairobi (Kenya)	Low	Good for motorized vehicles
Kolkata (India)	Lower-middle	Good
Managua (Nicaragua)	Lower-middle	Good

Communal points	Income	Road Infrastructure
Bahrain	Upper-middle*	Good
Chongqing (China)	Upper- middle	Good
Kunming (China)	Upper- middle	Good
Yaoundé (Cameroon)	Low	Poor outside the centre (30% paved roads)
Accra (Ghana)	Low	Poor in suburban areas
Belo Horizonte (Brazil)	Lower-middle	Poor in suburban areas
Dar es Salaam (Tanzania)	Low	Poor in suburban areas
Lusaka (Zambia)	Low	Poor
Nairobi (Kenya)	Low- Middle	Poor
Bishkek (Kyrgyz Republic)	Low	Poor in suburban areas

* High according to WB data but used as Upper middle within this source book due to similarity of local conditions to other upper middle income countries.

Kerbside	Income level	Road Infrastructure
Belo Horizonte (Brazil)	Upper-middle	Poor in suburban areas
Nairobi (Kenya)	Lower- Middle	Poor in the suburbs
Maputo (Mozambique)	Low	Poor in the suburbs
Tangier (Morocco)	Lower-middle	Accessible
Varna (Bulgaria)	Upper-middle	Good
Ghorahi (Nepal)	Low	Poor

Block collection	Income level	Road Infrastructure
Ghorahi (Nepal)	Low	Poor
Bamako (Mali)	Low	Poor
Tangier (Morocco)	Lower middle	Good
Nairobi (Kenya)	Low	Poor
Quezon (Philippines)	Lower-middle	Poor in suburban areas

4.2.2 Street sweeping

Sweeping is mostly done manually in developing countries either by municipal staff or in PPP arrangements.

There may be different service arrangements in different parts of the city depending on the desired level of cleanliness, such as involving the participation of citizens or closing contracts with operators providing motorized sweeping services

Sweeping is often contracted out together with the collection service to private operators as shown by the secondary case studies

Street sweeping and litter control is the waste management service that we come to rely on and should most appreciate. In many parts of the world we see people working hard to sweep and keep our streets clean. These are the unsung heroes of any waste management system.

Sweeping is the job of picking up the debris that people leave behind. In our cases, sweeping is largely conducted manually. Work is performed daily. Sweepers often work in two shifts, during the day from early morning to late evening.

Depending on where you live, sweepers use handcarts and bins or wheelbarrows, brooms and shovels, or pieces of cardboard to scoop up debris. The distance a sweeper can cover in a shift varies depending on the situation, the littering habits, road conditions, and aptitude of the worker. The accepted norms in the in-depth case studies are that one worker will be able to sweep between 0.2 and 2 km of road per day.



Photo 2: Sweeping performed at night in Surat
(© Sanjay K Gupta)

From the field

People who sweep the streets work extremely hard to make our living environment clean, but are not always socially recognised or shown respect for the work they do.

Most of the time sweeping is done as a stand-alone activity but in Qena it is done together with the collection service by municipal staff, as there are no containers on the streets. Road infrastructure in Qena has been improving in the last 10 years and now the roads are in good condition. The workers sweep the street and collect the fine fraction waste, placing it into plastic bags in their handcarts. Trucks driving parallel to the sweeper or wait somewhere nearby as the waste is collected from each building in the handcart together with the dirt from sweeping and placed in the open truck

From the field

Sometimes street sweeping is used by the municipal administration with the main motivation to create cheap public jobs for the electorate. Needless to say that such political opportunism does not always deliver professional services and public cleanliness after the elections.

In the primary case studies, next to the municipality other service providers participate in restricted areas. Citizens step in to clean areas outside of the inner city in the member municipalities of CIGRES in Brazil. Citizens

Association, the so-called Residents Welfare Associations, take this role in some areas in Surat.

Common operator model (com) type 1: Street sweeping by municipal staff

Workers hired by the public authority to sweep the streets, picking up debris, litter, forming and clearing piles of waste left on the street, and placing the material into containers or collection vehicles. From our cases, this is the most common sweeping operator model, and is an activity that employs a lot of people.

In the primary case studies, next to the municipality other service providers participate in restricted areas. Citizens step in to clean areas outside of the inner city in the member municipalities of CIGRES in Brazil. Citizens Association, the so-called Residents Welfare Associations, take this role in some areas in Surat.

com 2: Sweeping through Residents or Resident Association.

Public authority delegates the client function to residents associations, who make their own arrangements to hire CBOs or individual sweepers. Alternatively residents get involved in cleaning the streets they live on.

In Surat private service providers are contracted for the mechanical sweeping of dust and soil on the most congested roads and busy market areas at nighttime. Manual sweeping of the inner city commercial areas and littering hot spots is done at nighttime, and early morning. Sweepings are discharged onto containers placed in different parts of the city or brought to collection points or transfer stations directly. 600 Citizens Associations have entered into service contracts with the Municipality to provide cleaning services.

com 3: Street sweeping contracted to micro-service providers.

Private companies, NGOs or CBOs are hired to sweep the streets as a singular service item (ie. not tied to a collection contract), and contracted to serve specific zones. Quality of the work overseen by the municipality.

Sweeping is usually a municipal responsibility and may be done as a municipal service, or contracted out separately or together with the waste collection service. The only exception to this of the reviewed cases is that of Lusaka, where sweeping is under the responsibility of the National Roads Board and is therefore handled separately from solid waste management.

In most of the in-depth case studies it is provided as a public service except for the city of Castries, where multiple micro-contractors are engaged. The city ensures this service with the impressive number of 73 contractors, who each employ 3-4 staff to carry out this work in their respective areas. In the three semi-urban areas of Qena, sweeping is done by an NGO.

Of the secondary case studies there are similar arrangements with a fewer number of contractors in Kunming (China) and Nairobi (Kenya). Among the service providers are micro-enterprises and community based organizations. In the secondary case studies Bishkek (Kyrgyzstan), Varna (Bulgaria) and Yaoundé (Cameroon) the service is provided under the main contract with private contractors for collection.

com 4: Street sweeping contracted to a medium size or large company.

Private companies hired to sweep the streets as a singular service item and contracted to serve specific zones. Quality of the work overseen by the municipality.

4.2.3 Primary collection

Primary collection services lend themselves to small-scale service providers, as providing the service is non-capital intensive. Smaller service providers, such as NGOs, CBOs and Citizens Associations, are typically best at delivering primary collection services.

Community based primary collection is an effective way of extending collection coverage to low-income areas within cities which may be difficult to access with larger collection vehicles, and peri-urban communities. Flexible community-based primary collection can be very effective in improving collection service coverage, and improving equity of service provision.

The interface between the primary and secondary collection services is a vital point of intervention in the design of a waste management system. The overall quality and efficiency of the service, and the health impact to communities and workers, depends upon getting this right. Without a well functioning interface, the collection/transfer points can often become inner-urban dumps.

In many developing cities, regular and reliable waste collection services are only provided for the city centres or the wealthier districts. Extending collection services to all areas of the city is a challenge and a priority. In many cities considerable success has been made through involving micro-service providers in extending primary collection services to low and middle-income districts of the cities.

Micro-service provider (MSP) is a collective term introduced to refer to all the micro-entrepreneurs engaged in primary collection and include Community Based Organizations (CBOs), Residents Associations, local NGOs and CBOs or informal sector service providers, such as informal collectors or itinerant waste buyers (IWB).

com 6: Primary collection by micro-service providers (MSPs) as a singular service item, with revenue collected by the MSP.

Micro-scale service providers are franchised to provide primary collection/door to door services, and collect a small service fee from the door. The micro-service providers commonly include residents associations, NGOs or CBOs. They may work under supervision or memorandum with the municipality, or completely informally.

Primary collection is an important service-element for most developing cities. It is practiced in 4 of the 5 cities studied; only the member municipalities of CIGRES do not have primary collection as a distinct service element. Furthermore, 17 out of the 23 secondary cases have primary collection in certain city districts or the entire city.

In Maputo the local council enters into contracts with MSPs. In the suburban area, which makes up the largest part of the city, 43 MSPs are active in primary collection. The service is divided into 43 separate zones (one for each neighbourhood) with contract values depending on size and accessibility of each area. The annual value of all contracts combined is approximately 1.1 Mio USD.

Primary collection services exist as a distinct service element in most of the secondary cases studied. In Kunming (China), Bamako (Mali), Bishkek (Kyrgyzstan), Yaoundé (Cameroon), Dar Es Salaam (Tanzania) and Lusaka (Zambia) to name a few.

From the field

In some cases, manual collection is the only way to bring waste collection services to the households, as in the case of neighbourhoods only accessible by wooden walkways in flooded urban areas (Amazon region, Brazil)



Cartoon 4: Sometimes micro-scale service providers need support, training and caring just like small fish need nurturing to grow.

In the case of Dhaka, availability of credit, and a culture of NGO driven development, helped to catalyse the expansion of primary collection services. Scaling up from a micro-operator ‘franchise-type’ model in which providers are able to service a particular zone, with regularity and some security, proved very successful in expanding primary collection coverage.

Primary collection services also sometimes emerge as special arrangement (offshoots) or one-step collection arrangements, e.g. Nairobi (Kenya) where primary collection services are personalised to “special clients” who are willing and able to pay.

From the field

A key issue in designing primary collection service is who collects the revenue to sustain the service? The municipality can play an important role by defining service areas, tendering and monitoring service quality; however, if the revenue is to flow through the municipality then it must adopt good governance principles in particular ensuring that the collected money actually goes to the MSPs and is not siphoned off for other purposes.

The main differences between the types of primary collection system used relates to who collects the revenue

for the service, ie. whether payments are made direct to the MSP in cash at the door, or whether the municipality collects the revenue and pays the MSPs. For the latter, the contractual relationship between the municipality and the MSPs needs to work, ie. franchise-type agreements need to be in place which both ensure that services are provided, and that revenue collected actually gets to the MSPs. This is one of the most important aspects of good governance that needs to be focused on in the development of ISWM systems.

com 7: Primary collection by micro-service providers (MSPs) as a singular service item, with revenue collected by the public authority.

Micro-service providers are contracted to provide primary collection/door to door services, and are paid for the service by the public authority. The micro-service providers commonly include residents associations, NGOs or CBOs. They work under supervision of the public authority.

The transition from Neighbourhood collection to door-to-door collection method is best illustrated by the example of the suburban areas of Maputo. A similar transition happened in the low-income areas of Surat and in many of the secondary case studies.

Maputo: transition from neighbourhood to door-to-door collection in the suburbs

Until 2004 there were only few containers located in strategic places in suburban Maputo, mostly formal or large informal markets along the main access roads to the city. Within the vast neighbourhoods, home to more than 90% of the city's population, no waste collection service had historically been provided. Bad road conditions and narrow streets significantly restricted access for larger trucks. Therefore, people usually buried or burned their waste, or dumped it in open spaces, drainage channels or gullies.

By 2011, following an intensive period of development cooperation supported by GIZ and the World Bank, waste from all households in the neighborhood was collected door-to-door with handcarts. The primary collectors deposited the collected waste into large containers (usually 12 m³), placed along the main roads or in accessible locations within the neighbourhood.

Suburban neighbourhoods are now serviced twice a week. The collection teams consist of one or two collectors with handcarts. Each team has its designated daily route and collectors use whistles to announce their arrival. Residents living in less accessible houses are required to carry their waste to the primary collection point and wait if necessary for the collectors to pick up their waste.

There are two systems of pre-collection in place. Either the collectors distribute 25kg durable plastic sacks (eg. as used for rice) and exchange full bags with empty ones, or people bring their waste in their own receptacles. The waste is then transferred into the plastic sacks and the owner takes back its receptacle.

When the cart is full (capacity between 180 to 250kg, depending on distances and road conditions), the primary collectors move to the next available large container and empty the sacks there. The average productivity is 900 kg per collector per day. But, specific characteristics of each neighbourhood have a great influence on the amount of waste each worker can collect and transport.

Density, road conditions (sandy roads are slow), distances to the containers and in between houses as well as the landscape are key factors taken into consideration in the design of each collection route. Secondary collection vehicles collect the large waste containers and deliver to the municipal dumpsite. The containers have usually a capacity of 12 m³, with low sidewalls (< 120 m³) to facilitate loading. Some areas required smaller, more flexible containers and are serviced by 6 m³ Skip bins.



Photo 3: Door to Door Collection with residents emptying waste baskets in Surat (© Sanjay K Gupta)



Photo 4: Truck with trailer used for primary collection in CIGRES (© Thilo Schmidt)

Primary collection services are not only provided by MSPs. In the low income areas of Surat that make up about 10% of the town, the medium size contractors provide a differentiated primary service either through small size motorized vehicles or with manual equipment. The main contractors may subcontract a primary contractor or may carry out this service with its own employees.

The municipality itself also sometimes carries out primary collection services. In Qena, municipal staff provides the primary collection services. It is also done through the door-to-door method, but in a different way.

com 8: Primary collection by medium-large private service providers together with secondary collection.

Medium-large scale private operators provide primary collection/door to door services, as an integral part of the overall waste collection service. The private operator may sub-contract this work out to residents associations, NGOs or CBOs, but remain contractually responsible for the service provision.

com 5: Primary collection by the public authority together with secondary collection.

The public authority provides primary collection/door to door services, as an integral part of the overall waste collection service.

4.2.4 One-step and secondary collection

The municipality, SMEs or larger companies usually provide the more capital-intensive parts of the collection service, as they often demand use of motorized vehicles, and a supporting financing, management and maintenance infrastructure.

The more capital-intensive secondary collection or one-step collection services are, the more commonly the service is provided by fewer/larger companies. Longer-term contracts (5 years or more) are usually beneficial when the private operator is required to make significant investments as they allow up-front investment to be recovered.

There are cases that support the view that private sector participation makes the service more cost-effective, especially if there are good contracts in place, and bidding conditions that foster competition. On the other hand keeping the service public (or provided by municipal companies) may bring advantages as profit is not factored into the costs and services may be exempt from VAT.

In many parts of the world, the logistical realities offer the potential for waste to be collected from or close to the door. In these cases the type of waste collection system needed corresponds to what we have defined as a one-step system. In such cases there is no need for primary collection.

The secondary collection service begins where the primary service ends, ie. at the communal containers, collection points or transfer stations. The technical solution for secondary collection is very similar to the one-step collection services. In both cases motorized equipment is used to collect waste and transport from the source of waste generation to the place of transfer, processing, treatment or disposal. The operator models are also similar.

In the high-income residential areas of Maputo, a company under contract with the municipality provides the one-step collection/secondary collection service. One large, foreign, company is contracted.

In the city of Castries waste collection services are contracted to local companies chosen through competitive bidding. The contracts are for 5 years and area based, the city of Castries being divided in 4 collection zones. The contracts, managed by the SLSWMA, include clauses for control and monitoring and specific standards for cleanliness. One-step (door-to-door) collection services are provided in the areas where there is a paved road, typically higher income areas and town centres. In the towns of St. Lucia there are some areas where the trucks can't reach, but these are covered through the communal collection system by placing containers of various sizes in places that are easily accessible to residents, no

more than 200 m walking distance from their house. The waste collection contracts were developed with support from DFID and the World Bank. This form of contract has been broadly implemented throughout the OECS.

From the field

Quality of collection services will be improved by bringing the drop off point as close as possible to the waste generators. But this needs to be balanced with cost-effectiveness and affordability considerations.

com 11: Secondary/one-step collection with medium-large companies under service contracts with and paid for by the public authority.

The public authority contracts out the provision of either one-step services or the secondary collection service to a PSP, and pays for this service. The public authority owns part or the whole of the assets, and leases these for the use of the PSP contractor.

Concession contracts are a variation of the service contracts, where the responsibility of investment and ownership of equipment is shared. This is a type of arrangement that was very common Eastern European cities before the EU grant financing was mobilized for

investment. Middle sized companies had a high interest to enter these markets and offered beneficial concession type agreements to public authorities. After EU grant financing was rolled out, this type of arrangements were less attractive to public authorities, since they had their own equipment and it was better for them to go for service contracts.

com 12: Secondary/one-step collection with medium-large companies under concession contracts with and paid for by the public authority.

The public authority grants a PSP the exclusive right to operate, maintain and carry out investment for one-step services or secondary collection service, and pays for this service. The private operator is required to make and sustain the necessary investments in collection vehicles and other equipment.

To illustrate the one-step collection system, it is interesting to learn from Surat where 5 medium size companies deliver the service in 5 districts of the city. In more than 90% of total municipal area waste is being collected through door-to-door service and is transported to containers and transfer stations in the respective zones. The contracted operators deliver one-step collection service in most of the city and primary plus secondary collection in the more difficult to reach peri-urban areas. The system uses mixed vehicle types matching the road conditions. Coverage of number of households is between 1,000 and 1,500 per vehicle per day.

Interestingly, a one-step collection system is used in the semi-urban settlements in Qena and rural area of Maputo. The reason for the motorized door-to-door collection in the semi-urban settlements of Qena is likely related to less dense population and housing structure. The service is being delivered by an NGO that received collection vehicles through donor financing.

From the field

Secondary or one-step collection is capital intensive, and in order to function effectively, needs a well-managed and well-resourced operator.

In rapidly developing cities it is often difficult for investment in secondary collection systems, and the institutional/management capacity supporting them, to keep pace with the pace of urbanisation.

Look to the private sector as an additional source of investment, but don't expect a 'free lunch'. Contract conditions and durations need to be attractive.

Six of the secondary case studies reviewed used direct contracting for engaging the private sector in waste collection namely Accra (Ghana), Bahrain, Benin, Dar es Salaam (Tanzania), Quezon (Philippines), Varna (Bulgaria) and Tangier (Morocco) and revealed a mixed level of success.

One-step collection is also used in the member towns of CIGRES where it is being provided either by a large company or by the municipality. In Maputo, the municipality services the rural area of Catembe, using trucks with trailers. The area has only one access road to it, as it is situated in a bay, and the infrastructure is poor in the area. The collection points where people bring their waste are unmanaged plots of land.

Collection in the secondary case studies is generally done through varying levels of private sector involvement alongside the municipality or through a purely public service or a combination. Delivery by commercialised public enterprises and the inter-municipal structure was found in the minority of these cases.

com 9: Secondary/one-step collection by the public authority.

The public authority provides either a one-step or the secondary collection service. The service costs come out of the public authority budget, and revenue is collected via taxation systems and/or government subsidy. This OM type is also very common throughout the world.

com 10: One-step or secondary collection service by a public enterprise.

The public authority establishes a public company or enterprise to provide the services. Revenue is collected via taxation systems and/or government subsidy, with billing either managed by the enterprise or via the public authority. Establishing public companies is sometimes used a first step in a gradual process of privatising/commercialising collection services.

Joint ventures may be formed to carry out waste management services. In Eastern Europe, one of the strategies for gaining market share for middle sized Western European waste management companies has been to buy shares in communal service companies or create special purpose vehicles through PPP.

In Timisoara (Romania) an association between Timisoara State Owned Public Utility Sanitation Company and RER-RWE Entsorgung Germany established RETIM, a 50/50% Joint Venture Company delivering waste management services. The company still performs waste management services in the city, implementing one of the most successful selective collections systems in Romania. It has evolved into a solid collaboration between the two sides. RER provides the know-how and the reliability of a German company specialized in waste management and the municipality has the experience of waste management in the local conditions.

com 14: One-step or secondary collection service carried out by joint venture public/private companies.

This is an emerging model type in developing countries, whereby joint venture companies are established between the public authority and a PSP to provide collection service, and pays for this service. Different shareholdings can be seen – from 51:49% to 10:90% public: private. This OM type is often used as a means of bringing investment and expertise into the service, whilst preserving a public service character and level of decision-making authority in the hands of the municipality.

com 13: One-step or secondary collection service carried out by private service providers under a franchise or open competition model.

Private service provider is licensed/franchised to provide services, and granted the responsibility and right to collect their own revenue from municipal waste generators, e.g. apartment blocks, individual households.

In Accra (Ghana), a Canadian–Ghanaian joint venture was contracted to deliver waste collection services in the capital. In this instance the government interfered in local government affairs because of a growing indignation about the failure of the Municipality to adequately deal with the mounting problem of waste despite modest improvements made through its privatisation policy. The joint venture company was under no obligation to engage the infant local waste collection industry; nevertheless it has sub-let several areas to well-performing local contractors.

In many parts of Eastern Europe, franchise/open competition type operator models are in place whereby a private service provider is licensed to provide services,

and granted the responsibility and right to collect their own revenue from waste generators. The franchising arrangement is when the operators are granted exclusive access rights to certain contiguous geographical zones in the urban areas, and the open competition model is where the operators are free to collect waste from any location wherever they can secure revenue/contracts.

The existence of open competition, private-to-private arrangements for service delivery is however limited, in developing countries outside of Eastern Europe. This is confirmed by the fact that out of the 23 case studies reviewed, only Nairobi (Kenya) had this type of arrangement. The franchise contract for one-step and secondary collection services is generally viewed as having limited applicability in developing countries, riddled with many challenges.

4.2.5 Commercial waste collection

Commercial waste is often handled separately from residential waste, this frees up resources of the municipality to deliver a reliable service to the citizens. On the flip side, sometimes combining commercial waste collection with domestic (household) waste collection gives opportunity for cross-subsidy, and lower household waste charges.

As a general principle, commercial waste generators should pay the full costs of the service, including amortisation of equipment and infrastructure, and costs of closure and after-care of landfill. While implementing commercial charging local by-laws are required which specify penalties on those waste generators who fly-tip their waste in order to avoid the payment.

Collection from commercial entities is often organized separately and done in a different system as compared to the residential waste collection service. Collection coverage of over 90% has been achieved in Maputo and Surat, and in Bahrain, Belo Horizonte, Chongqing and Curepipe; places where commercial waste has been separately handled.



Photo 5: Small Vehicles unloading waste at a transfer station in Surat (© Sanjay K Gupta)

com 16: Commercial waste collection carried out by the designated PSP.

Private service provider is granted the responsibility and right to collect commercial waste in a certain zone, collecting their own revenue from commercial waste generators. Where there is no direct taxation for commercial waste collections, the contractors may regard the guaranteed commercial waste collections as a 'sweetener' and bid at lower cost per tonne for the municipal services (thus effecting a similar cross-subsidy but not directly).

In Maputo non-household waste producers above a certain threshold, such as larger commercial establishments, hotels, restaurants or industrial facilities are required to organize their waste collection. The definition of a large waste producer is any institution, commercial establishment, hotel or restaurant and industrial facility that produce more than 25 kg or 50 litres of waste per day. The system has been introduced to legalize and

regulate the existing private service provision and to alleviate the public collection system from a significant waste stream. The system registers private service providers as well as large waste producers. Quantities are estimated based on specific criteria such as number of beds in a hotel, number of employees in a bank or institution, etc.

In St Lucia, any person who conducts industrial or commercial operations is required to make their own arrangements for waste management, and shall ensure that any waste generated does not present a risk to human health, safety or the environment. Further, they are prohibited from the use of waste storage containers used by the residential collection service provider for households in order to avoid abusive use of these by the commercial sector.

In Surat, similarly to Maputo and to St Lucia, some commercial entities are responsible for the collection and disposal of their own waste; these include hotels, restaurants and eating joints. The freed resources would allow for better service provision for households.

In Qena city, demolition and construction waste and commercial waste is a burden for the municipal waste collection system. The city is expanding in the Eastern part with numerous construction activities underway.



Photo 6: Temporary disposal areas in Qena East
(© Borislav Mourdzhev)

For larger commercial waste as well as for construction and demolition waste, there are 3-4 designated areas for disposal in each neighbourhood in East Qena.

com 17: Commercial waste collection by private service providers under open competition model.

Private service provider is licensed (or simply allowed) to provide services, and granted the responsibility and right to collect their own revenue from commercial waste generators.

Businesses also use these designated sites. The municipality does not have enough equipment to service these areas as frequently as required, and are only able to clean the areas only once every several days. As a result, large quantities of waste are piled and become visible. West Qena has less construction and demolition waste and limited spare land to attract such practices

com 15: Commercial waste collection services carried out by the public authority.

The public authority provides combined municipal and commercial waste collection services, and collects the revenue via taxation to cover at the costs. This model enables full cost recovery, and may allow some cross subsidy from commercial to municipal waste services.

4.2.6 Transfer and transport

Transfer stations are used to the economies of scale and practicalities of transporting waste large distances. They may be used as an interface between the primary and secondary collection service, or between the secondary collection and long-distance transport service.

There is a large variety of transfer station designs in use. The most important criteria in designing the transfer station is to ensure efficient and hygienic transfer of waste.

Transfer stations are used to make collection and transport of waste more efficient, optimizing the use of limited technical and financial resources.

Within the primary case studies only the city of Surat uses transfer stations. Historically the transfer stations in Surat were simply plots of land where waste was stored temporarily and loaded manually into larger vehicles for transport. These unmanaged transfer stations caused nuisance due to odour, pests and dust.

To eliminate this problem the municipality constructed 7 semi-closed transfer stations at strategic locations in the city to cover the entire city area. This has helped significantly in eliminating the multiple manual handling of waste and improving the environmental conditions in the surrounding neighbourhoods. Of the 7 municipally owned transfer stations 3 are contracted out to private operators, 4 are still municipally operated but are soon to be contracted out

From the field

Main technical variables to determine economic viability of transfer stations are transport cost, distance and waste volumes. Management aspects of the facility must be observed. In the planning phase, communication with the served and affected population at an early stage is vital to build acceptance and avoid NIMBY attitudes. Environmental impact assessments may also be required during the planning process for these facilities.

The existence of transfer stations was mentioned in 11 secondary case studies. The transfer station designs vary from ramp-based systems, pit-based systems to fully enclosed buildings. Sometimes these are fully equipped for weighing, compaction, separation and processing (Curepipe - Mauritius) other times are quite rudimentary and are not much more than a plot of land within the city limits (Bamako - Mali). The majority of the transfer stations are owned by the municipality and operated by either public or private sector.

An innovative small transfer station (STS), designed to work in densely populated urban areas was pioneered in China during the late 20th Century. These STSs are housed within a building, and work by modified shipping containers being placed into specially prepared 'pits', meaning that primary collection handcarts and collection vehicles are able to discharge their waste loads at floor level. The containers sunk into these pits are lifted by electric winch and placed onto transfer haulage vehicles. Such STSs have been adapted to Vietnam and Egypt, and are now in the process of being implemented in Dhaka (Bangladesh).

com 18: Transfer by public authority or enterprise.

The public authority finances, owns, builds and operates the transfer station(s) either directly or through a public company. Financing of operations is through the public authority budget.

In Hong Kong in the 1990's, a network of transfer stations was designed, built and operated by the private sector, but financed (through competitive tender) by the Hong Kong Government Environmental Protection Department (national authority). The transfer contracts were tendered separately from the both the collection service and the disposal service contracts.

Although not in our case studies transfer stations can also be operator through a concession contract, where the investment into the modernization of the facility and the mobile assets is shared between the public authority and the private operator.

com 19: Transfer services provided by PSP under service contract with and paid by the public authority.

Public authority finances the design, construction and operation of the transfer station, tendering the operations to the private sector, either linked to the collection or disposal service contracts, or contracted independently of these services. The public authority pays for this service on the tonnes handled and owns assets.

com 20: Transfer investment and services by PSP under concession contract with and paid by the public authority.

The public authority grants a PSP the exclusive right to operate, maintain and carry out investment for transfer service, and pays for this service based on the tonnes handled. The private operator is required to make and sustain the necessary investments in fixed and mobile assets.

4.3 Resource recovery

4.3.1 Definitions and activities

Activities aiming at 'closing the loop' and returning both materials and nutrients to beneficial use, through preventing waste and striving for high rates of reuse, materials recycling and organics recovery are included here. The priority of the waste recovery options will be taken into consideration, categorizing reduction (prevention & minimization) and re-use as the best options at the top of the hierarchy, recycling and composting in the middle, and waste to energy or production of refuse derived fuel (RDF) (fitting into resource recovery, because they aim at the recovery of the thermal energy) are placed towards the bottom, above disposal.

Resource recovery is either done as a business because the intrinsic value of the materials ensure a profitable economic activity for private entrepreneurs, or as a subsidized activity or in a market created by extended

producer responsibility and other legislation aiming to protect environment by diverting materials from the landfill to resource recovery activities.

Recycling of ferrous and non-ferrous metals, certain grades of plastic, glass and paper are often managed by recycling businesses independently from authorities relying on formal or informal material supply chains.

The most common resource management activities delivered as part of the formal service are sorting, baling, pressing of recyclables and composting. Incineration, bio-digestion, RDF production and landfill gas recovery are also common throughout the world, but not strongly evident in the cases studied.

4.3.2 Recycling activities by the informal sector

Collection of recyclables is commonly done by the informal sector. Recycling rates achieved by the private, often informal sector, are the highest if encouraged by the municipality and the formal and informal sector are not in competition for materials.

In the primary case studies there is evidence of protection of informal sector rights to operate in waste management in Maputo, since the strategy encourages private recycling activities. Informal sector activities are reported in Qena and St Lucia while in CIGRES, these are tolerated but not encouraged. In Surat, the door-to-door collection in combination with the private treatment facility results in the formal sector capturing the majority of the waste stream, allowing little access to informal sector activities.

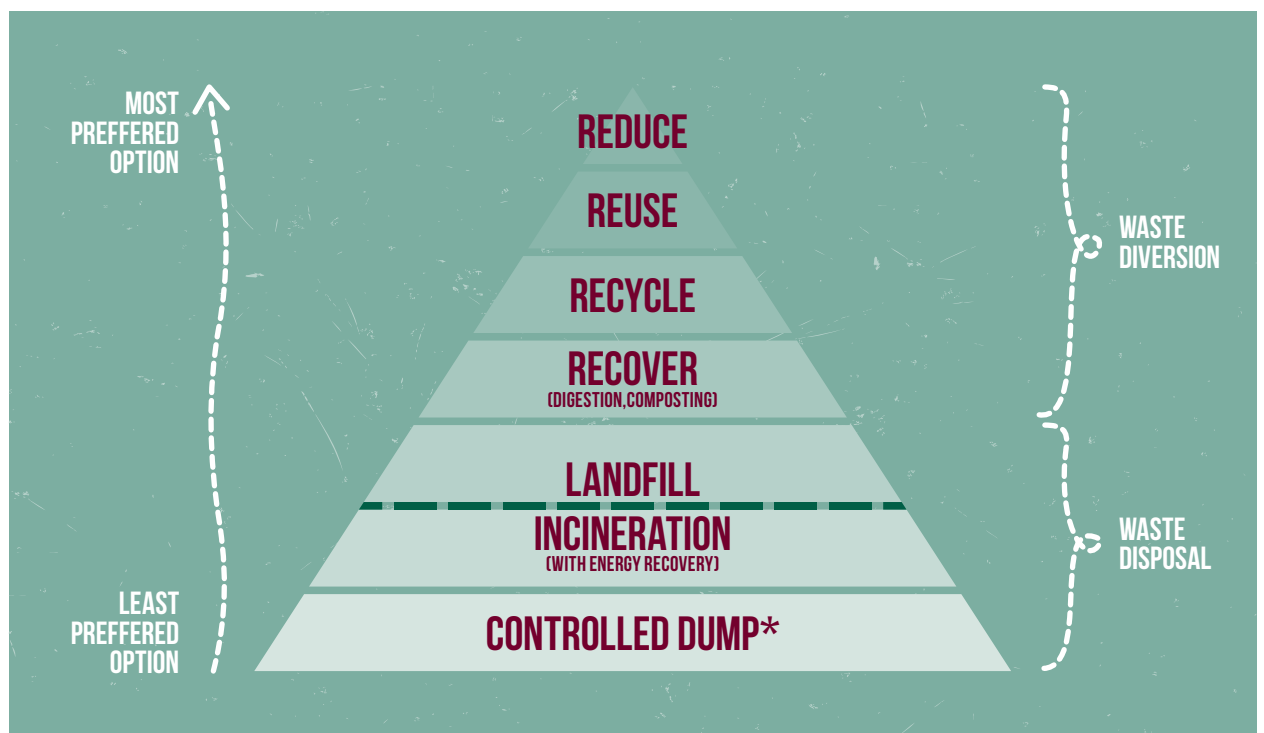
Informal sector activities are estimated to account for about 20-25% in Surat, 20% in Qena city, 20% in St. Lucia and 5% of recycling in Maputo. In Surat the number of informal workers and the amount of materials retrieved seems to be low as compared to other Indian cities. This is likely because of the very high coverage of daily formal door-to-door collection system that does not allow access of informal collectors to waste. It is estimated that

there are around 1500-1700 waste pickers in the city who pick waste from mostly market areas, dumpsites and sometimes from containers. In St. Lucia the activities of the informal recyclers is focused on plastic and rejects from the local bottling plant.

The informal sector in Qena Governorate is active predominantly in collection of waste from electric and electronic equipment (WEEE). It was also reported that in certain villages there are itinerant collectors who are buying up recyclables from households in return for small amount of money. It is difficult to judge the impact of the informal sector in the recycling activities, as there is no exchange of information between the local administrations and the end-users of the collected recyclables.

Perhaps most important is to note that informal sector is the main force behind the recycling activities in most of the secondary case studies reviewed. These include Belo

Figure 11: Waste Management Hierarchy (Hoornweg and Bhada-Tata, 2012)



*As a minimum, waste should be disposed at a “controlled dump,” which includes site selection, controlled access, and where practical, compaction of waste. Incineration requires a complimentary sanitary landfill, as bottom ash, non-combustibles and by-passed waste needs to be landfilled.

Horizonte (Brazil), Bishkek (Kyrgyz Republic), Chongqing (China), Curepipe (Mauritius), Dhaka (Bangladesh), Ghorahi (Nepal), Nairobi (Kenya), Quezon (Philippines), Tangier (Morocco) and Varna (Bulgaria). They retrieve materials from source, at communal points, at transfer points or at disposal sites.

Sometimes formal sector workers engage informally in recovering recyclable materials as was observed in Bishkek (Kyrgyz Republic) where drivers for the municipal enterprise retrieve easily accessible materials from the top of the bins they collect and subsequently sell them.

Their activities are integrated, recognised or dismissed and competed with by the formal waste management sector. The integration of the informal sector depends on policy, tradition, cultural issues, environmental legislation and other local specific factors.

com 24: Collection and sorting of recyclables by the private sector (informal/formal) in open competition.

PSP recyclers (informal or formal) access and extract recyclable materials of value at various points in the waste management chain including door-to-door collection, from containers, transfer stations and disposal sites. The private sector is financially viable based purely on the market value (price at the point of sale) of recyclable materials extracted.

Pune (India) – Integrated model contracted to the informal sector

Prior to 2008, using its own vehicles and labour, the Pune Municipal Corporation (PMC) could only service 7% of households with door-to-door collection. 86 per cent of the municipal solid waste was collected from community bins placed in public areas. Through a contractual agreement with the Pune Municipal Corporation, signed in 2008, SWaCH a cooperative formed by the waste pickers union, KKPKP, started servicing over 360,000 city households with door to door waste collection involving more than 2,100 SWaCH members.

The workers are paid through user fees, and are accountable to the residents as well as the municipality. Waste is segregated into recyclables and compostable (SWaCH has developed a significant operation to turn wet waste into natural fertilizer for public grounds). These efforts mean much less material makes its way to the city's landfill. While the municipality covers administrative costs for SWaCH, purchases equipment (carts, gloves, etc.) and supports health insurance, its costs are far lower than if it had to pay for private collection and disposal. The success of this integrated, decentralized system in one ward led to its expansion into 15 more wards in 2012. For more information go to:

<http://wiego.org/publications/integrating-waste-pickers-municipal-solid-waste-management-pune-india>

Santo André (South-east Brazil)

Source segregation scheme started to be implemented in 1997 by the municipality in partnership with local cooperatives. The city source segregation scheme includes door-to-door collection of wet and dry wastes and a drop-off system. Partnership with coops involves provision of recycling units for cooperatives; collection of recyclables is done by private contractor that takes materials to cooperatives for further processing; one cooperative is also involved in a scheme whereby members collect dry and wet wastes in shanty-towns and the other coop is involved in wood recycling. One of the cooperatives operates in a recycling plant within the city's landfill.

4.3.3 Extended Producer Responsibility

Extended producer responsibility (EPR) - otherwise known as product stewardship (PS) - is an economic instrument that is increasingly being integrated into national waste management policy and legal frameworks.

The concept of EPR is based on recognition that manufacturers, importers and distributors of products, have a responsibility to contribute proportionally to the costs and logistics of managing the waste generated from their product at the end of their consumptive use.

Originating in Europe, EPR has become a major component of EU waste policy, and systems have been implemented for a wide variety of materials streams including packaging and packaging waste, waste electronics and electronic equipment (WEEE), batteries, end of life vehicles, tyres and others.

The concept has been taken up and adapted for implementation by other countries, including Brazil, Tunisia and most recently Morocco, and also been recognised as a promising economic instrument for the waste/resources sector within the Rio+20 declaration, *The Future We Want*. EPR is not so well understood across much of the world, but it is here to stay – as it is an adaptable economic instrument that diversifies the financing sources and operator models employed to tackle global, national and local waste sector challenges.

The specific nature of EPR systems implemented in different countries and for different materials streams varies widely in terms of the operator models employed for practical service delivery. At a basic level of definition EPR schemes may either be managed by producers themselves (or by so called ‘compliance schemes’ on their behalf), or centrally organised by national public authorities (most often the Ministries of Environment or specialised waste management agencies).

com 25: Client and revenue collector functions delegated to extended producer responsibility organisations set up and managed by producers, importers and distributors of goods.

Producers, importers and distributors of goods, e.g. packaged fast moving consumer products, either mandatorily or voluntarily (or both) establish funds and organisational arrangements to support recycling systems tailored to specific materials streams.



Photo 7: Waste being manipulated at CIGRES sorting station (© Thilo Schmidt)



Photo 8: Baled sorted recyclables at CIGRES sorting facility (© Thilo Schmidt)

com 26: Client and revenue collector functions delegated to extended producer responsibility organisations set up and managed by public authorities.

Government imposes a levy or tax on the import of packaging and other materials, with the funds directed to a national recycling fund for expenditure on support recycling systems tailored to specific materials streams.

Within each of these very generic model types, there are a range of variations possible relating to the specific role of municipalities, producers (or their compliance schemes) and waste collection contractors. The municipality, for example may still pay for and organise separate waste collection, but producers responsible for providing sorting services, or the waste collection contractor may provide the service and deliver materials to the compliance scheme. Also, municipalities may or may not retain responsibility for public awareness and promotion, for identifying the location of collection points, for providing containers etc.

In some parts of Eastern Europe and North Africa, recycling system operating under EPR schemes are still dominantly supplied with material by the informal sector, via buy-back centres. Put simply, if material can be delivered to you already sorted at the point of collection then a great deal of costs is saved and consequently a direct payment relationship can be arranged at the street level with the collectors.

The existence of EPR schemes is largely driven by legislation obliging producers of consumer goods to take their proportional share in delivering results, usually expressed in the form of recycling targets. Further background to the range of types of schemes can be found in *Wasteaware Policy Paper 1 – Producer Responsibility for Packaging Waste* and in GIZ's publication *Case Study for Introduction of Economic Instruments for Solid Waste Management in Bulgaria*



Photo 9: Final compost bags ready for sale in Surat
(© Sanjay K Gupta)

4.3.4 Recycling and recovery by the formal sector

Recycling (including separate collection, sorting and sale) is often done together with other elements of treatment, such as composting and RDF production, or as part of mechanical biological treatment plants in the formal system.

Resource recovery facilities through PPP tend to be more efficient than public sector ones. Formal private sector contracts for resource management are usually long term contracts to ensure recovery of investment. They usually work based on guaranteed waste quantities. Resource recovery is also most efficient if there is no competition among technologies for the waste streams.

Though resource management is part of the official agenda of the cities, it's not the most important goal. In low and middle income countries there is often limited public pressure for treatment of waste.

Sorting and recycling are done in Qena, Surat and CIGRES of the primary case studies. In Surat and India, these activities are done in complex facilities. In CIGRES, the facility includes composting and landfilling and is done by a public inter-municipal association. In

Surat the facility includes composting and RDF production and is done by a private company contracted by the municipality.

Table 12: Sorting and recycling in the in depth case studies by the formal sector

	Qena	CIGRES	Surat
Sorting	Manual Sorting	Manual sorting with conveyor belt	Manual sorting with conveyor belt
Recycling	Pressing and baling 1% of input	Pressing and baling 14,6% of input	Pressing and baling 7-12% of input

In the secondary case studies, the existence of a formal sorting and recycling plant is mentioned only in Varna (Bulgaria), showing that recycling activities are not regularly part of the formal waste management system in low and middle-income countries.

Micro-scale contractors are largely absent in formal sector resource recovery. In depth case studies show that resource recovery in the formal sector tends to be a capital-intensive activity done mainly by large companies or the municipality.

A variation of the model when the public authority relies on a franchisee or several franchisees to deliver recycling services may be more cost efficient and reliable, as it is an entirely market driven activity.

com 21: Collection and sorting of recyclables by the public authority or enterprises.

Separate collection and sorting of dry recyclables, or facilities for sorting mixed municipal waste with or without RDF production are financed and operated by the public authority. Revenues accrue to offset part of the costs of the recycling activity but rarely cover the full costs, requiring a proportion of available waste management budget, or a nationally organised EPR system to support the activity.

com 22: Collection of recyclables by the private sector under contract with the public authority.

PSP provide separate collection service for recyclables under a service contract, with net costs paid for by the public authority. Such systems may be developed under a franchise arrangement with the municipality, and may require payment of an ‘avoided gate fee’ saved by the municipality for reasons that the materials are diverted from landfill.

com 23: Collection and sorting of recyclables by the private sector under franchise contract with the public authority.

Recycling systems are financed and operated by the private sector under a franchise arrangement with the public authority, potentially requiring payment of an ‘avoided landfill gate fee’ to the franchisee.

4.3.5 Composting

It is important to choose appropriate resource recovery technologies that work well together with the existing collection system, waste quantities and composition, and other local conditions.

Composting plants for mixed waste implemented historically experienced difficulties in keeping the plant operational or selling the final product. Recently mixed municipal waste composting facilities may be experiencing a revival, with new techniques employed for fine sorting and enhanced biological processing.

Composting plants for segregated (separately collected) green and/or food waste require collection systems to deliver the material at or close to the required quality.

Success is conditioned by the existence of a market for the products, coupled with avoided costs of landfill and also in some cases carbon financing.

Three of the in depth case studies have experimented with composting at commercial scale; examples from which lessons can be learned.

Table 13: Composting in the in depth case studies

	CIGRES	Surat	St. Lucia
Composting	Composting equipment - failed	Windrow composting 15-17% of input	Small scale community composting - failed Large scale composting equipment - failed

Composting may be done for the purpose of stabilization of organic matter prior to landfilling and for the purpose of producing compost to be used as soil improver/fertilizer.

The treatment facility in CIGRES, operated by the inter-municipal association, originally included a composting step for the purpose of obtaining a compost to be sold as fertilizer. The sieves and the wheel loader in CIGRES

are failing and much of the material ends up mixed and un-sieved on the composting platform because the facility receives mixed waste despite being designed for separately collected waste. Thus the composting plant is producing marketable compost only on a small-scale; rather it is used as a step to stabilize waste materials that are then disposed.

St. Lucia's publicly operated composting activities at the landfill site have terminated for technical reasons, as the equipment chosen was too small and not sufficiently robust so failed to match the needed capacity. St. Lucia SLSWMA experimented with introducing community based small scale composting which was successful at the beginning but finally failed due to lack of a long term awareness raising program running parallel with it.

Qena municipality had an attempt to run a composting facility, as it was part of the 2001 plan of the government to install composting stations throughout Egypt. The plant is no longer in function and this may be due to the fact that there is no demand for compost as farmers apply animal manure directly as fertilizer and to the low quality of compost resulting from mixed waste.

com 27: Composting established and managed by the public authority.

The public authority develops and operates the composting plant, either focused on green waste, green and food waste or mixed municipal waste. Such plants usually fail to produce a marketable product, due to lack of in-built incentive for quality control (quality aspects), and/or low demand in the local area for the products (logistical aspects). But they may be operated just to stabilise materials prior to disposal. Composting may form part of an integrated resource recovery facility (or MBT).

Composting in the cities reviewed was done on a commercial scale by the private sector in 3 cities Dhaka (Bangladesh) – 700t/ day, Bahrain - 75t/ month and Bishkek (Kyrgyz Republic) and by the municipality of Belo Horizonte (Brazil) - 20 t/ day. In two cities the municipalities

have small-scale compost pits at the disposal sites with limited production of compost, in Ghorahi (Nepal) and Managua (Nicaragua).

Composting at commercial scale financed and operated by the private sector is more successful, as the private operators usually are more experienced, set up composting facilities for specific, clean waste streams, such as green city waste and market waste and are entirely dependent on the revenues from the local market.

com 28: Composting facilities established and managed by PSP.

The private sector finances and operates composting plant independently, and secures contracts from the public authority for the input material.

Composting is often piloted at small scale, community level, this has happened in one of the semi-urban areas in Qena Markaz. The facility is set up and managed by Community Based Organizations or NGOs sometimes financed through grant financing and are established to serve local markets



Photo 10: A container being emptied at a disposal site in Surat (© Sanjay K Gupta)

com 29: Composting facilities leased for operation to PSP.

Composting facilities are established by public authorities but operated under service contract by PSP.

com 30: Small-scale community composting by micro-service providers.

Micro-service providers establish and operate small scale decentralised composting facilities. All costs and revenues accrue to the PSP, but may be supplemented by payment of avoided costs of collection and disposal.

4.4 Treatment and disposal**4.4.1 Definitions**

This section covers the physical elements of the waste management service that are linked to environmental protection, towards the end of the waste management chain, and the lower part of the waste management hierarchy.

In treatment and disposal the major contract types are:

- **Private Design Build Operate (DBO) and Public Finance (F), ownership stays with Municipality**
- **Private DBFO or DBFO Transfer (T)**

- **Special purpose joint venture type PPP for DBFO**
- **Open competition**

In the developing world incineration is seldom implemented, with the exception of a few countries, most notably China. Disposal on the other hand is very common, and it can be anything between an open dumpsite and sanitary landfill. The following table shows different categories of disposal sites that will be used when looking at the situation of disposal in the case studies.

Table 14: Landfill classifications (adapted from Hoornweg and Bhada-Tata, 2012)

	Operating and engineering measures	Leachate management	Landfill gas management
Uncontrolled dump	No controls; informal waste picking; no engineering measures.	Unrestricted contaminant release.	None
Semi-controlled dump	Few controls; some directed placement of waste; informal waste picking; no engineering measures.	Unrestricted contaminant release.	None
Controlled dump	Registration and placement/compaction of waste; surface water monitoring; no engineering measures.	Unrestricted contaminant release.	None

	Operating and engineering measures	Leachate management	Landfill gas management
Engineered landfill/controlled landfill	Registration and placement/compaction of waste; uses daily cover material; surface and groundwater monitoring; infrastructure and liner in place.	Contaminant and some level of leachate treatment; reduced leachate volume through waste cover.	Passive ventilation or flaring
Sanitary landfill	Registration and placement/compaction of waste; uses daily cover; measures for final top cover and closure; proper siting, infrastructure; liner and leachate treatment in place and post-closure plan.	Containment and leachate treatment (often biological and physical-chemical treatment).	Flaring or utilisation with or without energy recovery

4.4.2 Incineration

Incineration is not an approach widely applied in developing countries due to financial constraints, and incompatibility of the municipal waste stream (due to low calorific value and as a result inability to sustain self-combustion and low efficiency of energy generation). However in certain richer countries and/or smaller states with extremely limited availability of space for landfill incinerators, or where foreign donors have been available (often promoting their own national technology) incinerators may be in operation. Sector 2 by the public sector. The remaining cities had varying levels of environmental protection at their disposal sites and were yet to achieve full compliance and mostly owned and operated by the public sector.

As a technology mass burn incineration is well proven, however other higher tech waste to energy technologies such as gasification and pyrolysis are less mature or confined to very specific non-municipal waste streams.

Of the secondary case studies incineration is only mentioned in the Chinese cities of Chongqing and Kunming where up to 6.9% of the waste is incinerated. An incineration plant is planned in Bahrain, but at the time of writing its status of development was unclear. None of the in-depth case studies use incineration as a waste treatment method.

com 31: Incineration financed by the public authority, designed constructed and operated by the private sector.

Public sector finances construction of the incinerator, contracting the design, construction and operation to the private sector. Combination of gate fees and feed in tariffs for electricity (or heat) finance the operation and maintenance of the facility.

com 32: Incineration financed, constructed and operated by PSP under concession contract with the public authority.

Private sector design, build and finance the construction of incinerators, with guaranteed minimum quantity of municipal waste input and feed in tariffs for electricity (or heat).

4.4.3 Disposal

Sanitary landfill may be operated in countries falling in any income category, indicating that other factors rather than income drive controlled disposal.

Most sanitary landfills are owned by the municipalities and operated by the private sector. The disposal sites functioning at standards below those of a sanitary landfill are usually publicly owned and operated.

Disposal is done in all case studies but the environmental protection standards of disposal vary widely and can be anything from an open dump to a sanitary landfill. Most cities reviewed have practices that fall in between these, controlled disposal.

Maputo has one main dumpsite that was an open dumpsite and has been reshaped and equipped in 2004. The site has no facilities for treatment of leachate or management of landfill gas but it is now managed and controlled to some extent. It has a fence and it is equipped with a weighbridge, compactor and caterpillar, thus it classifies as a *semi-controlled open dumpsite*. The municipality owns and operates the municipal disposal site besides additional and emergency services. The ownership for the future sanitary landfill is not yet finally decided upon.

The disposal facilities in **Qena** are two main *open dumpsites* serving Qena city and additional smaller dumpsites to serve the three semi-urban areas where collection services are in place. These sites are not managed and no elements of environmental control are in place. Fires at the dumpsite are frequent. The only measure taken is to deploy a bulldozer every now and then for levelling the waste and for applying some cover.

Surat has a *controlled landfill* in operation and also a *sanitary landfill* with 125,000 m³ capacity which is not yet operational. A third landfill of 625,000 m³ capacity is under construction. These disposal facilities are located close to each other, but only the one dumpsite is in use. The disposal site is levelled and covered daily and classifies as semi-controlled disposal site. The sanitary landfill is designed to receive only the rejects from the processing plant, however it is not yet functional because the EIA permit was delayed and the tendering process for its operation is only recently started. The municipality is tendering the operation and maintenance to a private contractor for a period of 10 years.

com 35: Landfill constructed by the public authority and operated by PSP.

The public authority finances, develops a landfill site incorporating the necessary engineering and environmental protection measures. The operation of the site is contracted out to the private sector.

In case of many publicly financed investment, regardless if the source of financing is national or international, the financing party prefers to rely on the technical know how for design, construction and operation on private parties selected through open bid procedures, while keeping ownership of assets at the public authority.

The **CIGRES** disposal site, operated by the inter-municipal association, receives partially bio-stabilized waste material, and thus even if not fully engineered it functions with a significantly reduced environmental impact. The site has a clay base with leachate drainage and treatment, landfill gas drainage with no treatment. Compaction and covering is done regularly.

com 36: Landfill financed by the public authority, designed, contracted and operated by PSP.

The design, construction and operation of the landfill is contracted out to a private company. The investments are from public funds and the public authority retains ownership of the facility.

com 33: Landfill constructed and operated by the public authority.

The public authority finances, develops and operates a landfill site incorporating the necessary engineering and operational measures. Revenues are collected through a gate fee and/or tax.

St Lucia has two disposal sites, both owned and operated by the SLSWMA, the Deglos *sanitary landfill* near

the capital city Castries in the north of the island and a *controlled landfill* at Vieux Fort in the south of the island. Deglos landfill takes up about 75% of the waste collected in the island and complies with best practice except for the absence of a landfill gas management system. Vieux Fort is a much smaller controlled landfill site.

From the 23 secondary cases reviewed, only 6 have sanitary landfills, 4 of which are operated by the private sector and 2 by the public sector. The remaining cities had varying levels of environmental protection at their disposal sites and were yet to achieve full compliance and mostly owned and operated by the public sector.

Table 15: Overview of disposal standards in the secondary case studies

Sanitary landfill	Engineered landfill/ controlled landfill	Controlled/ Semi-controlled dumpsite	Uncontrolled dumpsite
Kunming (China)	Bahrain	Yaoundé (Cameroon)	Benin (Nigeria)
Ghorahi (Nepal)	Lusaka (Zambia)	Bishkek (Kyrgyz Republic)	Tangier (Morocco)
Belo Horizonte (Brazil)	Quezon (Philippines)	Chongqing (China)	Accra (Ghana)
Chongqing (China)			Dar es Salaam (Tanzania)
Varna (Bulgaria)			Kolkata (India)
			Managua (Nicaragua)
			Nairobi (Kenya)

One extreme was noted in Bamako, which has no designated disposal site. In this city waste is simply deposited in fields or on open land by the municipality handling secondary collection. Most of the deposited waste is used to some extent by farmers.

One sanitary landfill owned and operated by public sector is located in Kunming. Kunming has had a long journey to full compliance with a number of uncontrolled dumps in the past. In this case, the municipal waste ends up either being incinerated or at one of the two landfills. The landfills were built in 1997 with funding from the World Bank. At one of the landfills, methane recovery takes place under a Clean Development Mechanism project. In long term, the plan of the city is to build more

incinerators in order to reduce the quantity of waste going to landfill.

Another sanitary landfill owned and operated by public sector is located in Ghorahi and was built in 2005 using a grant from the Ministry of Development. Site operations are financed from the municipal budget. The municipality has established a landfill management committee with the participation of local communities to ensure that local concerns are adequately addressed.

The sanitary landfills from the remaining 4 secondary cases with sanitary landfill are operated by the private sector. In most of these cities, the municipality owns the landfill and has contracted its day-to-day operations to private contractors.

The Brazilian law on solid waste promotes the integration of organized waste pickers in waste management systems. The national waste law determines a deadline for closure of waste dumps. As in most cases, waste picking activities are common at the dumpsites; solutions for

informal waste pickers must be found. Often there are initiatives to stimulate the creation of waste separator cooperatives, which gain concession to operate a separation facility integrated in a waste treatment centre with a sanitary landfill.

Private landfill – Kostinbrod, Bulgaria

The first regional landfill constructed in line with European environmental requirements with private financing in Bulgaria through PPP. The owner and operator of the landfill is “Kostinbrod Eco” JSC, property of the leading municipality of Kostinbrod (32.5%) and of the private investor (67.5%).

The municipality contributes by provision of land, the value of which defines its shares in the capital of the company and the private investor provides the financing, which is repaid by the charges during landfill operation. The private investor is concerned about service affordability as main factor for return on investment, thus rationalises the size of investment. The landfill serves 6 municipalities with total population of 70 000 people and accepts non-hazardous industrial waste. Experience outlines important issues for the success of the enterprise:

- Readiness of the private investor to finance a pre-investment period, in case of Bulgaria of 2 years, the development of feasibility study and design and implementation of all permitting procedures required under national environmental and spatial development legislation;
- Necessity of a consultancy team to manage the whole process of permitting and design, construction and the first operational year to guarantee overall consistency and continuity of the project and its implementation;
- Contractual and commercial competence of the public authorities, municipal commitment to provide land, assists administrative procedures and use the landfill.

com 37: Landfill designed, built financed and operated by PSP.

The private sector finances, develops and operates a landfill site. Long term contracts for supply of waste to the landfill at a certain gate fee are secured with the public authority(ies). Other permitted wastes are accepted from commercial sources with separately negotiated gate fees.

com 34: Landfill constructed and operated by the public authority, cooperative carries out recycling under franchise agreement.

The public authority constructs and operates the landfill, allowing participation of recycling cooperatives to continue to extract and sort recyclables at the site under franchise-type agreement.

DBO for landfill – Oradea, Romania

A PPP for a period of 20 years was signed between the county (regional authority) and a private company that had to assure all activities for waste disposal from his own financial contribution. The project was initiated by the Local County Oradea through the national, county and local strategy of sustainable development and through the environmental action plan.

The PPP contract was signed in December 2003 between the Local County and Keviép Kft. Debrecen with the exclusive activity of construction, administration and operation of the county sanitary landfill.

The services provided by the landfill operator include: sorting, composting and disposal. There are a series of additional facilities of the landfill: waste sorting plant, composting plant, leachate pre-treatment station, land-filling, all necessary utilities like water, energy, buildings, access roads.

Fees were differentiated according to the types of waste to be delivered to the landfill (municipal and industrial; selectively collected and construction and demolition waste). All collection trucks are weighted and a gate fee per tonne was set.

- **Municipal and industrial waste - € 12,87/ton**
- **Selectively collected waste - € 0,00 /ton**
- **Waste resulted from demolition - € 2,21/ton**

There is a profit sharing agreement between the private investor and the contracting authority. The local authority will receive a part of the profit over a certain level and used for education and awareness actions related to the importance of waste collection

4.5 Integrated Models

Integrated operator models occur when different elements of the service (street sweeping, collection, transfer, recycling, treatment and disposal) are combined together under one service arrangement or contract either in part or in total.

Integrated models combining street sweeping and primary collection have been discussed in Section 5.2.3, and integrated collection services discussed in Section 5.2.4. Therefore these models are not included in this section.

A key decision when designing integrated service arrangement is whether to split the collection services from the treatment and disposal service, or whether to combine them together. Where services are split it enables a point of measurement and monitoring within the

system. Also by nature collection operations (customer service, vehicles, logistics) are very different in nature to treatment and disposal (materials handling, civil works and environmental controls), and therefore different types of operators are good at different things.

Transfer station represent a point of interface between these two major service groups, and may be either managed separately, together with the collection services, or as part of the waste treatment and disposal system. Combining transfer together with the treatment and disposal service is the option most commonly used as it is a service that in nature is more similar to the back end of the waste management chain rather than the front end. On the other hand, if there are any shortcomings in

communication, planning or even conflicts between the two parties, problems tend to concentrate at the interface – which is the transfer station and typically the least appropriate location as a waste buffer.

Fully integrated contracts are the preference of many of the international waste management companies, as they provide both guaranteed access to the municipal waste stream, exclusive access to recyclables, and control over the operational and environmental standards throughout. Contract periods are usually in excess of 20 years, and bind the municipality into a fixed arrangement for this period. Measures of service quality, performance and or target for recycling and recovery are included within the contract.

com 38: Integrated services provided by the public authority or enterprise.

Full integration of the collection and treatment/disposal service elements with the public authority or enterprise performing the entire service.

Fully integrated services financed and operated by the private sector are sometimes possible. Private parties will only invest if they are confident that they can recover the investment, i.e. the contracts are long enough, waste quantities are sufficient for economies of scale in logistics and treatment and the burden of taking care of historical pollution, such as closure of old disposal sites is not too high.

A further example is where the municipality enters into a joint venture arrangement with a private company, with the private operator responsible for bringing in financing and operational expertise into the system.

com 39: Integrated services with investment financing, construction and operation by the PSP.

Full integration of the collection and treatment/disposal service elements, contracting out to the private sector. The contractor is required to finance, construct and operate facilities/services and is paid a price per tonne of municipal waste.

com 40: Integrated services provided through joint venture PPP.

Full integration of the collection and treatment/disposal service elements through a joint venture with a private company. The public authority provides financial guarantees, and often also staff, and the private partner manages the service and brings in investment for the construction/upgrading of service and facilities.

Whether or not, or how, to include recycling within integrated service arrangements depends on the choice of operator model for recycling systems. If for example formal recycling systems are the aim, then inclusion of recycling is often favoured as a means of enabling revenue to partially offset the service costs. If however existing recycling systems are informal, then including the service within the integrated contract may be more difficult or contentious, or just not a good idea. Within EPR recycling systems there is a natural incentive to design-in an interface between the formal and informal recycling system elements, as it is more often more efficient to the overall system for materials to be delivered clean and sorted by the informal sector to buy back centres, which in turn feed into the recyclables value chains.

A further model is Integrated Resource Recovery Centres (IRRCs). Such facilities are becoming more common. This operator model overlap somewhat with the previous discussion in Section 4.3.4 and 4.4.2 (com 26) but are included here because the sorting and processing of materials in IRRCs is often done separately from the collection of these materials.

The IRRC in Surat, combining composting and RDF production, was established through a Design Build Operate Finance and Transfer (DBOFT) type agreement with a 30-year concession contract. Surat Municipal Corporation invited open tenders for processing of waste at minimum costs through a Public Private Partnership model. The incentive provided by the municipality was to offer land at concessionary price and provide infrastructure such as paved roads, electricity and water facility etc.

The plant is equipped with a mechanical compactor and binders for RDF bricks. RDF is made from the rejects of the composting process including various high calorific value materials such as rags, tyres, plastic of all types, paper, cardboard, multilayer packaging, etc. These are sent to combustion boilers and are used to generate thermal energy. Some of the material streams used in RDF production are recyclable, thus the existence of the plant attracts some materials that otherwise may be recycled.

The plant operates at 400t/day capacity, takes up about one third of the total waste generated per day in the city. The plant is fully operational from 2009 and includes composting as one of the process steps. Windrow composting is done for pre-sorted, sieved and shredded material, equipped with cranes for turning the heaps and moving the material. About 15 to 17% of the input material is turned into compost and is sold mostly in bulk to a chemical fertilizer company.

com 41: Public authority develops and operates an integrated resource recovery facility.

The public authority develops and operates an integrated resource recovery facility combining different mechanical, biological and thermal treatment processes.

A more balanced solution to integrated resource recovery as opposed to fully public or a DBOFT contract would be a concession or a service contract. In this case the city, under well-negotiated contractual conditions, could benefit both from the services of an experienced operator, potentially from private investment and would keep its control over solutions for waste management in the long term.

com 42: Integrated resource recovery facility provided by PSP under concession or service contract.

The private service provider develops and operates an integrated resource recovery facility combining different mechanical, biological and thermal treatment processes. The public authority usually pays a gate fee.

Another variant of this model is where the municipality or inter-municipal association develops and operates an IRRC itself. An example for this model is the facility from CIGRES.

Below is a table summarizing the coms that have been identified in this section and their corresponding reference number

Table 16: Types of common operator models identified

com	Type	Description
1	Public model: sweeping. Street sweeping by public authority staff.	Workers hired by the public authority to sweep the streets, picking up debris, litter, forming and clearing piles of waste left on the street, and placing the material into containers or collection vehicles.
2	Resident's model: sweeping. Sweeping through Residents or Resident Association.	Public authority delegates the client function to residents associations, who make their own arrangements to hire CBOs or individual sweepers. Alternatively residents get involved in cleaning the streets they live on.
3	Micro PSP: sweeping. Street sweeping contracted to micro-service providers.	NGOs or CBOs are hired to sweep the streets as a combined service together with primary collection, contracted to serve specific zones.
4	PSP: sweeping. Street sweeping contracted to a medium size or large company.	Private companies hired to sweep the streets as a singular service item and contracted to serve specific zones.
5	Public model: primary and secondary collection. Primary collection by the public authority together with secondary collection.	The public authority provides primary collection/door to door services, as an integral part of the overall waste collection service.
6	Micro franchise PSP: primary collection. Primary collection by micro-service providers (MSPs) as a singular service item, with revenue collected by the MSP.	Micro-scale service providers are franchised to provide primary collection/door to door services, and collect a small service fee from the door.
7	Micro contracted PSP: primary collection. Primary collection by micro-service providers (MSPs) as a singular service item, with revenue collected by the public authority.	Micro-service providers are contracted to provide primary collection/door to door services, and are paid for the service by the public authority.
8	PSP: primary and secondary collection. Primary collection by medium-large private service providers together with secondary collection.	Medium-large scale private operators provide primary collection/door to door services, as an integral part of the overall waste collection service.
9	Public model: secondary/one-step collection. Secondary/one-step collection by the public authority.	The public authority provides either a one-step or the secondary collection service. The service costs come out of the public authority budget, and revenue is collected via taxation systems and/or government subsidy.

10	<p>Public enterprise: secondary/one-step collection.</p> <p>One-step or secondary collection service by a public enterprise.</p>	<p>The public authority establishes a public company or enterprise to provide the services. Revenue is collected via taxation systems and/or government subsidy, with billing either managed by the enterprise or via the public authority.</p>
11	<p>PSP service: secondary/one step collection.</p> <p>Secondary/one-step collection with medium-large companies under service contracts with and paid for by the public authority.</p>	<p>The public authority contracts out the provision of either one-step services or the secondary collection service to a PSP, and pays for this service.. The public authority owns part or the whole of the assets, and leases these for the use of the PSP contractor.</p>
12	<p>PSP concession contract: secondary/one-step collection.</p> <p>Secondary/one-step collection with medium-large companies under concession contracts with and paid for by the public authority.</p>	<p>The public authority grants a PSP the exclusive right to operate, maintain and carry out investment for one-step services or secondary collection service, and pays for this service.. The private operator is required to make and sustain the necessary investments in collection vehicles and other equipment.</p>
13	<p>PSP franchise: secondary/one-step collection.</p> <p>One-step or secondary collection service carried out by private service providers under a franchise or open competition model.</p>	<p>Private service provider is licensed/franchised to provide services, and granted the responsibility and right to collect their own revenue from municipal waste generators.</p>
14	<p>PPP joint venture: secondary/one-step collection.</p> <p>One-step or secondary collection service carried out by joint venture public/private companies.</p>	<p>Joint venture companies are established between the public authority and a PSP to provide collection service, and pays for this service.</p>
15	<p>Public model: commercial collection.</p> <p>Commercial waste collection services carried out by the public authority.</p>	<p>The public authority provides combined municipal and commercial waste collection services, and collects the revenue via taxation to cover at the costs.</p>
16	<p>PSP franchise: commercial collection.</p> <p>Commercial waste collection carried out by the designated PSP.</p>	<p>Private service provider is granted the responsibility and right to collect commercial waste in a certain zone, collecting their own revenue from commercial waste generators.</p>
17	<p>PSP open competition: commercial collection.</p> <p>Commercial waste collection by private service providers under open competition model.</p>	<p>Private service providers compete for direct contracts with commercial waste generators, regardless of geographical location, collecting their own revenue from commercial waste generators.</p>
18	<p>Public model: transfer.</p> <p>Transfer by public authority or enterprise.</p>	<p>The public authority finances, owns, builds and operates the transfer station(s) either directly or through a public company. Financing of operations is through the public authority budget.</p>
19	<p>PSP service: transfer.</p> <p>Transfer services provided by PSP under service contract with and paid by the public authority.</p>	<p>Public authority finances the design, construction and operation of the transfer station, tendering the operations to the private sector, either linked to the collection or disposal service contracts, or contracted independently of these services. The public authority pays for this service based on the tons handled and owns assets.</p>

20	<p>PSP concession: transfer.</p> <p>Transfer investment and services by PSP under concession contract with and paid by the public authority.</p>	<p>The public authority grants a PSP the exclusive right to operate, maintain and carry out investment for transfer service, and pays for this service based on the tons handled. The private operator is required to make and sustain the necessary investments in fixed and mobile assets.</p>
21	<p>Public model: recycling.</p> <p>Collection and sorting of recyclables by the public authority or enterprises.</p>	<p>Separate collection and sorting of dry recyclables, or facilities for sorting mixed municipal waste with or without RDF production are financed and operated by the public authority.</p>
22	<p>PSP service: recycling.</p> <p>Collection of recyclables by the private sector under contract with the public authority.</p>	<p>PSP provide separate collection service for recyclables under a service contract, with net costs paid for by the public authority.</p>
23	<p>PSP franchise: recycling.</p> <p>Collection and sorting of recyclables by the private sector under franchise contract with the public authority.</p>	<p>Recycling systems are financed and operated by the private sector under a franchise arrangement with the public authority, potentially requiring payment of an 'avoided landfill gate fee' to the franchisee.</p>
24	<p>PSP open competition: recycling.</p> <p>Collection and sorting of recyclables by the private sector (informal/formal) in open competition.</p>	<p>PSP recyclers (informal or formal) access and extract recyclable materials of value at various points in the waste management chain including door-to-door collection, from containers, transfer stations and disposal sites.</p>
25	<p>Private EPR: recycling.</p> <p>Client and revenue collector functions delegated to extended producer responsibility organisations set up and managed by producers, importers and distributors of goods.</p>	<p>Producers, importers and distributors of goods, e.g. packaged fast moving consumer products, either mandatorily or voluntarily (or both) establish funds and organisational arrangements to support recycling systems tailored to specific materials streams.</p>
26	<p>Public EPR: recycling.</p> <p>Client and revenue collector functions delegated to extended producer responsibility organisations set up and managed by public authorities.</p>	<p>Government imposes a levy or tax on the import of packaging and other materials, with the funds directed to a national recycling fund for expenditure on support recycling systems tailored to specific materials streams.</p>
27	<p>Public model: composting.</p> <p>Composting established and managed by the public authority.</p>	<p>The public authority develops and operates the composting plant.</p>
28	<p>PSP concession: composting.</p> <p>Composting facilities established and managed by PSP.</p>	<p>The private sector finances and operates composting plant independently, and secures contracts from the public authority for the input material.</p>
29	<p>PSP service: composting.</p> <p>Composting facilities leased for operation to PSP.</p>	<p>Composting facilities are established by public authorities but operated under service contract by PSP.</p>

SERVICE ARRANGEMENTS

30	<p>Micro PSP: composting.</p> <p>Small-scale community composting by micro-service providers.</p>	<p>Micro-service providers establish and operate small scale decentralised composting facilities. All costs and revenues accrue to the PSP, but may be supplemented by payment of avoided costs of collection and disposal.</p>
31	<p>DBO PSP: incineration.</p> <p>Incineration financed by the public authority, designed constructed and operated by the private sector.</p>	<p>Public sector finances construction of the incinerator, contracting the design, construction and operation to the private sector. Combination of gate fees and feed in tariffs for electricity (or heat) finance the operation and maintenance of the facility.</p>
32	<p>DBFO PSP: incineration.</p> <p>Incineration financed, constructed and operated by PSP under concession contract with the public authority.</p>	<p>Private sector design, build and finance the construction of incinerators, with guaranteed minimum quantity of municipal waste input and feed in tariffs for electricity (or heat).</p>
33	<p>Public model: landfill.</p> <p>Landfill constructed and operated by the public authority.</p>	<p>The public authority finances, develops and operates a landfill site incorporating the necessary engineering and operational measures. Revenues are collected through a gate fee and/or tax.</p>
34	<p>Public recycling cooperative: landfill.</p> <p>Landfill constructed and operated by the public authority, cooperative carries out recycling under franchise agreement.</p>	<p>The public authority constructs and operates the landfill, allowing participation of recycling cooperatives to continue to extract and sort recyclables at the site under franchise-type agreement.</p>
35	<p>PSP service: landfill.</p> <p>Landfill constructed by the public authority and operated by PSP.</p>	<p>The public authority finances, develops a landfill site incorporating the necessary engineering and environmental protection measures. The operation of the site is contracted out to the private sector.</p>
36	<p>DBO PSP: landfill.</p> <p>Landfill financed by the public authority, designed, contracted and operated by PSP.</p>	<p>The design, construction and operation of the landfill is contracted out to a private company. The investments are from public funds and the public authority retains ownership of the facility.</p>
37	<p>DBFO PSP: landfill</p> <p>Landfill designed, built financed and operated by PSP.</p>	<p>The private sector finances, develops and operates a landfill site. Long term contracts for supply of waste to the landfill at a certain gate fee are secured with the public authority(ies). Other permitted wastes are accepted from commercial sources with separately negotiated gate fees.</p>
38	<p>Integrated public service.</p> <p>All service elements combined into one, provided by the public authority or enterprise.</p>	<p>Full integration of the collection and treatment/disposal service elements with the public authority or enterprise performing the entire service.</p>
39	<p>Integrated PSP concession: All service elements combined into one, with investment financing, construction and operation by the PSP.</p>	<p>Full integration of the collection and treatment/disposal service elements, contracting out to the private sector. The contractor is required to finance, construct and operate facilities/services and is paid a price per tonne of municipal waste.</p>

40	Integrated PPP. Integrated waste management combining all service elements into one, provided through joint venture PPP.	Full integration of the collection and treatment/disposal service elements through a joint venture with a private company. The public authority provides financial guarantees, and often also staff, and the private partner manages the service and brings in investment for the construction/upgrading of service and facilities.
41	Public model: integrated resource recovery.	Public authority develops and operates an integrated resource recovery facility. The public authority develops and operates an integrated resource recovery facility combining different mechanical, biological and thermal treatment processes.
42	PSP: integrated resource recovery. Integrated resource recovery facility provided by PSP under concession or service contract.	The private service provider develops and operates an integrated resource recovery facility combining different mechanical, biological and thermal treatment processes. The public authority usually pays a gate fee.

Sorting and recycling at CIGRES Inter-Municipal Association

CIGRES sorting facility was designed to cater for selective collection of dry recyclable waste and conventional collection of the remaining mixed waste with a high organic fraction. Upon arrival at the treatment facility, the recyclable material would be transferred to a conveyer belt for manual sorting, followed by baling, storage and sale. The rejects would also be baled and sent to final disposal at the landfill on the site.

The mixed, but predominantly organic and wet fraction would be put on a different conveyer, to sort material for composting. The remaining material would be sieved, the coarse fraction would be sent to the landfill and the fine material would be additional organic matter for composting.

However, at the beginning of operations, it was not possible to convince the municipalities to invest in selective collection because of the high investment and operation costs. Therefore the input to the treatment plant is mixed municipal waste, and the current process has changed accordingly.

Manual sorting of dry recyclable materials from mixed waste: Use of PPE in sorting and conditioning

After weighing, the collection trucks discharge the load at the cemented and roofed receiving yard. The waste is transported by a wheel loader to discharge the material into two hoppers that feed two conveyer belts. On these conveyers, recyclables are manually removed and separated in marketable material fractions, using specific containers for loose storing or pressing and baling.

Gourds of mate tea: removal of aluminium rings and composting of gourds. In this step, also specific unmarketable wastes are withdrawn, such as batteries or fluorescent lamps, for storage and later collection by a specialized company. Another typical material for the most southern region of Brazil are gourds for *mate* tea where the aluminium rings are removed for recycling, while the gourds go to compost.



Photo 11: Manual sorting of dry recyclable materials from mixed waste: Use of PPE in sorting and conditioning (© Thilo Schmidt)



Photo 12: Gourds of mate tea: removal of aluminium rings and composting of gourds (© Thilo Schmidt)

In-depth case study - Castries, St. Lucia

The Castries City Case Study illustrates the challenges of a small island economy, heavily dependent upon the tourism sector for its economic survival, struggling to deliver waste management services in a manner that protects both public health and environmental quality; services that improved after the implementation of a World Bank financed regional project, commencing in 1997.

In St. Lucia, in 2004, together with the introduction of the Waste Management Act, a Waste Management Strategy was developed for the island, but it was never implemented. The strategy was developed through a technical assistance project financed by the World Bank, and though it has no apparent flaws it lacked political support, so it was never implemented.

The objective of the WB project was to reduce public health risks by improving domestic solid waste management practices and facilities and promoting compliance with the “Special Area” designation of the Caribbean Sea, specifically set out to significantly strengthen the countries’ capacities to effectively collect, treat and dispose of solid waste in an environmentally sustainable manner.

St. Lucia is a PSP model for sweeping and collection and a public national model for disposal. The client is the Local Council of the City of Castries for sweeping and the St. Lucia Solid Waste Management Authority (SLSWMA) for everything else. Sweeping and collection is contracted out to various private operators, while operation of disposal is done by SLSWMA. There is no revenue collector function, since operational budget comes from the national budget.

Waste Management Profile:

Due to the WB project and other additional funding, the Government of St. Lucia has managed to introduce and sustain a waste collection and disposal service covering 100% of the Castries population of more than 60,000 residents – irrespective of income.

Castries City Council as the entity responsible for street **sweeping** within the city embarked upon the privatization of these services and contracted micro-scale contractors for performing the service. In 2012, the Castries Constituency Act expanded the geographical area of responsibility for CCC – which now covers four constituencies: Castries Central; Castries South; Castries North and Castries East. Thus they needed to expand the number of contractors from thirty-three to seventy three. Further, there is a second tier of contracts – referred to as the Caretakers Programme focusing upon small side streets and footpaths. These contracts are considerably smaller in value and the individuals are paid on a monthly basis.

Primary **collection** was contracted out to 4 area based service providers in Castries. Saint Lucia has Door to door collection in the areas where there is a paved road, its motorized, typically higher income areas and town centres. Communal collection points are placed in strategic places, not further than 200 m walking distance in areas where road access with motorized vehicles is difficult or impossible.

Due to the comprehensive nature, and frequency, of waste collection services throughout Castries, coupled with the city's proximity to the sanitary landfill site at Deglos, there is no need for secondary waste collection or waste **transfer** services. The only exception to this may be a minority of the small commercial waste generators, such as shops and cafes, who employ casual labour to illegally transport their waste to the household waste containers.

SLSWMA is seeking to minimise the amount of waste disposed of within the Deglos landfill site. At this moment, a small proportion of wastes are separately collected, namely waste oil and waste lead-acid batteries. The majority of materials **re-used or recycled** are segregated from the waste stream and processed at the Deglos landfill site, including green waste, tyres, scrap-metal and WEEE.

In St. Lucia there have been initiatives to undertake publicly run **composting** projects, through a community program and central community facility at the landfill site. The former failed due to insufficient promotion activities and awareness raising, the latter failed due to a mismatch between the capacity of the equipment chosen and the input material to the plant.

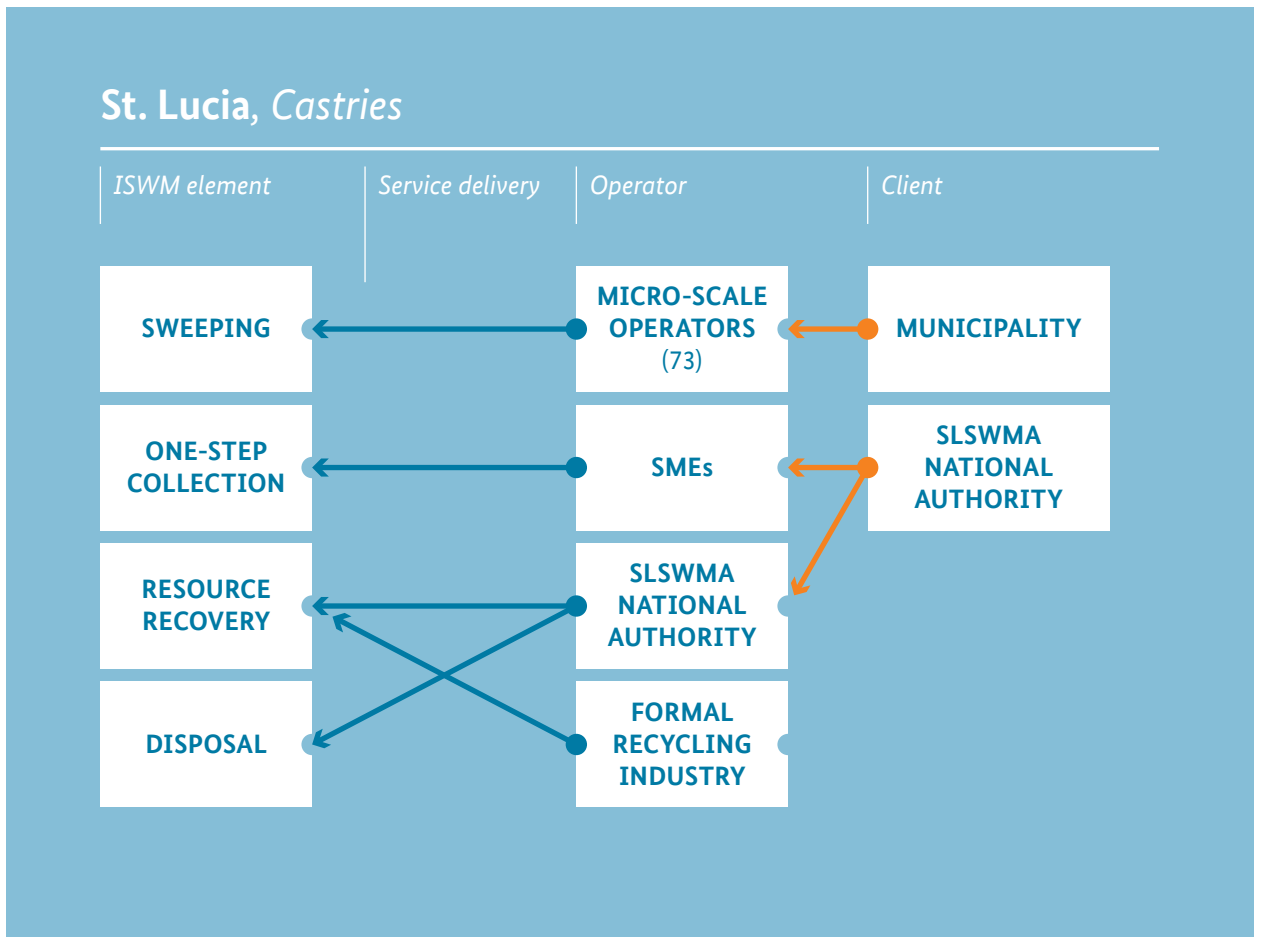
Presently, SLSWMA runs two disposal sites, the Deglos **sanitary landfill** near the capital city Castries in the north of the island and an engineered disposal site at Vieux Fort in the south of the island. Deglos landfill takes up about 75% of the waste collected in the island and complies with best practice except for the absence of a landfill gas management system. Vieux Fort is a much smaller site but it may be classified as a controlled landfill due to its high environmental protection standards.

St. Lucia is a curious mix in terms of operators, as in sweeping and in collection was outsourced in order to increase the efficiency and standards of these services, while for treatment and disposal the operator opted out of private sector participation in order to ensure proper use and maintenance of the landfill facility and equipment purchased with WB and CDB funding.

Table 17: Castries Waste management performance indicators

City: Country:		Castries St. Lucia		
G1	Country income level	World Bank income category Upper-middle income	GNI per capita \$ 6,530	
G2	Population	Total population	62,000	
G3	Waste generation	Total municipal solid waste generation (tonnes/year)	78,021	
No	Category	Indicator	Results	
Key Waste-related data				
W1	Waste per capita	MSW per capita (kg per year)	219	
W2	Waste composition	Summary composition of MSW for 3 key fractions – all as % wt. of total waste generated	-	
W2.1	Organic	Organics (food and green wastes)	40%	
W2.2	Paper	Paper	10%	
W2.3	Plastics	Plastics	26%	
W2.4	Metal	Metal	5%	
Physical Components			Traffic light code	
1	Public health – Waste collection	Waste collection coverage	High (100%)	● ●
1Q		Quality of waste collection service	High (85%)	● ●
2	Environmental control – waste treatment and disposal	Controlled treatment and disposal	High (100%)	● ●
2Q		Environmental quality of waste treatment and disposal	Medium/High (80%)	● ●
3	3Rs – reduce, reuse and recycling	Recycling rate	20%	● ●
3Q		Indicator of the ‘quality’ of 3Rs provision	Medium (50%)	● ●
Governance Factors				
4U	User inclusivity	Degree of user inclusivity	High (88%)	● ●
4P	Provider inclusivity	Degree of provider inclusivity	Medium/High (80%)	● ●
5F	Financial sustainability	Degree of financial sustainability	Medium/Low (40%)	● ●
6N	Sound institutions, proactive policies	Adequacy of national ISWM framework	Medium (54%)	● ●
6L		Degree of institutional coherence	Medium/High (79%)	● ●

Figure 12: The relations between the client and operator in Castries, St. Lucia in-depth case study



St. Lucia has a ISWM system compatible with its status as a prime tourist destination. Waste collection services are comprehensive and high quality, and waste disposal, although ranked as medium/high in terms of quality, is appropriate for the level of affordability of the general population. St. Lucia achieves a relatively low recycling rate, struggling to increase rates due to its distance from major commodity markets and the relatively low policy priority of 3Rs as opposed to the public health and environmental control objectives.

On the governance side, St. Lucia achieves a high degree of user inclusivity and a moderate/high level of provider inclusivity. The weakest part of the Islands ISWM system is financial sustainability; services are paid for through general taxes rather than direct service charges and as a result the incentive placed on waste generators to lower

their waste quantities is absent. Through centralising institutional responsibility for the client function into the SLSWMA, the country has managed to affect the transition to higher standards and even service provision across the island.

St. Lucia has found good solutions to managing its waste management system. The support provided by development assistance during the 1990s was a catalyst of the transition process; difficult decisions had to be made regarding the location of landfill sites due to the extremely limited availability of land, and implementation was not without its problems to put it mildly. Nevertheless, political determination and the consistency of client function ensured by establishing the SLSWMA created one of the ISWM success-stories for Small Island Developing States (SIDS).

5. Management arrangements

Having seen the framework conditions, the various operator models for delivering waste management services, this section looks at management arrangements.

Management depends on the capacity of the client, operator and revenue collector and will be different in the

different service arrangement. Regardless of the service arrangement, there always need to be mechanisms for choosing technical solutions, operational decision-making in implementation, quality control, monitoring and financing capital, as well as operation and maintenance costs.

5.1 Capacity of the client and revenue collector

As in most cities around the world, likewise in our case studies, the client and the responsible authority for waste management is most commonly the local government or municipality. The client's will and capacity to do a good job, combined with their capacity as a revenue collector, is a decisive factor for service delivery.

Technical, management and financial capacity of the client enables it to choose and implement operator models. The operator models adopted may vary from case to case but certain practices point out the relative strengths of the different clients as presented in this chapter.

The case study of Maputo shows the importance of having feasibility studies that work as criteria for evaluation of projects and decision-making.

The case of Surat shows the importance of institutionalizing proven management tools.

The case of Qena, that of St. Lucia and to some extent that of CIGRES show that relying too much on resources that one cannot control, such as the national funds for re-financing and operational budget jeopardizes the waste management system in the long run.

Awareness of financial capacity seems to be more important than financial capacity. The cities of Maputo and Surat) show how important it is to manage within ones means.

Surat has a far more advanced waste management system as compared to Maputo but has less control of its assets and waste management options as the private sector involvement increases.



Cartoon 5: Its very important to know the weight your fishing rod holds just like its important to know your capacities as a client

5.1.1 Technical and management capacity

In **Maputo**, a low income city, there was enough management capacity at the high level of municipal government to both attract international development financing to waste management and have a continuous say on the technical solutions and choices made in the City. The Municipality of Maputo is the competence centre for ISWM in Mozambique. Other municipalities and the national institutions responsible for waste management seek its strategic planning and implementation skills. The municipality is often invited as an opinion leader and a national resource on ISWM. Therefore it has a significant influence on the national technical discussions related to ISWM.

The directorate of solid waste management has benefited from training and capacity building for introducing modern management methods and increasing technical capacity through the PROMAPUTO development financed programme. On a technical level, the Directorate is relatively well placed with long-term operational experience in service provision, investments in human capital and on-going training measures. A revised institutional setup, new and distributed job descriptions and efforts to improve financial management have all contributed to increasing management capacity. However, remnants of the old management structure, which was distinctively hierarchical, are still present and complicate further developments.

The monitoring capacities of the Directorate have improved drastically and up to date information about waste collection and the performance of the private contractors is available on a daily basis. Creating a new department for planning and monitoring helped to recruit new and relatively qualified personnel. The new recruits managed to establish a kind of basic management information system. However, the consistency, quality and integration into daily routine of monitoring activities leave still some room for improvements.

Surat is another example of high management capacity, where the municipality controls choices based on technical evaluation and was able to institutionalize an effective control and monitoring system and attract

private investment to modernize waste management through innovative solutions.

Qena has demonstrated relatively good technical and management capacities for achieving cleanliness and reaching local goals of high employment. The main focus on the activities continues to be cleanliness. The local government has been struggling in recent times to keep the collection service at good levels since the economic downturn in the country has limited their financial capacity and therefore their ability to pay staff salaries.

From the field

In many places, waste management issues are allocated to local public construction and infrastructure authorities, due to the fact that these departments manage vehicles and manpower for collection and dumping. Often, technical and management capacities are not at levels that match the complex requirements of modern ISWM. Capacity building and organizational development are key factors for appropriate management and operational structures

In **CIGRES**, the municipalities recognized the opportunity to form an association that would serve their goals and would also be able to tap into the national funds. However, the technology chosen for treatment is failing. This shows that the founding municipalities of CIGRES did not have experience in operating such plants nor did they foresee the appropriate budget for refinancing. Nevertheless, the plant managers have done their best to overcome the issues with the equipment and substitute mechanical equipment with manual labour to the extent possible. Thus the plant is successful in sorting recyclables while the composting component is failing.

The **Castries** case is somewhat similar to CIGRES, as the client is at a higher level of governance, in this case at the national/island level. There are also similarities regard-

ing the technical and management capacity, as these show to be good and further strengthened for collection and disposal through the development cooperation interventions, but insufficient to successfully manage the composting initiatives that were started there.

In St. Lucia, the SLSWMA is staffed by educated, experienced and motivated individuals who have benefitted from a structured training programme which, over the years, has been supported by international organisations such as DFID, JICA and funded, at the time of the Authority's inception, by the WB and CDB.

Importance of the Client function in developing ISWM

Developing the Client function (ensuring and supervising the provision of services) is one, if not the, key aspect of the different stages of developing ISWM systems.

In the least economically developed countries and/or countries emerging from conflict, or natural disaster, ISWM is at the earliest stage of development and may not be recognised at all as an issue for attention by the municipality, or at least it may not have the capacity to be instrumental in establishing waste collection as a public service.

In countries where collection services are being developed to serve a proportion of the urban population, an initial recognition of the Client function can be observed. ISWM has been realised as a problem at the political level, and in order to address the situation municipalities are enabled/directed to step up their efforts to ensure that ISWM services are provided in order to protect public health.

In countries where collection services are provided to the majority of the urban population, formal recognition of the Client function has usually been made coupled with acceptance (or imposition) of the role and need for the municipality to take responsibility for ensuring provision of at least collection services to the urban settlements. During this stage of ISWM development, the municipality is developing its capacity (and allocating budget) to ensure that services are either provided by itself, or that functioning arrangements are in place for the contracting-out of these services to the private sector, NGOs or CBOs.

As we move up into more complex ISWM systems, the Client function continues to strengthen and often become separated from the operator function through greater incidence of PSP. Common Client function improvements through the higher developmental stages of ISWM include establishing service performance standards, diversification of operator models and professionally staffed municipal departments or specialised Contract Management Units (CMUs).

In the highest development stages of ISWM, the Client function and the services have become so well established (almost routine) that the staffing levels required within the municipality to supervise the provision of services at the desired quality and coverage may be very low.

5.1.2 Capacity of the revenue collector

Capital investments and collecting revenues for operations are quite different in this sector. Capital investment may come from international financing organizations, national or local budgets or the private sector may be attracted to invest. There are several options for financing operations and a combination of these is normally used. The sources of financing include municipal taxes collected from local taxes, user charges, national subsidies, sale of recyclables, compost, energy or refuse derived fuel. Indirect revenues may come from economic instruments. A few of the commonly used revenue generating instruments are extended producer responsibility schemes, landfill or other pollution tax and product charges.

Capacity of the local authorities to control re-financing and operational revenues will influence the choice of the operator model.

In **Maputo**, the city is able to cover 68% of its cost, including investment costs from the collected revenues. **CIGRES** municipalities (Brazil) and the association itself depend for refinancing in large part on federal and state government funds to complete municipal funds.

In **Qena** all assets are transferred to the municipality but the municipality has no budget for re-financing and is largely dependent on state budgetary transfers for operational budget.

Castries is in a similar situation, but here the dependence on the national budget is 100 per cent as there is no user charge or tax applied to the users and the municipal budget is not financing the waste management operations anymore. With the economic downturn, **St. Lucia** has experienced a downturn in the number of tourists, which in turn has limited severely the budget available for financing waste management operations.

Surat recognized its limitations to re-finance investments and opted for attracting private sector investment, in this way assuring cost effective solutions.

The municipality has been able to make payments on time and this seems to be one of the key reasons of good partnership, while in many other Indian municipalities, timely payments to contractors has been a constant challenge.

In Yala, Thailand, decentralization is triggering development of technical and management capacity.

In the past, municipal finance was substantially under the control of the central government. In recent years that has changed under the national policy of decentralization. Central subsidies to municipalities are now being reduced or withdrawn, and Yala municipality therefore finds itself now facing the need to make services such as waste collection and disposal more efficient, and to recover their costs.

In Kenya technical and financial capacity issues are inter-linked:

Local authorities especially Mombasa, Nairobi and Kisumu are overstaffed with poorly trained workers. The local authorities often are faced with financial difficulties in meeting the large payment of wages. Hardly a year goes by without threats of strikes by workers demanding past due wages. Most local authorities have become economically constrained in offering efficient management of MSW, and are now more willing to embrace new ideas that can improve the management of MSW. Although there is legislation covering waste management, local authorities lack the capacity to implement.

5.2 Five driven clients

Improvements in the waste management systems in all in-depth case studies were triggered by the leadership of the municipality (client) who had the desire, will and determination to change things. The set of beliefs and values of the decision-makers, the human factor, have a strong influence on the choice of operator models both in terms of arrangements and management.

The local political will is strongly connected to the demand and level of involvement of the citizens, visibly so in Maputo, Qena and Surat where citizens wanting to live in cleaner and safer cities triggered changes in governance. In St. Lucia, next to the citizens' demand for cleanliness there was a strong pressure from the tourism industry.

The stories from the in depth case studies and Ghorahi (Nepal) show us that "where there is a will there is a way" regardless of capacities or the operator model chosen.

The role and importance of the client is well articulated throughout all of the five cases studied. This book captures the enthusiastic words of the case study authors regarding the magnitude of impact a local community/government vision and will has on the development of the waste management service. All the case studies are a story of success of local communities and government changing the sector of waste management dramatically for the better.

Maputo: In recent years the importance of Solid Waste Management (ISWM) increased significantly. Not only amplified by the public sensitivity and consciousness about the issue, but politicians also acknowledged the importance of ISWM for the urban environment.

Since 2004 with support from the German Government (through GIZ) and the World Bank, technical and financial assistance initiated a strategic development process. While the Ministry for Environment (MICOA) formally has a guiding and supporting role in Solid Waste Management, within Maputo all responsibility and initiative lies with the Municipal Council. Due to the fact that the capital city is under constant surveillance from the general public and the press, the city authorities are forced to perform well and maintain a reasonable service level.

Qena: Ten years ago tribal and religious differences marked the political and social setting of Qena governorate. These political nuances are mentioned here only because at that time, along with the tangible measures of making the city of Qena a safer place for its citizens, the governorate administration launched an ambitious

programme for beautification and cleaning. Improvement of the city infrastructure and the introduction of regular cleaning of streets and collection of waste from households led to a significant difference in the urban landscape. Qena began to be referred to as an exemplary city, an example that the other cities in Egypt can follow.

These efforts of the governorate administration also led to an internationally recognized acknowledgement, as the city was the first in the country to obtain ISO 14001 certification, in 2004, for its much improved environmental performance.

From the field

Political will is perhaps an over-used term, but time and time again we notice the positive effect of determined political leaders on development of ISWM systems.

Making change happen does not always require big money interventions, though it can certainly help. Rather, improving ISWM practices can be done with limited finance so long as there is political determination, skill, attention to detail and sufficient capacity within the client team.

CIGRES: Back in 2001, thirteen (13) prefectures of the State of Rio Grande do Sul, in Southern Brazil, met to form the Inter-municipal Consortium of Solid Waste

Management – referred to as the CIGRES. Their primary aim was reported to be solving two pressing and inter-related problems: firstly, the distorted pricing of some private waste management companies perceived as operating waste collection and disposal services in a monopolistic fashion – referred to as the “Waste Mafia”. Secondly, to address the issue of final disposal sites with poor environmental conditions for those municipalities who had not entered into contracts with the previously mentioned private companies. The outcome was successful both in terms of combating high (monopolistic) prices paid by municipalities for waste management, and in terms of improving recycling rates and disposal standards. Gradually more and more municipalities joined the Association, presently numbering thirty (30).

Surat: The 1994 pneumonic plague that the city suffered was blamed on waste littered everywhere, clogged drains, heaps of waste with bad odour which all-together created unhygienic condition for citizens. The city suffered a huge commercial loss estimated around 1200 million INR or USD 60 million Euro during that time. This outbreak of disease compelled the Municipal Corporation to introduce innovations in the field of basic civic services to match with the increasing demand

of local citizens. A new Commissioner was appointed and under his leadership the Municipality undertook massive cleaning operations, bringing in administrative changes, demographic restructuring and community participation. The city of Surat initiated public private partnership models in solid waste management. Within a couple of years, Surat went from arguably being one of the dirtiest cities in India to being crowned the cleanest city. Since then Surat remained on the top 10 cleanest cities in India.

In **Castries** the big change for the positive happened in the nineties when the municipalities reacting to the pressure from the citizens and the tourism industry took action to clean up cities, beaches and harbours. International development assistance, and strong political backing of the Prime Minister and his Cabinet, further strengthened the transition to higher standards.

From the secondary case studies, Ghorahi (Nepal) has demonstrated clear vision, a strong will and determination to achieve exceptional delivery of solid waste management services. This was achieved through continuous measures to build capacity and strengthen the organizations that are tasked with delivering this important service.



Cartoon 6: When there is lack of interest and motivation you won't catch anything, on the other hand the right attitude can take you a long way.

5.3 Capacity of the operator

Public sector technical capacity in collection, and to a lesser extent disposal, is typically good as municipalities have first-hand experience in these operations. Their experience in resource recovery and treatment is limited.

Micro-scale private sector providers provide a solution to expanding primary collection service coverage, but need capacity building and training in environmental and safety standards, functioning under a contract and running a registered business.

Local SMEs or larger scale companies may bring good technical skills and are able to get involved in more capital-intensive activities. This type of company is not always available in countries in the developing world for municipalities to rely on.

International private contractors for collection and disposal have good technical capacity, but management is not always able to cope with the specific local conditions, including overcoming cultural differences.

Large-scale private operators involved in resource recovery and treatment may have strong technical and management capacities and good financial capacity. These features increase their negotiation powers and may enable them to impose unfavourable conditions in the cities where they operate.

The technical capacity of the *municipality as an operator* is relevant in all case studies mostly in collection and disposal. In all case studies Municipalities do have a long-standing experience in providing services in the sector. In **Qena** the technical capacity of the operator is good, but there is rarely documentation for management, i.e. there are no technical studies detailing the basis on which waste management solutions are chosen. On the other hand the technical staff does have charts including length and location of streets each waste collector must cover.

In **Maputo**, the technical capacity of the municipality as operator is good, but there is limited equipment at hand to work with and limited budget to invest in and finance the improvement of operations. Thus the focus of the municipality is to increase its capacity as a client and gradually give up the role of an operator. This process has been supported technical assistance and investment from development agencies.

In **Surat**, similarly to Maputo the municipality is increasingly stepping out of the operator role. This is done by attracting private investors underpinned by investments by the municipality. The ability to attract or raise financing is an important skill of these municipalities as clients.

The technical capacity of an *inter-municipal operator* of a resource management plant is showcased by **CIGRES** treatment and disposal facility. The technological failure of the process is not due to the present operation; rather it is due to design and issues related to the public sector



Photo 13: Poster of a health and safety campaign from CIGRES (© Thilo Schmidt)

as a client. With the materials input and resources at hand the operator is doing a relatively good job in capitalization of recyclables, appropriate treatment of household and some hazardous waste and the management of

a controlled disposal site. Of the primary case studies, the highest environmental standards for disposal are implemented in CIGRES.

Capacity of the CIGRES Inter-Municipal Association

CIGRES currently employs 77 staff, 71 workers involved with the processes of sorting and packaging of waste and recyclable materials, and a further 6 for management and administration activities. The working environment is competitive as employees work against production benchmarks and receive bonuses when they exceed these. The employees receive health and safety training regularly and are provided with personal protection equipment.

The technical capacity of a *national authority* as operator is showcased by **St. Lucia**, where the SLSWMA retained the operation of the disposal site and the sanitary landfill. The management of the sanitary landfill is at high standards, indicating solid technical capacity of the operator in disposal. The equipment of the composting facility on the other hand failed, because the chosen equipment was inadequate, indicating a lack of technical knowledge, or perhaps more likely, a lack of understanding of the specific local conditions on the part of the international development agencies who oversaw procurement.

Micro-service providers (MSPs) are working mostly in primary collection or small-scale resource management. These operators include citizen's associations, community based organizations, various NGOs and micro-enterprises, usually with good practical experience but often with difficulties in working with the formal waste management system. The shortage of their knowledge is probably in the sphere respecting environmental norms or certain standards that may be imposed by the client, keeping financial records and doing financial planning. In Maputo the qualification level of managers and staff on technical and management capacities has been almost non-existent; therefore the municipality provided training to the operators.

MSPs in resource management are often informal or semi-formal businesses with a long-standing involve-

ment in private waste management activities. When the formal sector extends its system to resource management it often employs personnel who were informal waste pickers before, as they are highly skilled in performing their job.

From the field

Designing and managing the interfaces between the primary and secondary collection services, and also between the other links in the chain is one of the greatest challenges in ISWM.

Formalising the interface, and using innovative design engineering and management techniques is a useful focus of development cooperation.

Small to medium scale private contractors for collection proved to be efficient in Surat and St. Lucia. In both cases these are local or national providers, familiar with the specifics in terms of infrastructure, expectations and culture, and therefore able to provide a high standard service indicating good technical and management skills.

Large-scale private contractors for collection and transfer usually have good technical and management capacity; the clients don't have many headaches with them. If large contractors are invited from the interna-

tional sphere local conditions and cultural factors may influence the way they will cope with the service they are providing in their usual markets.

For example in Maputo the large-scale service providers for the inner city and the secondary collection in the suburban areas have been selected according to international procurement standards of the World Bank. The companies selected in the first bidding process (operating from 2007 to 2011) were from Portugal and from South Africa. Operational challenges initially included equipment maintenance, lack of spare parts, and lack of discipline of staff. The European based company was quicker with the initial setup, but had then significant difficulties in day-to-day management in the local context. It required considerable efforts from the municipality's side to manage that contract and overall client satisfaction was not good. The South African company

took more time to become fully operational, but then managed to maintain service provision at a satisfactory level. Despite the initial language barrier they managed to synchronize more effectively with the technical demands and operational issues of their contract.

The service providers in Surat are all Indian, including Hanjer Biotech Engineering Private Limited, a Mumbai based company that was selected to build and operate the *resource management* facility to take up one third of the total waste generated. The company runs a profitable business, producing and selling high quality compost, capturing a large part of the recyclables from the waste stream either for direct sale or RDF production. The company managed to negotiate a 30 year concession contract with the municipality and is currently extending its business to capture all the waste generated in the city.

The importance of combating corruption in developing ISWM systems

It is a well-known fact that ISWM systems suffer from and because of corrupt practices. However, very little has been written on this subject probably due to fear or exposure and reprisals.

Corruption by definition involves the extraction (theft) of money that could otherwise be spent on improving the quality and coverage of services, and to move upwards through ISWM development stages.

Even in an early stage of development, waste management involves permanent and costly transport operations, which represent a significant portion of the municipal budget. This makes waste management an attractive target for corruption. As waste management systems develop towards more sophisticated arrangements, revenues increase and coupled with this, corruption pressure.

A bewildering range of corrupt practices and scams can be observed, all the way from pay-offs to public officials and financing of electoral campaigns in exchange for awarding service contracts, turning a blind eye to poor service and environmental performance in exchange for kickbacks, granting contracts (sometimes for long durations) to companies within which public officials have a shareholding or 'silent' financial interest, scams involving purchase of inappropriate waste treatment technologies, to more sophisticated trans-boundary waste shipments which contravene international accords such as the Basel Convention.

Whilst it is improper to generalise too much about corruption, being very specific to certain individuals and cultures and a complex issue working on many different levels, nevertheless ensuring transparency within the management, financing, tendering, contracting and operational management of ISWM systems, and punishing offenders, is an important issue.

One thing appears sure; developing ISWM systems requires concerted efforts to combat corruption with strong political backing and public pressure. Developing ISWM requires strict enforcement of due process, including the action of non-governmental pressure groups and the Public Prosecution Service. Failing to combat corruption contributes significantly to the desired ISWM objectives not being met, or to an ongoing fragility embedded in the system.



Cartoon 7: Corruption is often a way to get unfair advantage.

5.4 User inclusivity

Asking people’s opinion, needs and demands is important when introducing ISWM services, changing the service and/or when introducing or changing user fees. Experience shows that it is wise to design services around the needs and aspirations of their users.

Decentralized management for primary waste collection and sweeping services is very efficient in suburban and low-income areas. Putting in place a responsive complaint handling system can also help improve waste collection service and cleaning urban spaces.

Lack of public consultation in siting waste treatment or disposal facilities can hinder these types of investments. The proper functioning of these heavy investments can be jeopardised by lack of consultation and sense of ownership during the planning and implementation stages.

User inclusivity has three dimensions to it: extent of collection coverage; involvement in decision making; and formal mechanisms for feedback to service providers.

One important dimension of user inclusivity is to involve the users in decision-making. This leads directly to another dimension that includes formal mechanisms for feedback to service providers, communication with them, and conducting surveys to find out the preferred service opinion. The situation in this regard is widely different in our case studies, and it has a history in most.

In **Maputo**, after the increase of the waste fee in 2007, cost recovery could be guaranteed. The success of the system spread rapidly and other neighbourhoods demanded the service as well. In 2009 a total of 25 out of 43 neighbourhoods were contracted. Public pressure increased in a positive sense and in 2010 the political decision was made to roll out the system to all neighbourhoods as fast as possible, despite potential gaps in direct financing through the waste fee. The fee increase in 2010 then secured financing for the 2011 roll-out of the system to 91% of the users. Cost recovery increased from 62% to 82% cost recovery including all investment and operation costs. The rest of the costs were sustained by the PROMAPUTO World Bank financed project.

Communicating with the public whilst introducing user charges in Maputo

CIGRES is working with a complex and well-documented structure for decision-making, and a transparent accounting system.

Solid waste management is a topic constantly discussed in public in Maputo. Media are reporting frequently either about improvements in service delivery or about defaults and lack of service provision. Historically, the city has seen difficult times, when heaps of waste piled up in the streets of the city centre and the Municipality lacking capacity to respond. Emergency measures, including interventions from the military to help in the collection, were not uncommon.

The Municipality tried to engage the public with information campaigns alongside the introduction of a fee for ISWM. After initial difficulties (in 2002) the fee collection mechanism became successful and provided significant revenues for the sector. Recent increases of the fee (2007 and 2010) did not cause any considerable concerns from the public. The concept of public contribution towards improved service provision had been accepted.

Public understanding does link the service clearly to the waste fee, as is often referred to in news articles or letters from the public. The willingness to pay for service delivery is accompanied by a common demand for improved service delivery. This creates political pressure and keeps the topic on the political agenda. A formal complaint system managed by the urban districts and neighbourhood administrations is in place in Maputo. While being functional it is not the main feedback or complaint “channel” for the public. More commonly complaints are communicated through personal networks and the structure of the governing party. These structures are very well developed (down to a nominated representative of every 10 households) and are widely used for dialogue, the distribution of information and complaint management.

In **St. Lucia** there is a lot of attention placed on keeping citizens informed and involved in decision-making. Several methods are used for this including mass media coverage of waste management related issues and community meetings for consultation whenever something changes in the system, or where prolonged problems are encountered, such as miss-use of community containers. Nevertheless, the stake is not so high in the case of St. Lucia residents because they are receiving a service which they do not directly pay for – being funded from central government from tax revenues. The only cases where interaction is needed are for awareness raising campaigns and for complaint handling.

Both of these are managed through well-established systems and staff. For education and awareness raising, SLSWMA has designated staff and a budget for activities such as distributing leaflets and running an education program for schools. These activities work well for the regular collection service however they proved to be insufficient or inefficient in case of the household scale composting program, an initiative that the authority tried to implement within targeted communities.

The complaints are done directly to the SLSWMA by phone, in person or in writing and the complaints are logged and handled in due course according to the formally established complaints handling procedure. Private waste collection contractors are financially penal-

ised – in compliance with specific contract clauses, and receive penalty-points for poor performance, such as late or missed collections. Reaching a prescribed number of penalty points within a given period of time can result in contract termination.

From the field

Often operators play a role in complaint handling, as being the primary point of contact with the users, they have first-hand access to them. Such systems work well in case the operators are used either as interlocutors, being responsible to pass on the information to responsible municipal staff or if they are also entrusted through their contracts with the means to handle complaints.

Qena is the other extreme as compared to the positive examples of Maputo and Santa Lucia. There is no complaint and grievance mechanism set up formally, the citizens do go directly to the Municipality to complain, but there is no designated staff or procedure on how to handle these complaints. There appears to be little concern from the residents about the present poor status of waste management services – although they may complain about delayed collection of garbage bags which they leave in front of their houses. Delayed collection of the bags is not uncommon, since there is a shortage of collection equipment and staff. This appears to be the only type of feedback from the citizens about the services they receive.

In **CIGRES** member Municipalities, citizens complain about irregularities of waste collection directly to the respective municipal administration, by way of direct communication. This is possible and works well due to the small size of the towns. There is no formalized feedback mechanism for the population, basically because waste collection is performed by each municipal administration and not by CIGRES. Thus, the interface between the population and CIGRES is just occasional during visits of the waste treatment centre or during environmental education campaigns.

Relations between CIGRES and the general public were initially difficult due to protests against the construction of the waste treatment facilities. After encountering problems of land ownership, an alternative site was selected. The Environmental Impact Assessment procedure required by the law is vague on public consultation requirements, stating that these shall be done when necessary. There is no documentation on public consultation during implementation of the waste treatment facilities, though this is a requirement of the environmental permitting process.

One of the important changes introduced in **Surat** as part of the city's efforts to increase cleanliness was a centralized and transparent system for complaints management by the municipality. The system is computerized, so that residents' complaints come to the attention of city officials immediately. The Municipality also ensured that shortcomings in services are quickly addressed. To resolve the complaints, the municipality has set time lines between 24-72 hours. If the complaints are not rectified, the responsible operator is penalized. There is a system under which citizens can track the status of their complaints.

From the field

A high level of public awareness by the goes a long way in securing their support in solid waste management activities. In Curepipe (Mauritius) building public awareness was part and parcel of the education curricula, focused on teaching a shared commitment for keeping the city clean and clear of waste.

The door-to-door collection system according to the Municipal Waste Management Law of 2000 was first implemented in a pilot area and was followed up with an in-depth study on its impact including a survey to find out its acceptance among citizens. The study revealed that the citizens are comfortable and appreciate the door-to-door collection system and recommended its rollout across the entire city.

Another way to involve citizens applied in Surat is via citizen's administrations; the Resident Welfare Associations who manage the street sweeping services in 25% of the city area, involving over 600 such associations.

A level of user inclusivity was also evident in the **secondary case studies**. Overall the majority of these case studies include an element of user inclusivity and together lead to the factors that affect user inclusivity meaning public awareness and involving the community in decision-making.

In contrast where efforts in generating public awareness are not well executed, as was the case in Benin (Nigeria), support for the solid waste management activities is not guaranteed. In this case, the municipality attempted to engaging the public but only secured the opinions of the traditional and community leaders. This resulted in waste collection fees being set at a level that the locals felt they could not afford. Citizens were therefore not willing to pay this fee especially as they felt that the government should provide this service at no cost to them. Lack or the low level of public awareness lead the residents of Dar es Salaam (Tanzania) to think that waste services should be provided for free and they did not understand why they should have to pay for them.

As success stories in community involvement in decision making, can be mentioned the municipality of Ghorahi (Nepal) that took proactive measures to involve the community by consulting citizens during the planning and construction process of the sanitary landfill and by forming a management committee, headed by a person from the community to monitor site operations.

Also, the successful mobilization of the community in Dhaka (Bangladesh) secured their support in separating waste at the source, which facilitated production of good quality compost. The model of the plant is based on several partnerships illustrating the importance of inclusivity.

Putting the principle of co-responsibility into practice, Belo Horizonte, Brazil

In Belo Horizonte (Brazil) the municipality achieved inclusivity within the integrated recycling system (formal plus semi-formal) as a special feature of ISWM.

The semi-formal recyclers are organized in cooperatives and through formal recognition, support and partnership agreements from the municipality. This is made possible through specific campaigns, combatting the public opinion that waste management is an obligation of the municipal administration and “comes for free”. Overcoming this perception is necessary to involve the public in waste management issues.

To address this, in 1993 the Superintendence of Public Cleansing created a department of social mobilization with the task of implementing educational programmes and campaigns to educate, organize, and raise public awareness and thus develop the of a notion of co-responsibility in waste related issues.

5.5 Management

5.5.1 Decision-making procedures

Technical and management capacity of client authorities is the main factor determining operational planning and decision-making. Testing and then rolling out (and scaling up) waste collection and transfer systems and waste treatment has proven to be a prudent approach.

In **Maputo**, the ISWM Master Plan is used as a reference for decision-making. All project proposals have been scrutinized for the technological and financial conditions of Maputo for many years and Maputo City Council has enjoyed autonomy in decision-making.

In recent years, the economic and political pressure from different waste treatment providers has increased and gained more attention at the political level. Nevertheless, so far the technical and financial feasibility is still the main criterion for final decisions.

The collection service solution is based on a technical and a feasibility study. The collection service introduced in the suburban areas was tested first in a few areas and then rolled out to other areas gradually over the period of 6 years. Similarly waste management tariffs were introduced first as a small amount and then gradually increased as the service improved.

In the case of **CIGRES** it is up to each municipality to decide on how collection is managed, but once the association was established the decision-making structure for the common treatment and disposal was laid out in the statute. The levels of decision-making and division of administrative tasks between the municipalities and CIGRES are defined as follows: the municipalities have the conferral of high level management such as giving guidelines to the Consortium, through the Council of Mayors and the General Assembly, while the Consortium itself maintains an Executive Secretariat to meet operational and managerial tasks.

The municipal association started with 13 municipalities and after the benefits were proven to these other municipalities felt encouraged and joined. Now there are 30 municipalities in the association.

In **St. Lucia**, the SLSWMA Board is comprised of representative of a broad range of ministries and the Association of the Tourism Industry. The Board gives mandate to a general manager and technical staff, recruited based on qualifications for taking operational decisions. The activities and decision-making procedures have been in line with international best practices for tendering contracts, engaging into contracts and for monitoring and control.

In **Qena** the operational decisions are made by the Local Government Units. Local Government Units are mandated by the Qena Governorate, in turn mandated by the national government, to take on the responsibility and tasks related to waste management. Operational decisions are made based on experience; there are no written technical and feasibility studies.

From the field

Governance procedures are necessary to ensure the effective division of responsibilities between management Boards and the executive officers. At the same time, Governance procedures need to ensure that matters of conflict of interest are duly notified and recorded.

In **Surat**, and other Indian cities, the responsibility for waste management is placed on the Municipal Corporation, headed by the Municipal Commissioner. The Commissioner takes waste management related decisions in agreement with the elected Mayor. In Surat,

starting with 1994 and during the time S.R. Rao was the Municipal Commissioner, a management system was put in place for cleaning the city and the system stood the test of time. He established the system based on certain guiding principles. The one that affected the choice of technical solutions the most probably was the belief that private sector is cost-effective and innovative. Initially the collection system was implemented in 3 administrative areas in 2004, and then based on its success it was rolled out to the remaining 4. Similarly sorting and composting started with a private contractor for 400 tonnes per day (TPD) and is being scaled up to 800.

Municipalities that have autonomous units operating at arm's length with the municipality to deliver solid waste management services have demonstrated effectiveness in finding innovative ways of resolving challenges faced on the ground. Three of the secondary case studies reviewed, Belo Horizonte (Brazil), Lusaka (Zambia) and Varna (Bulgaria) managed to maximise collection coverage by using an array of collection services that suited the areas to which service was provided.

Decision-making and implementation of ISWM in Bahrain is done through discussions between municipalities, Ministry of Municipalities, municipal council and other involved ministries if applicable. In Gaza Strip after a decade of establishing the 1st Joint Solid Waste Management Council (JSWMC), the regional approach has proven its comparative advantages over the individual municipal system in the Palestinian Territories. The success of the 1st JSWMC had led to formulation of other councils in other local regions where it becomes an endorsed trend.

5.5.2 Procurement

Procurement of services for micro-enterprises or other small contractors for collection and sweeping seem to be best done in a decentralized manner. This may be done through invitation or open bidding

Procurement process for larger operators is usually through public bidding. For municipalities it is a challenge to keep these processes free of influence. Development involvement is often beneficial for keeping these bids transparent

For treatment facilities, procurement may be a tool for attracting private sector investment. For this type of arrangements it is important for both parties to understand the business and the technology that is being proposed as a treatment. This ensures equal positions during negotiations.

Municipal disposal sites are usually managed by the municipality itself or by a private operator through concessions like Build-Operate-Transfer (BOT) and Design-Build-Operate (DBO) as a type of public-private partnership. Contracting out engineered landfills seems to be a challenge. Most probably this is because it's difficult to find the right trade-off between the affordability to the customer and profitability for the operator.

Procurement is relevant only in the cases where private sector is involved and may be done through invitation or public bidding. In cases where an open bidding procedure is applied, a key step in inviting bids or as a step in the assessment process is the pre-qualification. In most bidding procedures the selection criteria is the cheapest qualified bid. For this reason, it is critical to be rigorous in selecting those companies that meet the threshold required for capability and experience and who can be relied on to deliver a service that meets the defined performance criteria.

Sweeping often is most commonly performed by municipal staff. The main exception of our case studies is in **Castries** where 73 micro-scale contractors in the city provide this service, contracted by the City Council. The procurement is a transparent process, done by invitation or by expression of interest from the service provider.

Surat is another exception in two ways. Firstly, because a private service company is hired for mechanical sweeping at nighttime though public bidding and secondly, besides using its own staff for sweeping, it formed partnerships with Residential Welfare Associations to be responsible for sweeping in 25% of the city's area. The partnership between the Municipality and the Community was formed during meetings, when municipal staff went out to meet the Associations and decided to contract them for the service rather than employing people directly. The Associations then engaged staff on behalf of the municipality as they see fit to carry out the work.

In **CIGRES**, sweeping is performed only in the central town areas, by public municipal servants, while in the residential neighbourhoods, kerbside cleaning is done by the population, which results, in most cases, in a clean urban space. This indicates that citizens feel and show responsibility for their neighbourhood, however it is important to know that this is not a common situation throughout the country.

Out of thirty (30) municipalities, twenty-five (25) outsourced collection, and five (5) keep collecting on their own. Eight (8) of the 25 outsourced municipal collection services are run by one middle size company, contracted through tendering process, selecting the proposal with the lowest price at the conditions of the tender. Seventeen (17) municipalities contract small local enterprises to execute collection service and transport to final destination, usually by letter of invitation or call for tender. The 5 municipalities executing this service on their own use public equipment, normally allocated in a municipal secretary of public services and cleansing

From the field

In ISWM systems, responsibility for ensuring the provision and quality of services always rests with the public authorities, even when actual day-to-day service provision is contracted-out.

In **Maputo** for large *collection* service contracts, these follow the procedures of International Competitive Bidding, while the primary waste collection uses adjusted and simplified procedures to cater for the limited capacity of the small-scale service providers. The tender process included training and capacity development for small-scale providers, executed by the Municipality's technical staff with technical assistance through development assistance.

In the semi-urban settlements of **Qena** Governorate, where NGOs are active there was considered to be no need for a procurement procedure. In **Surat**, procurement of waste collection services is done through public bidding procedures that are advertised in newspapers, the municipal web site and an e-tendering system.

Sorting and treatment facilities do not exist in **Maputo** or in **St. Lucia**. In St. Lucia there was an attempt to undertake composting, and this was operated by internal

staff of the SLSWMA – as are waste segregation and sorting activities within the sanitary landfill site.

In **Qena** there is some sorting done at the disposal site, this service is not contracted; rather the municipal staff perform the service.

In **CIGRES** the member municipalities of the Association delegate the task of sorting, treatment and disposal to the Association.

In **Surat**, treatment is tendered through public bidding, similar to the procedure used for the collection services. Landfill sites are managed by the Local Authority, Municipal Association or the National Solid Waste Authority in all our primary case studies. In Surat there is a sanitary landfill that is currently being tendered out through public bidding.

Bahrain: Companies were selected by **competitive tendering** for waste collection services in the 5 governorates in Bahrain. The municipalities decided to tender out the services in order to obtain the best services at least costs. Outsourcing the services through public tendering to two international companies was found to be cheaper than to five, one for each governorate. Waste management services are efficient and at high standards in Bahrain.

The current service is based on communal containers placed to serve 12 households each on average. The companies use motorized compactor trucks for collection. The terms and conditions within the municipal waste collection contract are set by municipalities, the Ministry and municipal council, and the contract, signed by all five municipalities and private collection companies, acts as a formal agreement between the two parties.

5.5.3 Monitoring and control

Monitoring and control is part of the client's responsibilities irrespective of who is delivering the service. This works best where good practices form a set of procedures or systems. Control mechanisms built into contracts, such as penalties for delay in payment or failure to deliver the service are widespread.

Monitoring of street sweeping and control is usually based on areas served, monitoring of transfer, treatment and disposal is mainly based on quantity handled.

A decentralised system with delegated responsibilities for monitoring can be efficient. Control and monitoring of micro-enterprises is best done frequently and through cooperation, such as meetings, visits to the neighbourhoods, or even delegating part of the monitoring task.

The availability of sufficient trained staff is important in monitoring.

Monitoring and control may lose some of its efficiency in case the municipality is both the operator and the client. This is inherent to the nature of the public operator model.

In **Maputo**, where primary collection is done with multiple microenterprises the municipality holds monthly meetings to discuss operational and contractual issues with these providers. The newly created department for planning and monitoring helped to recruit new and relatively qualified personnel who managed to establish a basic management information system. However, the strongly hierarchical structure of the former management has not completely disappeared from the institutional culture of the organization. The monitoring capacities of the Directorate have improved drastically and up to date information about waste collection and the performance of the private contractors is available on a daily basis. However, the consistency, quality and integration into daily routine of monitoring activities leave still some room for improvements.

Contract management remains a challenge for the municipality of Maputo as the municipality has been receiving support through the World Bank program to do this task. The monitoring activities for the large secondary collection service contract have not been without influence as the former contract for the inner city has been plagued by the inability or lack of willingness of the municipality to apply contractual penalties for lack of performance.

East and West **Qena** each has a Deputy Head employed by the city council responsible for waste management. Under the authority of the Deputy Head, there are 4 Heads of Neighbourhood who monitor the waste sweeping and collection activities. The Deputy Head has a map

of his neighbourhood with stretches and names of each worker responsible for this area. Street sweepers can be

From the field

Penalties should only be used for incentivising good performance, rather than as a way of justifying under-payment of the contractor.

finned via a cut in their salaries for lack of performance. Apart from that each truck is accompanied by a superintendent to ensure that waste is transported to the designated dumpsite. Fines for littering are levied by the Head of the neighbourhood. At present it becomes very difficult for them to fine people for littering due to the financial difficulties in the country as a whole.

In **CIGRES** member municipalities, monitoring and control of the contracted collection services are within municipal responsibility. In this context, the weighed and charged amounts delivered to the facilities of CIGRES represents the most easy and confidential feedback benchmark, due to a transparent charging system agreed between service provider and numerous clients. On the other hand, on the municipal level there is no standardized system in place which feedbacks quality of the contracted collection services. The internal management of the sorting and treatment plant includes monitoring the performance of employees and paying a gratuity proportional to production, the latter motivates teamwork.

Establishing monitoring and management procedures were an important step when setting up the SLSWMA of **St. Lucia** in 2004. Monitoring was one of the failing functions in solid waste management in the 90's and this needed to be corrected and institutionalized. Today the authority deploys Enforcement Officers to each geographical area of the country – and they are primarily responsible to ensure that the designated contractor operates within complete compliance with their contract.

Where the contractor fails to meet all requirements a Rectification Notice is issued designating a specific time within which the issue must be addressed. Where the problem is not addressed within the specified time, or is of a very serious nature, a Default Notice is issued. Default Notices are linked to financial deductions from the monthly contract payment made to the contractor – providing a clear financial incentive to ensure good performance.

SLSWMA's Enforcement Officers also have responsibility, within their geographic zones, for investigating and taking corrective action in the case of littering and illegal dumping of waste. Further, they are responsible for ensuring strict compliance of contract service conditions by the private operators.

In addition to SLSWMA's own staff, the minister responsible for planning has the authority to designate Authorised Officers for enforcing the provisions of the Solid Waste Management Act. The Ministry of Planning & Environment is authorised to monitor SLSWMA's operations within the Deglos Sanitary Landfill Site – although it is reported that, in reality, this does not really happen to the desired level. Therefore, SLSWMA is self-regulating in this regard and employs other third parties, where necessary, such as the Caribbean Environmental Health Institute (CEHI) for monitoring leachate treatment and discharge.

SR Rao, the chief commissioner of **Surat** during 1994 introduced several tools to monitor and control the waste management activities in the city that function today. Rao ordered officials responsible for solid waste management to make personal field visits every day, rather than relying on dubious reports. He insisted that all his

officers be in the field till noon (as he was) and spend 40% of their field time in slum and problem areas. The city decentralized responsibility for waste collection so thoroughly that each individual street sweeper answers for a specific stretch of road. Financial and administrative powers are delegated to the zone chiefs; individual as well as group duties and tasks are fixed; the officials are equipped with wireless and mobile phones for communication; and the monitoring and evaluation system is computerised.

From the field

Effective contract monitoring requires staff to be out in the field, a hands-on activity, rather than a desk-based one. Budget needs to be provided to make sure that enforcement staff can travel freely to carry out spot-checks of contractor performance.

Another efficient management and monitoring initiative that was mentioned before is involving *Resident Welfare Associations* in street sweeping activities. The municipality pays the Citizens' Association work if the neighbourhood is considered to be sufficiently clean. Reports on the level of cleanliness are prepared monthly by the local sanitation inspectors and crosschecked with surprise monitoring visits from municipal staff. This system has resulted in overall improvement of cleanliness and has ensured a higher level of community participation. Surat Municipal Corporation awards certificate of excellence to three best Associations, which adds a further motivation for other Resident Associations to improve cleanliness.

Furthermore, the municipality has set up a system of penalties for both the private operators and municipality for service or payment delays. For example, if the private contractor has not done 100% door-to-door collection, the resultant default is a penalty, which is deducted from the assured payment. Similarly, if the municipality fails to make payment within the stipulated date, it has to pay interest for the number of days payment is delayed.

Contract monitoring in Lima, Peru

In Lima an international consortium was chosen to do the public sanitation services in 1995. A 10-year contract was signed between the municipality and the consortium. In July 1996 the Municipal Agency for Supervision of the Cleaning Service was set up to be responsible for verifying and auditing the compliance to the contract. The unit was staffed by technical personnel with over 10 years of experience in waste management, among these 5 administrative staff and 18 field inspectors. The monitoring was carried out 24 hours a day and based on random sampling for sweeping, collection and disposal management.

The Agency was equipped with vehicles, communication systems, cameras, equipment for taking topographical measurement, data storage system, etc. In case of non-compliance the Agency applied penalties based on stipulations from the contracts. The company then had means to appeal against the findings, if they did not do so; the penalties were deducted from the agreed payments by the municipality. The costs of the Agency were paid by the Municipality and were around 5% of the city's waste management costs. The monitoring system contributed significantly to achieving improved waste management standards and overall cleanliness of the city.

5.5.4 Transparency

Common tools to increase transparency are open bidding, establishing a set of objective procurement criteria and having a third party (a second pair of eyes) watching over the whole process and management. User inclusivity and attention of mass media increases transparency.

Certain monitoring and control tools or methods were used in the case studies especially to increase transparency and reduce the risk of corruption.

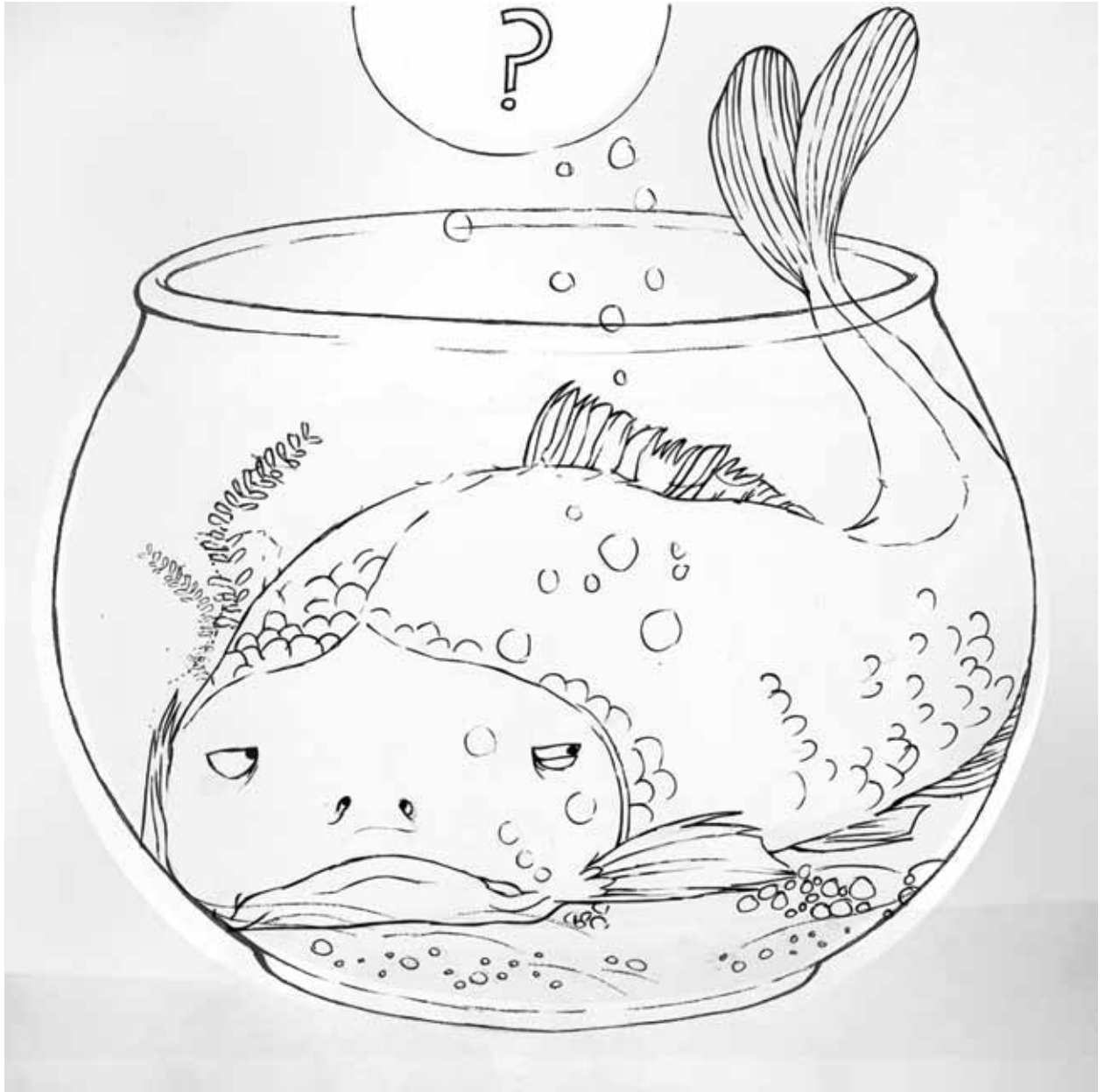
The Municipality of Maputo has consistently made decisions based on clear feasibility criteria and the World Bank and GIZ involvement added transparency to the bidding process. User inclusivity is high in Maputo; the press is also covering waste management issues regularly, this also leads to higher transparency. However, with the increasing economic development, also interest in the waste management sector increased and with that the threat of influencing decisions.

The involvement of development agencies have added to the transparency of the bidding process in St. Lucia as well and now are safe-guarding the integrity of contract management in collection services. The authority however has refrained from contracting out treatment and disposal services to private operators after the investments were finalized being concerned about the proper use and management of equipment.

One of the main reasons for CIGRES Municipalities to join together was to fight against cartel practices of the companies who dominated the market and imposed artificially high prices for services. So in and of itself the association is a mechanism to increase transparency in the sector. Furthermore, the Inter-municipal Association opted to be a non-profit organization and function under public law to avoid monopolization of functions that could occur under private law.

From the field

Measuring waste quantities in tons rather than cubic metres, and keeping and spot-checking records improves transparency, and provides a firmer basis for future planning and investment.



Cartoon 8: Monopoly may breed fat and lazy operators similar to a big fish in a small aquarium.

In Surat open bidding practices are there to increase transparency in all the services. Choices are made based on technical and financial eligibility considerations. Then there are a few specific practices to increase transparency. Inspectors are crosschecked by spot inspections

that are done ad-hoc. Transfer stations operators are paid by the ton handled. There is a weighbridge at the transfer stations and the actual weights are registered and reported leaving less room for overestimation.

5.6 Financial management

5.6.1 Revenues and sources of financing

This section focuses on financing operation and maintenance, and does not refer to investment financing.

To read about sources of investment financing please refer to section 3.5.

Waste management operation may be financed by a variety of revenue streams. The most common revenues are user charges and gate fees, taxes, subsidies and the sale of recyclables, compost or energy from resource recovery activities.

In a more regulated market and less frequently in the cases studied for the purposes of this book other economic instruments may be introduced to raise additional financing for waste management, especially for diverting waste away from landfilling and encouraging prevention, resource recovery and treatment. Examples of such instruments are the extended producer responsibility schemes, product charges and taxes, deposit systems, landfill tax, micro-financing schemes, etc.

Special and innovative ways to raise money

In our case studies some mechanisms for raising money were innovative and do not fall in the large categories listed above.

- Surat municipality is renting space on public dustbins placed on commercial areas for advertising to private companies. These revenues are earmarked for the waste management service budget.
- SLSWMA in St. Lucia charges an annual fee for issuing waste collection licences to competent contractors.

5.6.2 Money flows

To fully understand the operator models, it is important to understand how the services are paid for, how the money flows between the client, operator, revenue collector, customer, and other third parties who ensure the revenue for the operational budget and for re-financing the worn-out equipment.

The money-flows are best shown by a set of diagrams, looking at each physical element in turn in all the cities and distinguishing between the cities or areas within the cities where money flows are different.

Revenues are usually collected through central taxation, as an attachment to utility bills (eg. electricity, water), as a proportion of property tax or directly from user to private operator.

When user charges for waste management are used for financing the service there is a more reliable basis for future planning.

If, as is commonly the case, the municipality does not cover all costs from waste charge revenues but it can cover all costs by cross financing from other locally collected taxes, public services can be sustained at a high level.

Many developing municipalities are heavily reliant on national funds besides the locally collected revenues.

Figure 13: How are collection services paid for in Maputo



The waste fee is charged monthly through the national Electricity Company. This method is very effective as the payment rate is above 90%. The city benefits from development financing. The goal for the end of 2012 is 100% cost recovery for investment and operation costs from collected revenue. Current cost recovery rate is 68%.

The informal sector plays the vital role in recycling activities, diverting 5% of the generated waste from the formal waste management system. This way the informal sector contributes to financial sustainability by avoiding the costs of handling these materials in the formal system.

Figure 14: How are sweeping and collection services paid for in Qena City



The waste fee is charged monthly, payment rates are currently very low, but even when these were higher, and they were far from covering operation costs. Due to this the city is heavily reliant on state budgetary transfers.

Figure 15: How are collection services paid and re-financed in 3 semi-urban areas of Qena



NGOs established through development assistance collect revenues from users directly based on verbal agreements. All three NGOs finance their operation cost by cross-subsidizing the service with the service of cleaning septic tanks. For re-financing they rely on the Municipality.

Figure 16: How are collection services paid for in CIGRES member municipalities



In 23 out of the 30 municipalities, households are charged a yearly service fee. In these cities cost recovery rates vary from 7 % to 77% of the costs, depending on the payment rates in the municipalities that vary very widely.

The Federal and State government both provide funds in various forms to close the gap and to support re-financing and investment.

Figure 17: How are collection and transfer services paid for in Surat City



Surat is doing well covering its cost from direct municipal charge on waste collected together with Property tax, as 5% of property tax annually. The payment rate is 92%.

Figure 18: How are sweeping and collection services paid for in St. Lucia



Collection and transfer are paid for through the same money flow based on the tons handled. There are other municipal sources complementing this budget to cover 100% of operation and re-financing costs.

In St. Lucia, there are no user charges for waste management. Waste management is organized at national level and is paid from the national budget. The main source of financing is funds collected through an Environmental Levy on imported goods and tourism. In addition, residents are paying indirectly for waste management services through the payment of income and property tax. The authority receives some minor funds from license fees issued to waste handling companies, mainly collection companies.

From the point of view of the client it seems to be a good idea to operate treatment and disposal together in order to be able to benefit from the revenues arising from the sale of recycling, composting and other valorisation of waste.

In case a special purpose company is doing the treatment, joint venture type PSPs or profit sharing agreements would allow the municipality to benefit from the revenues.

Long-term concession contracts for waste treatment deprive municipalities from financial control and overall control about how waste is treated. It is important to have room for negotiation and flexibility in this type of 30-year concession agreement as policies; priorities and waste management technologies change fast.

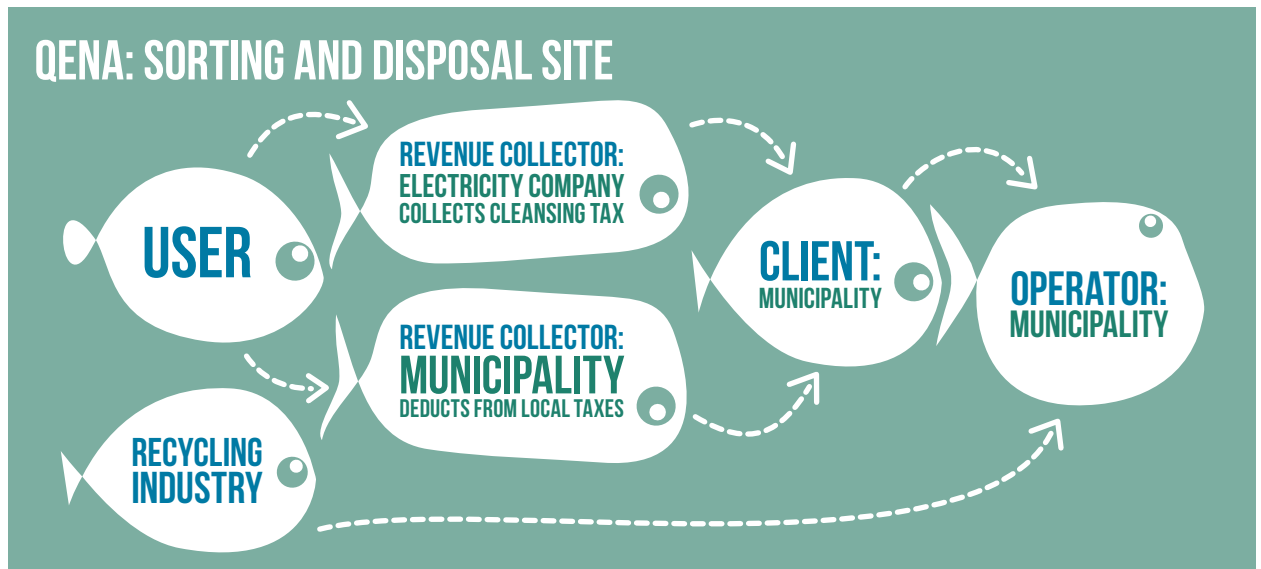
Revenues for treatment and disposal may come from a gate fee paid directly at the facility. Such is the case of St. Lucia, where commercial users pay a fee for disposal of “special” wastes.

Figure 19: How are treatment and disposal services paid for in Maputo



The disposal site from Maputo is financed through the same waste charge as collection; the funds are earmarked for waste management and stay in the municipality to finance the operation.

Figure 20: How is sorting and disposal paid for in Qena



At Qena disposal site there is a small amount of recycling, about 1% of the total waste stream coming to the landfill is recycled and these revenues are additional to the ones used for waste management from the municipal budget and the tariffs collected. All these sources of revenue are not sufficient to operate and re-finance the system; Qena relies heavily on state budgetary transfers.

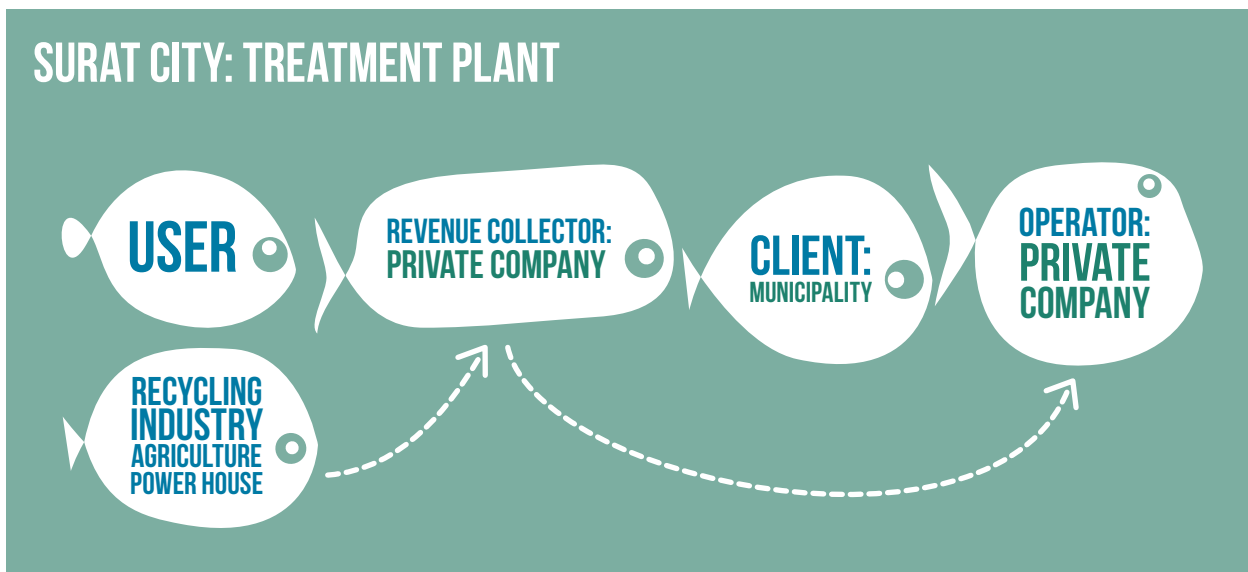
Figure 21: How is sorting, treatment and disposal paid for in CIGRES



At the CIGRES Association's treatment facility the revenues from the sale of recyclables are much larger compared to Qena due to the fact that the recycling rate is 18.2%.

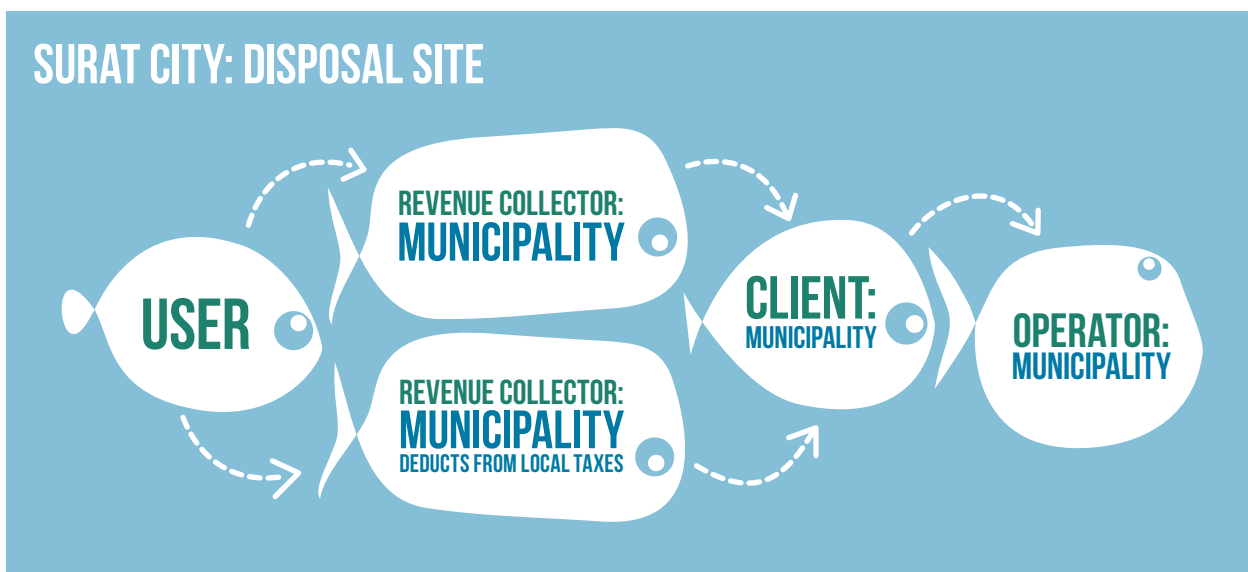
The revenue from recyclables and from the sale of compost cover up to 43% of the operation cost of the treatment and disposal facility. The rest is paid by the member municipalities. There is a rule of apportionment based on the size of the municipality, but not on the distance to the facility.

Figure 22: How is treatment self-financed in Surat



The treatment plant of Surat city is completely self-financed from the revenues it receives from the sale of recyclables, compost and RDF.

Figure 23: Money flow for refinancing the disposal site in Surat



The money flow for the operation and re-financing of the disposal site in Surat is very similar to the one in Maputo and to the collection system money flows in these cities.

Figure 24: How is disposal paid for in St. Lucia



The disposal sites in St. Lucia are financed the same way as collection, the money rests in the SLWSMA, being both client and operator. The authority receives some minor revenues from disposal of special waste and from handling cruise ship waste. So there is a minor cash flow from some industrial users to the operator.

5.6.3 Accounting and cost coverage

In the cities where accounting practices are good enough to know the costs, and private sector participation is high, payment rates are also high and revenues from fees and local budget are able to cover operation and re-financing costs.

In the cases where cost recovery was never a goal, awareness of costs is low and payment rates are low. This is also influenced by other factors, such as mayors wanting to avoid putting pressure on the electorate, or a poor economic situation.

User charges are set by the municipalities on the basis of property value, electricity or water consumption or other proxy measure of the ability to pay to differentiate between tariffs.

A number of cities have significant under-recovery of costs arising from a lack of review of the waste collection fees once they are set.

Independence from national subsidies for operation and re-financing budget seems to go together with good management, cost recovery and efficient systems.

We can only talk about cost-coverage rate in waste management if user fees are charged. If a full cost recovery charge is not in place, costs are subsidized from public financing sources, either local or from a higher level of government. Subsidisation is also necessary if charge level is not adjusted for certain level of non-payment.

In **Maputo** the target cost coverage rate is 100% for this year, it is lagging behind a little bit as some of the improvements in the service are not yet covered by the fees. It is presently calculated at 68%. The main instrument for the development and management of the financial aspects of ISWM has been a cost calculation model with detailed and localized cost calculations, waste quantity projections and assumptions for service delivery improvements. Based on this model, the municipality developed a strategy for achieving full service delivery with a sustainable approach. The cost coverage has been an important goal of the administration, it is one of the conditions of the World Bank loan and the city is working towards achieving it.

Surat municipality is aware of the costs of each physical element in operation as often operators are paid based on tons handled. Operation costs are covered 100% locally but only partially from waste fees, relying also on other municipal revenues. The costs for collection in Maputo and Surat are comparable; these are 7 to 17 EUR per tonne in Maputo and 9 to 19 EUR per tonne in Surat, depending on the wealth of the area.

In **CIGRES** treatment and disposal costs are accounted for and covered by participation payments from member municipalities. Waste collection costs are not clearly documented. 23 out of the 30 member municipalities of CIGRES collect a service charge for public cleansing.

Out of these, 17 reported their collection costs, so that for these cases an approximate financial coverage rate could be calculated. For municipalities that do charge a service fee for waste management, a cost coverage rate is calculated as the percentage of the total costs covered by the service charge. This rate is from 7% to 77%, considering only the costs of collection, transport, sorting, treatment and final disposal, not covered by revenue from the sale of recyclables.

The high non-payment rate of inhabitants of the public cleansing tax coupled with low fees limit the potential of municipal administrations to recover costs for solid waste management. This is a quiet common situation in Brazil, where real costs of municipal waste management often are not known – or not made transparent – by the municipal administrations. Costs are not allocated to one financial source, but diluted between municipal, state and federal funds. It must be stated that this situation is not only undesirable from a financial management point of view, but also may serve as a breeding ground for corrupt structures.



Cartoon 9: As a client its important to manage your resources, otherwise operators will take advantage of you just like fish may eat bates that are laying around.

From the field

Being a public utility service that creates a public good to citizens, public financing used for modernizing waste management, for investments, is very common, beneficial and natural to the sector.

However when it is used to close gaps in operational budget, to re-finance equipment and installations to maintain a certain level of service, it is not truly encouraging environmental behaviour or the sustainable introduction of technologies.

This type of public financing should be used as an emergency intervention to establish an essential public service.

St. Lucia's case is special, in that it has no direct user charging system or a link to municipal budgets, but it has a thorough cost accounting system. Based on the true costs the national authority that is also the operator of the service, SLSWMA, drafts its yearly budget, however it has no control over the revenues and the approval of that budget by the central government. SLSWMA receives some minor revenues from license fees, from disposal of special waste and from handling cruise ship waste.

In Belo Horizonte (Brazil) the waste fee accounts for 35-45% of the solid waste management budget. The rest of the budget is financed through central municipal funds. A municipal decision has been made not to increase the solid waste fee because it is more effective to increase property tax and allocate more of this to solid waste management.

In **Qena** city waste charges are not linked to costs. There is a record of the costs at the level of the Governorate but not at the level of the Department Heads who have the operational responsibility. There is also no cost centre for waste management costs. It is believed that the cost coverage ratio is low, but no figure is reported. In the semi-urban areas where NGOs provide the service the revenues are just enough to support the costs.

The importance of adding to the basket of policy & financial/economic instruments in developing ISWM systems

As ISWM systems develop an increasing range of policy and financial/economic instruments can be observed.

In countries at the very start of the ISWM process, sources of revenue to support ISWM systems are often limited to available public budgetary funds and direct payments for services. There are no policy or financial/economic instruments in place, and generally no formal cost recovery mechanisms in place.

As ISWM systems develop, bespoke financial/economic instruments begin to emerge, with a scaling up of public budgets, and cost recovery systems sometimes being put in place, although only covering a limited proportion of the service costs.

As ISWM policies and legislation emerge, more attention to putting in place costs recovery and/or alternative economic instruments to support the financing and refinancing of ISWM systems. The transition upwards through can be characterised as a series of 'policy jumps', involving the emergence of written policy, strategy, legislation, and economic/financial instruments dedicated to improved ISWM performance.

In the highly developed 'market-oriented' ISWM systems, policies are mature, and a range of economic/financial instruments available to support the diverse needs of the ISWM sector. These include well-developed local taxation systems, rigorous financial management and cost accounting, and mature procurement and contracting systems driving a competitive services/supply market.

In highly developed 'high-policy' ISWM systems, ambitious policy goals and binding legal targets are key driving forces. A wide diversity of financial/economic instruments are in place, tailored to specific waste streams.

5.6.4 Billing procedures and payment rates

Linking changes in fees to actual improvements in the service improves payment rates. Linking user charges to other utility bills both improves payment rates and reduces administrative costs of collecting the fee. Payment rates are higher if the municipality has means to enforce payment through fiscal or administrative penalties. Revenue collector and the mechanism to collect revenues work best if suitable to the local administrative capacity and ways of life.

Efficiency of billing procedure is of critical importance for collection rates and actual cost recovery. Certain billing approaches achieve higher payment rates:

- **Linking the waste charge to property tax;**
- **Linking the waste charge to other utility bills as electricity and water, supply of which could be stopped in case of non-payment.**

Payment rates above 90% in **Maputo** are due to the adhesion of the collection fee to an essential basic commodity - electricity. A further advantage is the continuous ex-

tension of pre-paid electricity contracts, which facilitate payment procedure and guarantee due payment. Some operational issues around revenue collection still need to be resolved. One issue is that the commission charged by the electricity company is percentage based. As a result each time the fee is raised, the commission increases without any extra service being provided. The relationship between the Municipality and the revenue provider is based on mutual trust not an accountable system.

In **Surat** municipal waste charge is collected together with property tax and the payment rates of the waste

fee are even higher, about 92% and amount to 5% of the collected property tax.

In **Qena** city only a few citizens pay the waste fee. The fee is charged together with the electricity bill but collected separately and the payment rates are low. In the semi-urban areas where the NGOs deliver the service payment rates are good and go directly to the provider.

In **CIGRES** 23 of the 30 member municipalities charge a yearly fee for waste management service. 7 do not charge such a fee or do not report charging. The payment rate varies between 20%-96.4%. One reason for this is that people living in a certain settlements may not be registered as a citizen by the municipal administration and may not own properties. The municipality charges the fee only to property owners being the best way to identify people in the absence of a registry. This makes enforcement difficult.

Thus, effective communication is often the only way to motivate people to pay. In addition, the collection of fees and taxes is a political issue, where, whenever possible, elected administrators or candidates tend to avoid the collection of municipal taxes, when there are other sources to cover costs.

In **Varna** (Bulgaria) waste fee is charged on the basis of property estimate from the tax administration and is collected together with property tax, thus achieving high payment rates – over 90%.

The main source of funding in **Yaoundé** (Cameroon) is the waste removal collection charge, only contributing 0.5% of the waste management budget. This charge is deducted from monthly wages. The charge is not based on per capita generation of waste and payments are minimal because 90% of the population are not in formal employment.

From the field

There are cases where private operators are made responsible for ensuring high fee collection and dealing with non-payers.

Such solutions may not work very well since private operators do not have the means to enforce payment, other than single out non-payers and stopping the delivery of service to these.

However stopping with the delivery of service, even to only a few users may constitute a breach of contract with the municipality, as it will impact the cleanliness of the city sooner or later.

Administrative or fiscal penalties are usually best enforced by the authorities.

Fees in two Chinese secondary case studies, **Kunming** and **Chongqing** are collected through central taxation and a budget is allocated for solid waste management irrespectively of the fees collected.

In **Accra** (Ghana), payments for waste collection are as high as 95% in the more affluent areas. However non-payment in the low-income areas can be as high as 30 to 40%. Payments by the users are made directly to the operator. Tariffs are set according to income levels or classification of the area.

Just like in **Accra**, payments for waste collection in **Dar es Salaam** (Tanzania) are made directly to the operator, but in this case users negotiate with service providers to pay less than is due. No action is taken for payment defaulters. Tariffs are set according to income levels or classification of the area.

5.6.5 Fines and penalties

Fines and penalties are a common instrument, known in all cases. Enforcement is high only in cases where monitoring and control systems are functional.

Fines and penalties are present in all the case studies but extent of implementation of these measures varies greatly. Fines are applied to people and organizations for littering and illegal dumping to implement the polluter pays principles.

In **Maputo** the Municipal by-law specifies that the Department Heads are entitled to fine illegal dumping, and this practice is enforced, revenues from fines show up among the sources of revenues for waste management. Fines for non-payment are not present, but payment rates are high. In Qena fines for littering are levied by the Head of the Neighbourhood. At present it is very difficult for them to fine people for littering because of the difficult economic situation in the country. Payment rates are very low and there is no enforcement mechanism in place.

The city of **Surat** has introduced a number of ways to implement fines and penalties that helped the cleanliness of the city. The sanitary workers are in Surat empowered to collect fines on the spot from people and legal entities that dump rubbish on the roadside. Each official carries a Receipt-Book from Zone Chief down to the Sanitation Supervisor, for spot-collection of “administrative charges for extra cleaning”. Another effective initiative was to create the Littering Detection Squad. The squad visits various places in the zones most vulnerable to littering. This squad is responsible for maintaining the cleanliness of the area and if any resident or shopkeeper is found to litter, first they are warned and the next time they are penalized.

5.6.6 Fees differentiation

Fees differentiation with the aim of cross subsidizing and increasing the affordability of the system is a good practice in low and middle-income countries. This helps the municipalities in its effort to ensure a waste management system to all its citizens.

Fees differentiation is a commonly used instrument to raise more revenue from organizations and wealthy residents in order to make the system more affordable for the poor. In most of our in depth case studies it is clear that the fee for waste management services is different for poor settlements, wealthy households, and commercial entities.

In **Maputo**, commercial entities producing more than 25kg waste per day are required to cater for their own collection or contract a private collection company directly, this way the residential waste collection service can benefit from more attention and resources of the

municipality. The residential fee is added to the value of the consumed energy and increases in three steps according to the progressive tariff system of the electricity provider. The differentiation is based on the assumption that the wealthier a household is, the more energy it consumes.

The Hotels of **Surat** take care of their own waste collection system; other commercial entities pay higher fees than households. The waste management service fee charged to households is 5% of the Property Tax; in this way those who have more property pay higher sanitation charges.

Table 18: Household waste fee in Maputo (Mozambique)

Consumption class	Energy consumption per month	Monthly waste fee
Social tariff	0-100 kWh	0,28 Euro
Low consumption	0-200 kWh	0,99 Euro
Average consumption	201-500 kWh	1,55 Euro
High consumption	>500 kWh	2,25 Euro

Fee differentiation for the public cleansing tax in the **CIGRES** case study is due to a fixed percentage rate according to the yearly tax on urban real estate, where bigger properties pay higher taxes. This is only in cases where municipalities include a public cleansing tax in the tax on urban real estate, but in most cases the fee is not significant and is far from covering costs, so differentiation at the municipal level is not very relevant.

At the level of association, however there is a system in place to help the smaller and poorer municipalities participate in the scheme. The monthly bill charged to municipalities takes as basis the total urban population of the municipalities of the consortium. 15% of the total costs incurred by the plant are considered fixed costs and are charged in two groups based on the size of the municipalities: the group of the large municipalities pay 65% of these costs and the group of the smaller ones pay 35% of this cost. The remaining 85% of the total costs

that are considered variable are charged in proportion to the urban population served by each municipality. The distance to the landfill of each municipality is not taken into account in the fee differentiation, so each municipality supports its own transport costs, regardless of the distance to the facility.

Large hotels and restaurants from Kolkata (India) have their own vats from which wastes are collected and transported regularly by the municipality or private vehicles on a fee-for-service basis. Small establishments dispose of their wastes on the road or in a nearby vat cleared by the municipality or by their own sweepers.

In Bahrain and Managua (Nicaragua), some low-income households are exempted from paying the monthly municipal charges for waste collection and in Varna (Bulgaria), domestic premises are charged half the amount charged to commercial premises.

5.6.7 Incentive schemes

Straightforward, targeted incentive schemes work better than complex economic instruments in the case studies. Micro-scale service providers often have very limited financial capacity and their participation in formal waste management systems is conditioned by access to capital. Micro-financing schemes have been very successful as part of a strategy to increase the participation of these providers in the formal service.

A good practice is to recognize that the informal sector by collecting and recycling part of the municipal waste stream at no cost to the municipality represents an economic benefit to the municipality and the city. Thus, to work with, rather than against this sector is likely a win-win strategy.

Introducing economic instruments that are more complex requires a more developed policy environment and well developed databases and monitoring systems.

For example you cannot have tax-breaks before introducing taxes and cannot introduce a reward for source segregation if you do not have a database about the prac-

tices of segregation of waste at household level.

Therefore there are only a few economic instruments in our case studies and those that worked are straightforward incentive schemes.

From the field

In Minas Gerais (Brazil) - whereby the informal recyclers are paid for environmental service - it is called “Bolsa reciclagem “ (recycling bonus).

Bolsa Reciclagem is a financial incentive for the work done by waste pickers. This incentive was implemented by the state government of Minas Gerais at the end of 2011 and regulated by law in June of 2012.

It considers the quantity and diversity of recyclable materials the waste pickers of associations and cooperatives are able to commercialize. The incentive is paid at the end of each three-month period.

An extended producer responsibility system was introduced in St. Lucia for packaging waste. However, effort to establish a deposit-refund-system for plastic bottles some years ago were blocked by the Chamber of Commerce – as entities selling commodities in plastic containers, such as water and soft drinks, feared that their commodities would be unfairly impacted within the market.

There are two other incentive schemes identified. One is the Brazilian national legislation that facilitates access to funds and gives tax breaks to Inter-municipal Associations. The other is in Surat where the municipality by offering land at a symbolic rental price gives an incentive to private companies to invest in resource recovery.

There have been efforts to show the economic benefits of the informal sector, one of the latest such efforts was a GIZ study carried out in 6 different cities in 2007, *The Economic Aspects of the Informal Waste Management Sector*. The results of the study show that the informal sector typically diverts a considerable amount of municipal waste to recycling or reuse. Thereby it brings a considerable benefit to the municipality and society, that otherwise would have to incur the cost of handling this waste in the formal system.

This point is sustained by the case studies reviewed for the purposes of this book as shown by the high recycling rates achieved by the informal sector or in cases where the informal sector is integrated in the formal waste management system. Recognizing this added value has determined municipalities and donors to set up various incentive schemes to help micro-scale service providers, one of these are micro-financing schemes.

In-depth case study - Surat, India

Surat is a well-known commercial city of India in the state of Gujarat known for diamond cutting, polishing and textile production. After the pneumonic plague in 1994, reported to have occurred because of bad waste management, the Municipal Corporation was compelled to introduce many innovations in the field of basic civic services to match with the increasing demand of local citizens and set the local objectives for cleaning the city as a high priority. Due to this and with the help of a new Commissioner, within couple of years, Surat went from arguably being one of the dirtiest cities in India to being crowned the cleanest city. Since then Surat remains on the top 10 cleanest cities of India.

The Surat municipal area is divided in seven administrative zones where zone offices are set up with infrastructure facilities to cope up with technical and sanitation demand of the city.

Management of municipal solid waste is covered in all state laws pertaining to municipal governance, but all the issues relating to ISWM are not adequately addressed in all state laws. States like Gujarat have adopted the MSW Rules and the Surat Municipality has framed its own municipal by-laws to facilitate implementation of MSW Rules.

Surat is mostly a PSP model with multiple operators in collection, transfer and resource management. The disposal site is municipally operated. The local authority handles revenue collection.

Waste management profile:

Street **sweeping** is provided by regular sweeping staff of municipality public service during day time but there are also private operators contracted for the mechanical sweeping of dust and soil from the most congested roads and market areas in the night time. Contractors use their own resources (manual and mechanical sweeping) for transporting the waste up to the transfer station in respective zone.

The city of Surat has adopted several systems working in parallel to collect waste from the point of generation. Door to door **collection system** was implemented initially in three out of seven zones of the city. Presently, waste is being collected through door-to-door services in more than 90% of the Municipal area and is transported to containers and transfer stations by private contractors while in low-income areas, there is a block collection system in place. Commercial Waste from hotels, restaurants, eating joints are collected and transported to transfer station through the Hotel Association of Surat. The hotel association pays the contractor and municipality only monitors the system.

After primary collection, the municipal solid waste is transported using a mix of methods like containers lifters, hydraulic dumper trucks, refuse compactors, tractor trolleys and other small vehicles to the 6 **transfer** stations acquired with weighbridges and CCCTV. From here, the waste is loaded into large container trucks or 16 ton capacity containers and disposed at Khajod landfills. All transfer stations are contracted out through concession contracts where investments were made by the municipality.

Regarding **treatment**, there is one private investor operating a treatment facility working based on a 400 ton/day service contract, representing one third of the municipal waste stream. The treatment facility for composting and RDF production in Surat (India) was established through a Design Build Operate Finance and Transfer (DBOFT) type agreement with a 30-year concession contract. The facility works at no cost for the municipality as do the informal sector recyclers. In this case, the informal sector is relatively small because of very high coverage of daily formal door to door collection system.

Surat has at the moment 2 landfill sites; one controlled landfill and one sanitary landfill newly built and in the middle of the procedure for getting Environmental Permits. The sanitary landfill in Surat was built only for residue waste from processing of waste and other inert materials but is not presently in use as Gujarat Pollution Control Board refused permission for disposal of mixed unprocessed waste. There will be a private operator for the sanitary landfill based on a concession contract.

Table 19: Surat Waste management performance indicators

City:		Surat	
Country:		India	
G1	Country income level	World Bank income category Lower middle income	GNI per capita \$1,530
G2	Population	Total population	4,600,000
G3	Waste generation	Total municipal solid waste generation (tonnes/year)	456,250 tons/year, 547,400 tons/year including recycled materials
No	Category	Indicator	Results
Key Waste-related data			
W1	Waste per capita	MSW per capita (kg per year)	Average of 119 kg per head (including recyclables)
W2	Waste composition	Summary composition of MSW for 3 key fractions – all as % wt. of total waste generated	-
W2.1	Organic	Organics (food and green wastes)	54%
W2.2	Paper	Paper	8%
W2.3	Plastics	Plastics	10%
Physical Components			Traffic light code
1	Public health – Waste collection	Waste collection coverage	80-100% ● ●
1Q		Quality of waste collection service	Medium/High (65%) ● ●
2	Environmental control – waste treatment and disposal	Controlled treatment and disposal	Medium 55% ● ●
2Q		Environmental quality of waste treatment and disposal	Medium/Low (40%) ● ●

City:		Surat		
Country:		India		
3	3Rs – reduce, reuse and recycling	Recycling rate	30%	● ●
3Q		Indicator of the 'quality' of 3Rs provision	Medium/Low (40%)	● ●
Governance Factors				
4U	User inclusivity	Degree of user inclusivity	Medium/High (65%)	● ●
4P	Provider inclusivity	Degree of provider inclusivity	Medium/High (75%)	● ●
5F	Financial sustainability	Degree of financial sustainability	High (87%)	● ●
6N	Sound institutions, proactive policies	Adequacy of national ISWM framework	Medium (60%)	● ●
6L		Degree of institutional coherence	Medium/High (79%)	● ●

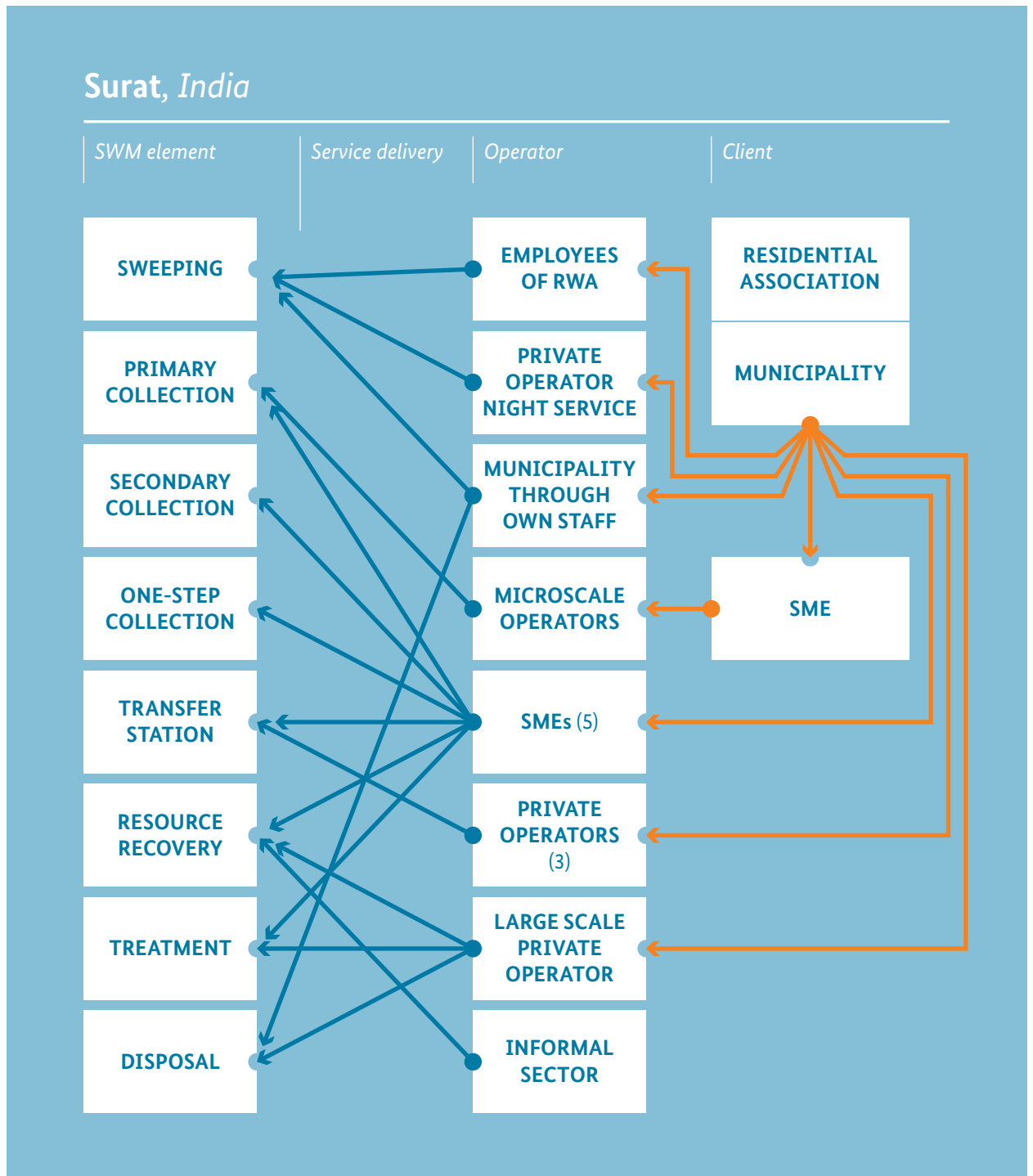
Surat has a remarkably well-performing ISWM system in comparison to other Indian cities, with their highly challenging environments for the provision of public services.

Driven by reforms introduced after the outbreak of pneumonic plague in 1994, Surat has put in place a highly diversified and largely effective system based on multiple PSP service providers. Collection systems are well developed, though quality of disposal is lacking due to delays in receiving environmental permits for the already constructed sanitary landfill. Recycling rate

is moderate. On the governance aspects, Surat scores extremely highly. The system is inclusive, financial sustainability is excellent, and institutional systems are well developed.

Surat provides a shining example of the affect on ISWM that can be made by political determination, innovation, and openness to experimenting with different operator models. Involving the private sector, but with strict monitoring from the municipality, seems to have been one key to success.

Figure 25: The relations between the client and operator in Surat, India in-depth case study



6. Selecting the operator model

6.1 The process of selecting operator models

In this chapter we look at conditions and capacities that trigger the choice of goals to improve certain or all aspects of the integrated waste management system and how these in turn enable the choice of certain operator models.

Conditions include the socio-economic context, the policy and institutional framework, the local challenges

and needs the country or city is facing at a certain point in time. Parts of the conditions are facilities or barriers set up by the legislation in a certain country that we have called local enabling conditions in this book. Capacities include technical, management and financial capacity of the client, operator and revenue collector.

6.2 From conditions and capacities to local objectives

The local conditions, challenges and needs concerning public health, cleanliness, environmental control, waste management and other related issues were the drivers that determined authorities to set local goals. We have found that these local goals were the main driver for development in the sector and thus also in choosing the operator model that would help to achieve them.

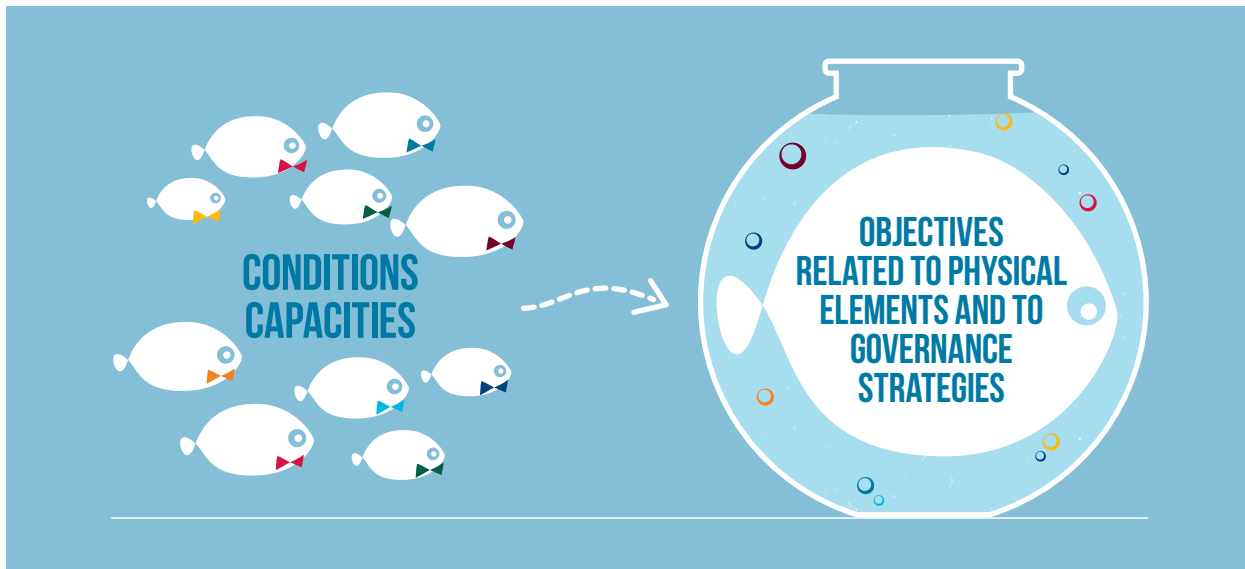
The cities struggled with urging problems such as the safety issues associated partially to dirty streets and urban spaces in Qena, the public health issues, including outbreak of pneumonic plague in Surat or the nuisance and public health problems associated with waste in Maputo.

These problems prompted the local authorities to focus their attention to the physical elements, and most sig-

nificantly to increasing collection coverage and getting waste out of the sight. Governance related local objectives were established as a response to another set of local problems and conditions for example in Qena the high unemployment rates among the educated youth was alarming and the authority set out to decrease it. In Surat authorities considered that the city is not cost effective in waste management activities as it is paying relatively high wages to employees as compared to the local market conditions.

As the local budget was limited and had difficulties to sustain the cost of the service, Surat authorities set out to increase cost efficiency.

Figure 26: The process of establishing local objectives



The table below presents a quick overview to highlight which conditions and capacities were important in establishing certain objectives in the in depth case studies. These do not contain all the conditions and capacities; rather highlight those that were found to be essential. The table in essence draws upon the experiences and lessons learned from the in-depth case studies but includes additional conditions and capacities that in the experience of the authors are common triggers for setting objectives.

Table 20: From conditions and capacities to physical objectives (based on the 5 in depth case studies and *completed with experiences of the authors*)

Physical elements	Drivers	Objectives
Public health	Dirty streets, public spaces Dirtiness of areas of commercial or touristic interest Low level of safety (conflicts, occurrence of crimes) associated with dirtiness of the streets Waste overflowing litter bins Pressure from third parties such as the tourism sector in the case of St. Lucia Aesthetic aspects to rise citizenship practice and local identification	Cleaning the city (Street sweeping)

Physical elements	Drivers	Objectives
Public health	<p>Direct public health problems from uncollected waste - increased incidence of childhood diarrhoea and acute respiratory infections (from open burning) in areas without a regular waste collection service)</p> <p>Difficulty in collecting waste in distant areas or with poor infrastructure, such as rural districts or peripheral areas, unpaved or narrow streets</p> <p>Indirect public health problems from uncollected waste blocking drains and watercourses - causing stagnant water, waterborne diseases, potential epidemics and widespread flooding</p> <p>A resulting demand for extending collection coverage to areas where such service does not exist</p> <p>Public attention, complaints and mass media coverage related to the problems caused by accumulation of uncollected waste</p> <p>An existence of demand for improved waste collection service</p> <p>Slow and inefficient waste collection, delays in service</p> <p>Nuisance and odour connected to the waste collection service</p> <p>Presence of accumulated waste around collection points</p>	<p>Extending collection coverage to everyone (Primary collection)</p> <p>Modernizing secondary and “one-step” collection</p>
	<p>Nuisance to the public caused by odour and pollution from poorly managed transfer stations</p> <p>Potential for economies of scale through transfer stations</p> <p>Lack of space for sanitary landfill close to waste generation increases distances</p>	
Resource recovery	<p>Awareness of the pollution caused by disposal</p> <p>Existence of a market for recyclables</p> <p>Existence of recycling targets in the legislation</p> <p>Existence of the polluter pays principle and extended producer responsibility principle in the legislation</p> <p>Existence of source separation of recyclables to increase quality of the product</p> <p>Decrease of disposal costs</p> <p>Poverty and social aspects – existence of poverty and cheap labour costs render economic viability for waste separation</p>	<p>Increasing Recycling</p>
	<p>Awareness of the pollution caused by disposal or back yard recycling methods</p> <p>Existence of source separation of organic waste to increase quality of the product</p> <p>Existence of a market for the product</p>	<p>Improving waste treatment</p>

Physical elements	Drivers	Objectives
Environmental protection	<p>Complaints, nuisance from waste disposal through odour, water pollution, smoke from open burning</p> <p>Poor environmental quality of waste disposal</p> <p>Existence of national legislation or policy that requires higher level environmental standards of disposal</p> <p>Poor control of greenhouse emissions and/or energy efficiency</p> <p>Existence of financing mechanisms and incentives</p>	Improving disposal

Table 21: From conditions and capacities to governance objectives (based on the 5 in depth case studies and completed with experiences of the authors)

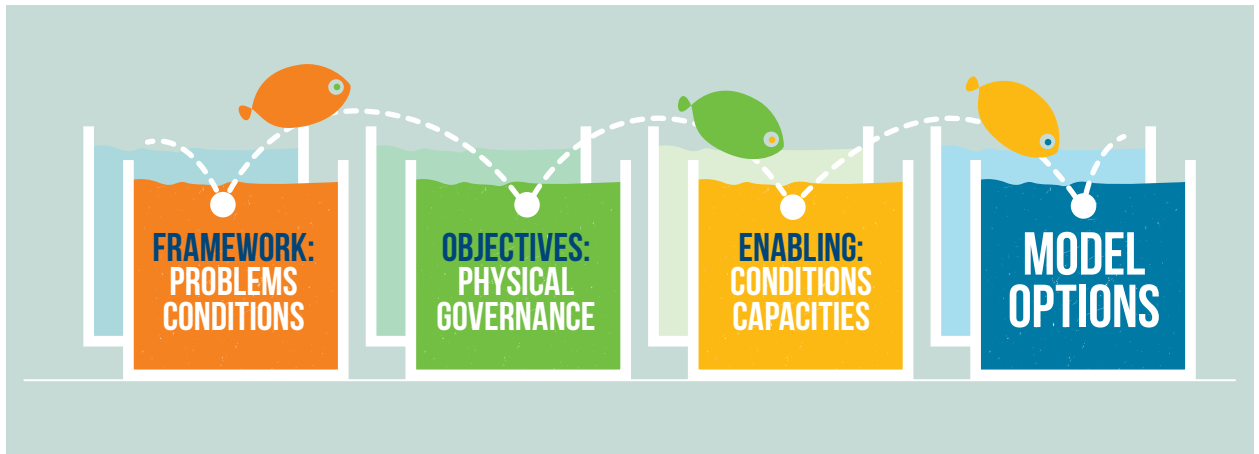
	Conditions and capacities	Objectives
Governance strategies		
Provider and user inclusivity	<p>Existence of laws and legal instruments which enable the „private” sector to deliver „public” solid waste management services</p> <p>Existence of organizations and structures to represent the private sector</p> <p>Existence of open and transparent bidding processes</p> <p>Presence of suitable institutional capacity and contracting tools</p>	Increasing private sector participation
	<p>Awareness at the level of local authorities about the social, environmental and economic benefits of informal sector activities in waste management</p> <p>Lack of barriers in terms of environmental standards and social acceptance</p> <p>Existence of representation of the informal sector providers</p> <p>Incentives to integrate informal sector in waste management systems, i.e. through national waste law facilitating financing of waste treatment infrastructure</p> <p>Training, capacity building and professionalization of informal sector</p>	Integrating the informal sector
	High unemployment	Increasing employment
	<p>Public awareness and involvement in waste- related problems</p> <p>Media attention to waste-related problems</p> <p>Requirement in the EIA procedure</p> <p>Dependence on collection of fees for cost recovery, turn costs, contracts and finance sources transparent to citizens</p> <p>Feedback mechanisms</p>	Getting citizens involved

	Conditions and capacities	Objectives
Financial Sustainability	<p>Limited local budget available for waste management</p> <p>The capacity and willingness of the citizens to pay for waste management services</p> <p>A requirement of the international financing organization lending part of the necessary financing</p> <p>Sound accounting practices</p> <p>Degree to which the commercial entities and institutions pay for the full cost of waste management or handle their own waste at their own cost</p>	Covering the costs
	<p>Limited local budget available for waste management</p> <p>Reliance on local budget for re-financing and operation (or funds attracted at own cost/risk)</p> <p>A knowledge or perception that the current waste management costs are high</p> <p>Increasing costs associated with extension of collection coverage or improved standards of disposal</p>	Increasing cost-efficiency of services
Institutional coherence	<p>Frequent littering</p> <p>Donor agency recognizing a need for capacity building and institutional strengthening</p> <p>Lack of capacity of the authority responsible for waste management (often recognized by an external party, i.e. donor agency)</p> <p>Lack of concentration of solid waste management issues into one department that can be held responsible (Qena)</p> <p>Weak control by the city as „client” of the delivery of the services (companies trying to gain unfair revenues in Surat)</p> <p>Insufficient cooperation between municipalities and the different levels of government</p> <p>Pressure from third parties such as tourism sector</p>	Improving monitoring and control
	<p>Threat to impartiality due to economic influence</p> <p>Meeting demands of international donors</p>	Increasing transparency

6.3 From local objectives to operator models

Once these local objectives are established everything else is set into motion to modernize waste management and choices are made on the technical solution, technology, the operator model including responsibility and ownership, the contracts that should be closed, the management and control tools, the ways operations will be financed, etc.

Figure 27: Selecting Operator Models



Local goals are aiming to improve one or the other physical element or governance strategy of the waste management system. The objectives related to the physical elements come first and respond to the question „what” should be achieved.

These are often linked to conditions such as the socio-economic context, geography, infrastructure and local problems. The governance objectives are related to „how” the services will be organized, paid for and managed and are thus equally important for selecting a model. These are often linked to financial, technical and management capacity of the client and operator and to the prevailing policy and institutional framework.

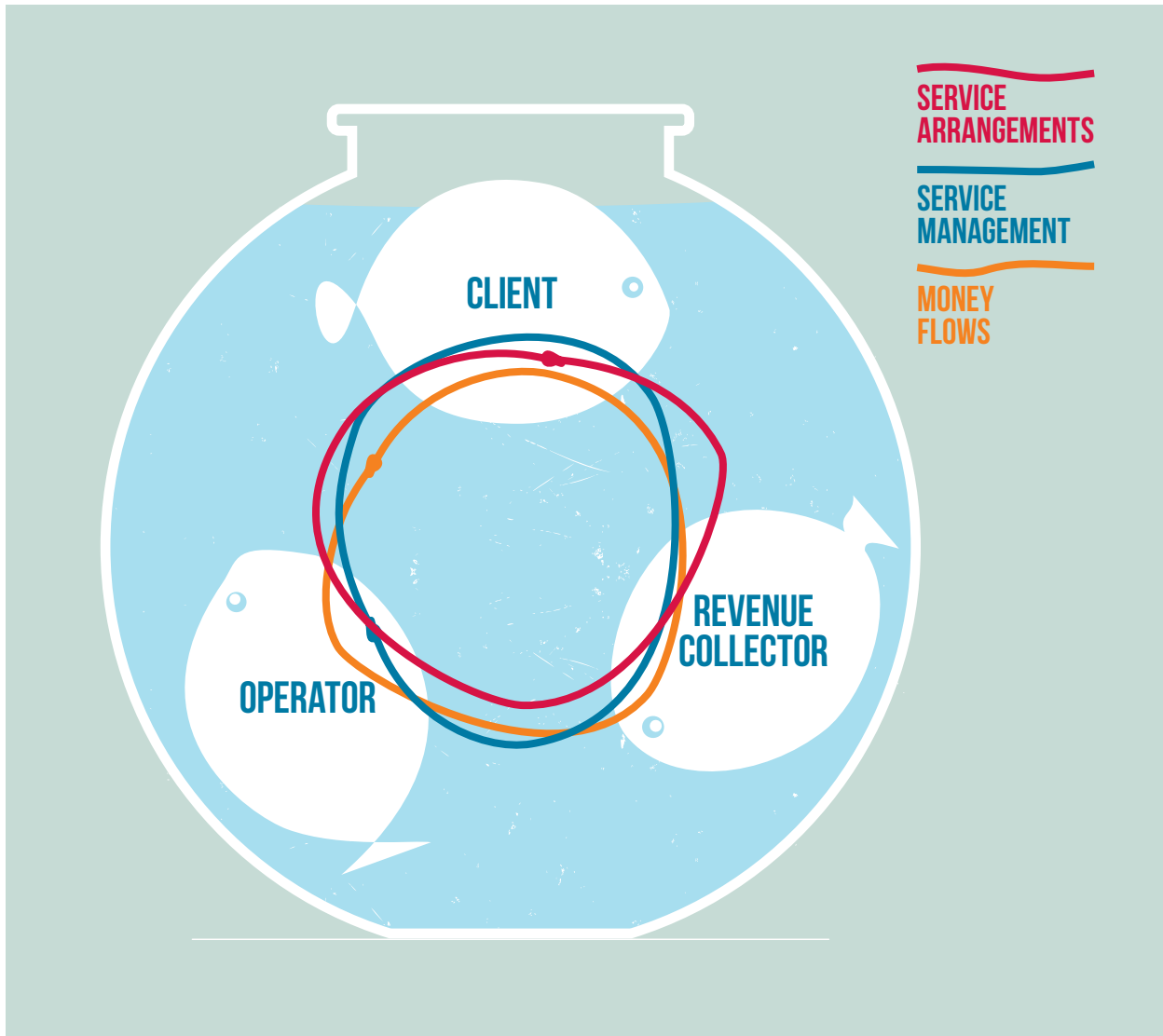
The analysis in the following sections are structured around the objectives set out in the in depth case studies because these are the ones that triggered change in the waste management system and thus also a change in the

operator model. Therefore the lessons learned arise from the cities’ (or case studies’) efforts to reach local objectives.

Linking these to details about client, operator and revenue collector and how these work together in terms of contracts and agreements, management and control, and financing enhance our understanding of the operator models in place. In this analysis we are bringing together all the defining elements of the operator model as introduced in the methodology section. Whenever it is possible we supplement the information with insights gained from the secondary case studies.

The diagram below is a quick visual reminder of the operator model definition we have used in this book and introduced in Chapter 2.

Figure 28: The Operator Model



6.4 Common Local Objectives

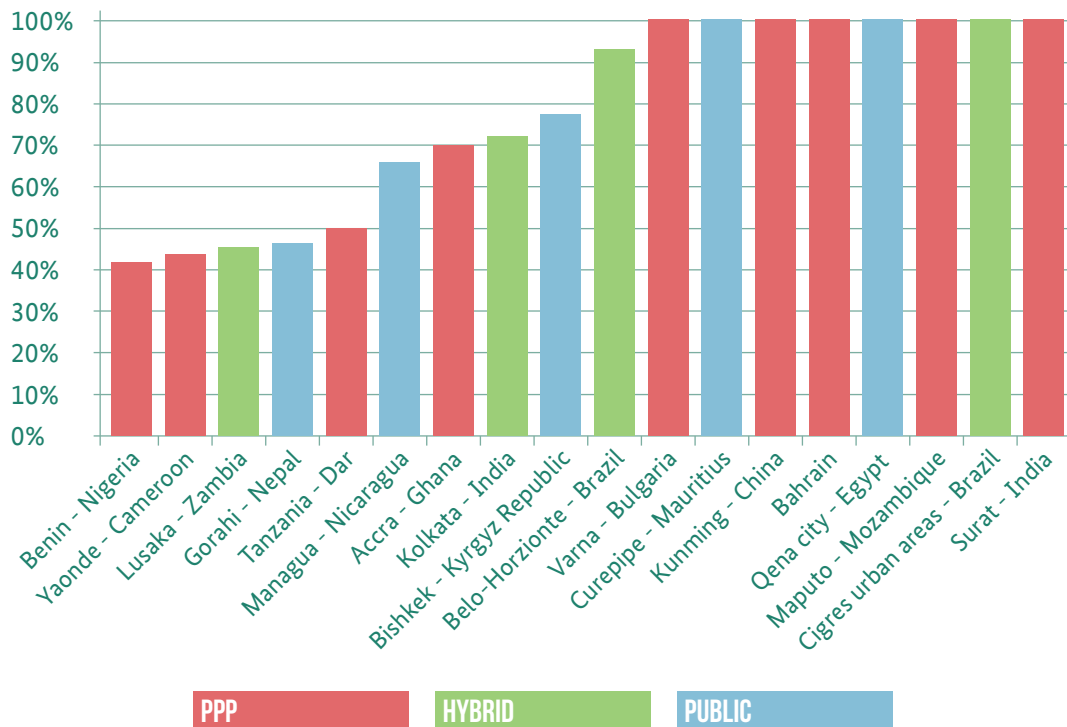
6.4.1 Cleaning the City

Sweeping and collection services are usually the number one priority of municipalities as they are driven by the need and demand for public health and cleanliness. Resource recovery, treatment and disposal usually get the attention of municipalities after sweeping and collection services function to a satisfactory level.

Collection service is carried out through public, PSP models or a hybrid model, that is a mixture of these.

As can be seen from the graph below the case studies reviewed suggest that PSP models, or those that have an element of PSP tend to be more successful in achieving high collection rates, but not necessarily so as there are exceptions to the rule in both ways. Some public services are reaching very high collection coverage and some PSP models are underperforming.

Figure 29: Collection coverage and model type



In the following we will analyse in more detail how operator models are set up, managed and paid for in the case studies, highlighting lessons learned about the appropriateness of the models

Regular cleaning of city and of streets used to be a challenge for Surat and Qena in the 1990s. The dirtiness of the streets was associated with public health issues (Qena

and Surat) and as contributing to poor safety facilitating the occurrence of criminal incidents or social conflicts (Qena). As a result the municipalities set out to introduce sweeping service in all areas through municipal staff, in Surat mostly as stand-alone manual sweeping service and in Qena sweeping combined with primary door to door collection.

Add-ons to the municipal operator model in Surat to help cleaning the city

In Surat, besides the regular municipal sweeping service it was considered that additional manual and mechanical sweeping of high traffic areas are necessary in the night in order to attain the desired cleanliness. For these extra services a PSP model was adopted through a sweeping service contract with a local middle sized company.

An additional twist is added to the Operator Model in 25% of the areas in Surat, where Resident Associations received service contracts based on areas and performance standards to manage their own sweeping as they see it fit. The attribution of contracts and selection of Resident Associations happened through a series of meetings between the municipalities the residents and the associations. Residents are also engaged in sweeping in Brazil as this is part of the culture and tradition.

For management and monitoring, Surat introduced a series of tools, such as regular and spot check inspections through field-visits, performance reports and instituted the Littering Squad for issuing fines for littering on the spot and having to pay high attention to areas well known for littering. Monitoring became very sharp and an important element of the Surat model as it was set as a governance goal to increase the monitoring, inspection and management capacity of the municipal staff at all levels and empowering personnel to perform these tasks.

These measures and the operator models earned the city country wide fame for high standards of cleanliness shortly after they were introduced.

Table 22: Operator model for cleaning the city

District	Relevant governance objective	Model	Operator	Contract	Management	Refinancing
Surat 75% of residential area		Municipal	Municipal staff	n.a.	Decentralized; Littering control	Local budget; Littering fines
Surat 25% of residential area	Improved monitoring	PSP	640 Residential Associations	Area based service contracts	Control through field inspection and cross check	Local budget
Surat high traffic roads and city centre	Improved monitoring	PSP	SME	Service contract	Control through inspection; Littering control	Local budget; Littering fines
Qena	Employment and social inclusivity	Municipal	Municipality	n.a.	Decentralized; No enforcement of littering control	Reliance on governmental funds

Sweeping thus may be done through municipal, PSP models or a combination of these in case additional services are needed besides the regular service. Contrary to the in-depth case studies where these services were predominantly municipal and separate from collection (except from Qena), the review of the secondary case studies shows that most commonly sweeping is done by a provider engaged for collection services.

No specific advantages or disadvantages were noted in the case studies that may be associated to selecting any one or mix of operator models.

There are, however some lessons learned, worth noting. Engaging residents or resident associations in sweeping through a PSP model proved to be efficient in Surat. The model built upon the idea that people will take pride in keeping their own areas clean and that areas will compete against each other to achieve higher levels of cleanliness.

Another lesson learned from the positive example of Surat is that introducing a littering control element to any model chosen, assigning and empowering personnel to patrol the city and fine people is an efficient add on to increase cleanliness. The system may achieve visible and impressive results especially at the beginning of its implementation. After a while the general awareness of the residents’ increases and littering decreases and thus littering control will no longer be necessary.

The evidence suggests that

- Regarding cleaning the city, no specific advantages or disadvantages were noted in the case studies that may be associated to selecting any one or mix of operator models.
- Engaging residents or resident associations in sweeping through a PSP model may be beneficial to supplement regular sweeping in high traffic or crowded areas
- Introducing a littering control element to any model chosen, assigning and empowering personnel to patrol the city and fine people is an efficient add on to increase cleanliness

6.4.2 Extending the primary collection coverage

Extending collection is especially a challenge in suburban, peri-urban or low-income areas with poor infrastructure. This is resolved now in all our primary case studies and their experience teaches us something. Lack of proper collection services, dirtiness and accumulation of waste was associated with public health issues (Maputo and Surat) and safety (Qena). The technical solution chosen for these areas was introducing a primary collection service with handcarts or other small suitable transport means and vehicles. Where roads were narrow and in poor condition manual equipment was chosen and the block collection method (Maputo suburbs, Surat low income areas), in other places with better infrastructure the door-to-door method (Qena) and smaller motorized vehicles may be chosen (some areas in Surat).

The operator model most commonly chosen was PSP through area based short term (1 year in Maputo) service contracts with multiple micro-scale service providers such as microenterprises, CBOs, resident associations and NGOs. In 7 of the 23 secondary case studies in some circumstances collection coverage has been increased through the participation of micro scale service providers where services are poor or non-existent, often in the poorer areas of the cities (Bamako – Mali, Bishkek – Kyrgyz Republic, Dar es Salaam - Tanzania, Kunming - China, Lusaka - Zambia, Nairobi – Kenya, Yaoundé - Cameroon).

These type of contractors are chosen as they serve the governance goal of affordability and cost recovery in

Maputo. Extending the service through primary collection in a municipal model was chosen in Qena where the governance goal was to increase employment and the municipality chose to do this by increasing their own staff.

The procurement process for these services through micro scale providers was through direct invitation letter in Maputo. The operators needed training that was provided by the municipality. The management is decentralized in a similar manner in the case studies, only the names for the administration at the district level changes. These may be called district administration (Maputo), neighbourhood heads (Qena) or zone chiefs (Surat). Frequent and flexible management meetings to discuss problems and contracts are helpful, rather than only monitoring and control, the administration cooperates in overcoming problems. Inspectors are doing site-visits and work best if they are crosschecked by unexpected visits from different inspectors to ensure a second pair of eye and exclude the risk of familiarity (Surat).

Some management tools in PSP schemes for extending collection coverage prove to be important. The rolling out of the collection system and involving private sector in providing this service was carried out through a step-by-step, area by area approach in both Maputo and Surat. As financial sustainability and user inclusivity were both governance goals in Maputo, while rolling out the service care was taken to consult users and stakeholders

making sure that the fees charged are associated to an improved service or to the extension of the service.

An important way for municipalities to increase their resources available for extending collection was focusing on residential users and municipal waste streams, leaving commercial entities and other waste stream producers to manage by themselves, complying to legislation and contracting private service providers directly (Bahrain, Belo Horizonte – Brazil, Chongqing- China, Curepipe – Mauritius, Managua- Nicaragua, Lusaka – Zambia, Maputo- Mozambique and Surat - India).

The municipal service in Qena highlights the fact that dependence on national budget for refinancing is a threat to performance in the long term. The municipal service in Qena used to be a showcase in the country for achieving cleanliness and high collection coverage rates. While the collection coverage rate is still reported to be 100%, the quality of the service is declining, since the municipality was forced to lay off staff and thus there are delays in collecting the waste.

Table 23: Operator model for extending waste collection coverage through primary collection

District	Relevant governance objective	Model	Operator	Contract	Management	Refinancing
Maputo suburban; 90% of population	Financial sustainability; User inclusivity	PSP	Microenterprise, CBO, resident association	43 area based 1 yr. service contracts	Decentralized; Roll out; Focus on HH waste	Full cost recovery from fees
Surat low income; 10% of population		PSP	SME, middle sized company	5 area based 5 yr. service contracts; Included in general service contract	Decentralized; Roll out	Full cost recovery from fees and local budget
Qena; Entire city	Increased employment and social inclusivity	Municipal	Municipality	n.a.	Decentralized	Reliance on governmental funds

In instances where the municipality did not have the sufficient capacity to collect waste from such areas through the official collection service, private-to-private models sprang up for collection in the neighbourhoods. Small providers who may be either formal or informal carry out the private-to-private arrangements. Community based operations and informal sector have stepped up to provide collection services in our secondary case studies in Bishkek – Kyrgyz Republic, Dar es Salaam - Tanzania, Lusaka - Zambia, Nairobi - Kenya, Kunming - China and Yaoundé - Cameroon in areas that are not adequately covered by the nominated service providers. The waste collected this way may not end up in the official dumps, especially if there is a gate fee for disposal,

and if there is no support from the municipality to integrate these services into the formal service. The fee collected is enough for getting the waste out of sight, and these initiatives need some type of support from the formal system to be able to deliver the waste to the formal treatment and disposal places.

Municipal service is always an option for delivering waste collection services, including primary collection services, these may be selected in situations where there are no local small scale private sector providers to engage in the activity or the municipality is unaware of their existence or chooses to keep the service municipal in order to achieve other objectives.

Special models for extending collection service to *isolated* and *rural or semi-urban areas* of the in-depth case studies

There is limited experience in extending collection service to rural or semi-urban areas. These settlements are different in terms of demography, economy, and settlement structure and have no or limited access to waste collection services (rural CIGRES - Brazil, most of rural and semi-urban Qena - Egypt).

In Maputo, Mozambique the service is done through the Municipal model implementing a rudimentary communal collection system. In Qena, Egypt, this is done through private-to-private arrangements either through development funded NGOs for mixed or the informal sector for WEEE. The NGOs are eligible to receive budget allocation for re-financing and investment of collection equipment.

The evidence suggests that

- Selecting PSP models and engaging multiple micro-scale service providers through service contracts for extending collection coverage to suburbs, peri-urban areas and slums is appropriate because it's a flexible and cost efficient solution
- Contracting through invitation letters and short-term area based service contracts (1 to 5 years)
- Decentralized management and monitoring
- The rolling out of the collection system is beneficial
- Focusing on residential users and municipal waste streams is beneficial
- Dependence on national budget for refinancing is a threat to performance in the long term

6.4.3 Modernizing “one step” or secondary collection

Part of extending collection is modernizing and extending motorized collection. Modernizing secondary collection and the „default” service carried out in one step will be considered together as both technical solutions and operator models chosen for these are similar and often outsourced by the same operator.

The review of the secondary case studies supports the evidence from the in depth case studies, showing that motorized collection service is usually provided by the municipality or medium to large size companies. Case studies show Secondary collection is mainly handled by

the municipality in Bamako - Mali, Curepipe - Mauritius, Gaza, Kolkata - India, Kunming - China and Managua - Nicaragua. In Chongqing, China it is handled by the private sector awarded by competitive bidding.

In Maputo and Surat, where companies are involved the contract attribution was through international **open bidding specifying technical criteria**. The winners were chosen from several applicants based on meeting the technical eligibility requirements at the lowest price. The operator chosen in Maputo was a large company from South Africa. Local companies may not have had the potential to comply with the requirements of the international bid. In Surat, 5 middle sized Indian companies were chosen.

Contracts are longer term, 5 to 8 years in our in depth case studies, taking into consideration the Brazilian municipalities not featured in the table below. This way the contractors have the time to recover their investment in equipment.

Rolling out the service area-by-area and focusing on residential consumers was a good practice in Surat and Maputo. The management tools used for this service were similar to primary collection, including **field inspection and performance based monitoring**. The relationship between client and operator is more formal,

meetings are less frequent and occur in case a need arises due to poor performance or for negotiations in Maputo. The economic interest, and thus also the influence is higher in these contracts, since the value of the contract is larger, so **more attention needs to be paid to transparency**.

Experience from Maputo municipality shows that the municipality no longer owns collection equipment and may have lost some of its **negotiation power and capacity for intervention** in emergency situations for collecting waste by itself due to the privatization of services. There are ways around this, i.e. by setting up clear terms for renegotiation and fore-seeing emergency situations in the contract, having a strong regulator in place who oversees the performance of the operator, or retaining ownership of facilities at all times (Cointreau and Coad, Guidance Pack, PSP, 2000) Also, the foreign companies selected in 2005 when such international tender was first launched in Maputo, had some **difficulties adjusting to the local circumstances, tradition and culture**. This may be the case in other cities but was not evident from the case studies.

Table 24: Operator model for modernizing and extending motorized collection

Case study	Relevant governance objective	Model	Operator	Contract	Management	Refinancing
Maputo	Financial sustainability User inclusivity	PSP	Large international company	2 area based service contract for 5 years	Performance based inspection; Roll out; Focus on HH waste	Full cost recovery from fees
Surat	Cost efficiency	PSP	Middle sized local companies	5 area based service contract for 5 years	Decentralized; Roll out	Full cost recovery from fees and local budget
Qena	Increased employment and social inclusivity	Municipal	Municipality	n.a.	Decentralized	Reliance on governmental funds

The evidence suggests that...

- Selecting PSP models with medium to large-scale companies for longer term service contract, a municipal model, or a mixture of these could work equally well.
- Open bidding specifying technical criteria are beneficial for medium to long-term contracts (5 to 15 yrs.)
- Rolling out the service and focusing on residential consumers is an effective strategy
- Field inspection and performance based monitoring is key
- Increased attention to transparency and eliminating economic influence from contracting and management delivers improved services

6.4.4 Improving interfaces within the collection & transfer system

The collection points are commonly used between primary and secondary containers. These are mostly municipally owned and keeping them clean is part of the job of the service provider for secondary collection or „default” mechanized collection through the communal or kerb-side collection methods where these communal containers are needed. Sometimes these are overflowed and then some change needs to occur in the service to correct that. For example in Maputo, the technical evaluation has shown that the containers are sufficient to cover 92% of the generated waste, though 100% of the population has access to these, resulting in overflowing of the waste in some of the inner city residential areas. The Municipality intends to correct this by investing in the infrastructure as soon as sufficient capital will be accrued from the tariffs.

The transfer stations of Surat are publicly owned, in fact the municipality has progressively invested over the years to improve the standards at these transfer stations by roofing and flooring them in order to reduce nuisance to the residents living nearby. Operation was contracted out for 4 of the 6 transfer stations and it is soon to be rolled out to the remaining 2 transfer stations. The operators of the transfer stations also transport the waste to the disposal site. The contractors in Surat are selected based on an open bidding process and are engaged under 10 year concession contracts. The payments are made by the municipality and are weight-based.

In 10 secondary case studies the existence of transfer stations is mentioned, in 9 of these the ownership is public and operation is either by public or private sector.

Table 25: Operator model for transfer stations and transfer in Surat

Case study	Relevant governance objective	Model	Operator	Contract	Management	Refinancing
Surat	Cost efficiency	PSP	Middle sized local companies	3 concession contracts for 10 years	Weigh-bridge based control and registry;	Full cost recovery from fees

The common practice of **retaining municipal ownership regardless of model chosen for operation** arises from the case studies.

The evidence suggests that...

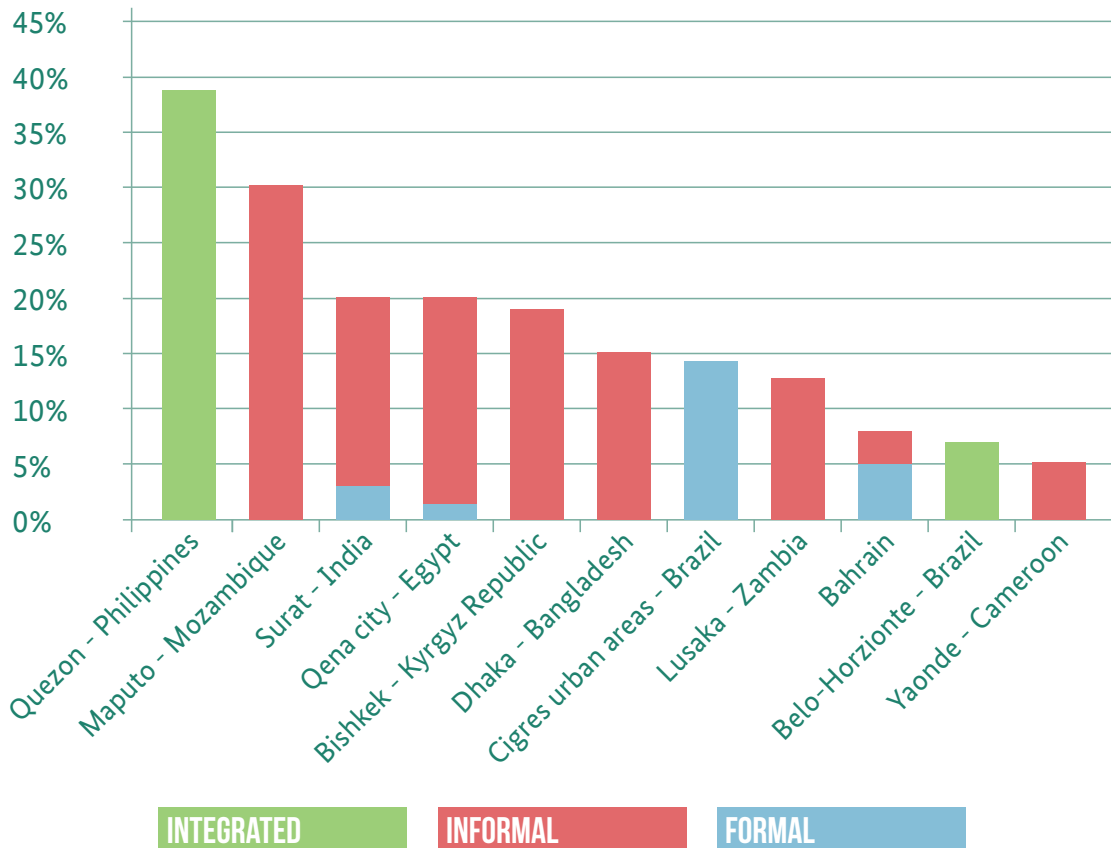
- No specific operator model arises for operating transfer stations or maintaining the cleanliness of urban collection points.
- Retaining municipal ownership regardless of model chosen for operation seems to be common practice
- When PSP model is chosen for a transfer station a longer term concession contract was preferred
- Rolling out the privatization of transfer stations step by step is a good practice

6.4.5 Increasing recycling

Both the informal and formal private sector are involved in recycling activities sometimes working together and other times working in competition with each other. The informal sector is the main force behind the recycling activities in most cases reviewed. This can be seen from

the graph below, even if in some cases the informal sector activities were not reported (CIGRES) or may be underreported. The integration of formal and informal sector activities was only noted in Quezon, Philippines and Belo-Horizonte, Brazil.

Figure 30: Contribution of formal and informal sector to recycling rates



In the in-depth case studies, there is little information on the informal sector activities, we know that these are regarded as beneficial in Maputo, are tolerated in Qena and are in competition with the formal system in Surat. Furthermore, in Surat, the private investor operating a treatment facility is working based on a 400 ton/day service contract, representing one third of the municipal waste stream. The facility works at no cost to the municipality, as do the informal sector recyclers.

However, when looking at the way the private operator is treating the waste, we can see that most of the high calorific value waste goes to RDF production and only some goes to recycling. The competition between the formal and informal sector will increase shortly to the detriment of the informal sector and to recycling when the company will extend its business with an additional 600 ton per day, taking up almost the entire waste stream.

The evidence suggests that...

Recognizing, supporting and/or integrating the informal sector emerges as a good practice.

- Increase of official recycling quota
- Better tracking of waste streams
- Better sorting quality
- Protection of livelihoods
- Possibility to improve working conditions and influence child labour occurrence

6.4.6 Improving resource recovery

Waste treatment by the formal sector in the secondary case studies meant mostly composting. This was done on a commercial scale by the private sector in 4 cities and by the municipality in 1 city. In 2 cities the municipalities have small-scale compost pits at the disposal sites with limited production of compost. Composting is not well developed in the case studies reviewed. The most successful examples of treatment facilities were the Dhaka composting facility with 700 ton/ day capacity followed by Surat treatment facility with 400 ton/day capacity. Following these capacities the next treatment plants are below 20 ton/day capacity. The case studies show that composting results in a high quality, marketable product if it is based on segregated input material (Dhaka, Bangladesh) or if it is properly sorted on site (Surat). Further, the existence of demand conditions the marketability of compost.

Improving waste treatment in the formal system meant setting up a treatment plant for sorting, recycling and composting in CIGRES, in the case of the Surat treatment plant RDF production is added to these activities. These treatment plants, beside the improved treatment objective have similar governance objectives yet are opting for different operator models to reach those goals. In Surat, India, the municipality was aiming to reduce costs for waste management through PSP and the CIGRES member municipalities in Brazil were trying to escape the high prices imposed by monopolistic practices of the companies active in the private waste management sector.

PSP for improving treatment

Surat opted for a **PSP model** that was launched through an open bid with technical specifications. The municipality **offered land and several facilities to attract private investors**. The contract is long term to allow cost recovery of the investment and ties the municipality to guaranteeing 1/3rd of the waste materials generated in Surat as input for 30 years. The insight of the municipality to activities of the treatment plant is limited, turnover, profit is not known, but there is no gate-fee charged. Scaling up the investment is currently planned that will mean taking up almost the entire waste stream of Surat, leaving little to no access to these materials for the informal sector.

The informal sector and the treatment plant are in competition for materials, both providing services at no cost to the municipality. The informal sector has the added value to operate in the highest priority activities of waste management, reuse and recycling and to provide livelihood to a large number of poor people. The treatment plant meanwhile is directing at least some of the recyclables that could be retrieved to RDF production because of their high caloric value.

Inter-municipal Association for improving treatment

The creation of the Inter-municipal Association CIGRES, beside the governance goals arising from the local conditions, was motivated by the **enabling conditions set up by the government to provide funds and tax breaks** to Inter-Municipal Associations. The technical choices made were not the best, as there is some misfit between the plant's design and the material it receives. It was supposed to receive source-segregated waste and it receives mixed waste. Thus composting equipment broke down. **A realistic view of the future, feasibility study and a more flexible design would have been beneficial.** Thanks to the good efforts of the operational management, the sorting and recycling is producing relatively good results.

The Association functions under strict rules described in the Law for Public Associations for contracting, institutional structure and management. **The system of fees favours municipalities that are closer to the treatment plant.** Municipalities pay according to their size and amount of input material, but distances are very varied and there is no system to charge these more fairly among the municipalities. Each municipality is paying for its own transfer cost.

All municipalities benefit through **economies of scale of the regional treatment facility**, as achieved prices for recyclables are higher through higher volumes, and unit costs per ton for implementation and operation would be higher in case of small municipal treatment facilities.

Table 26: Operator models for setting up resource recovery facilities

Case study	Relevant governance objective	Model	Operator	Contract	Management	Refinancing
Surat treatment plant	Cost efficiency	PSP	Large Indian Company	30 years concession, DBOFT; agreed ton per day	Limited control; Scale up	From sale of recyclables, compost and RDF.
CIGRES treatment plant	Correct prices set by market monopoly in the sector; Increase efficiency of resource use	Inter-Municipal	CIGRES, Inter-municipal Association	Standard contract required by law for Public Associations	Through representation of the municipalities in decision-making structures	From sale of recyclables and fees from member municipalities

There is limited experience in the case studies reviewed in setting up waste treatment plants. Nevertheless some lessons arise from these case studies regarding the selected operator models for waste treatment. **Resource recovery is a concern in more developed cities, where**

collection is already resolved. Attracting private investment is a preferred option when no public funds or donor financing is available. Making available land and other facilities makes such investments more attractive to the private parties.

The evidence suggests that...

- **PSP is a cost-effective model for waste treatment, but it may be an inflexible option as it works under long term concession contracts and with guaranteed input amounts.**
- Offering an incentive to attract private investment worked well
- Long term contract based on a fixed and guaranteed input ton/ day
- The informal sector and the treatment plant are in competition for materials, both providing services at no cost to the municipality
- **The inter-municipal, publicly managed model is more flexible and therefore may serve long term goals better, but is less efficient from both technical and economic point of view.**
- Enabling conditions set up by the government to provide funds and tax break
- A realistic view of the future, a feasibility study and a more flexible design are beneficial to the success of waste treatment
- Timely introduction of source segregation of wet and dry waste results in good quality compost.
- Existence of demand for end product and quality of the end product is important regardless of the operator model chosen

6.4.7 Improving disposal and treatment

In the 28 cities reviewed, only 7 have sanitary landfills, most of which are operated by the private sector. In most of these cities, the municipality owns the landfill and has contracted its day-to-day operations to private contractors. Local funds were hardly ever available to finance the construction of landfills; the notable exception was Ghorahi in Nepal. Investment financing is usually through national public or donor funds. Could you cite the exceptions? Might be interesting to know – or is that done in the table below by “public – PSP”?

Most of the partially engineered/controlled landfills are built, owned and operated by public sector. In either case affordability must be considered before investment to avoid situations in which the new facility is unused because gate fees are too high or reverts to being operated as an open dump because the costs for proper operation are too high (Rowse, 2006).

Table 27: Summary of level of compliance of disposal sites in the 28 reviewed case studies

Sanitary Landfill		Engineered landfill/ controlled landfill	Controlled/ semi- controlled dumpsite		Uncontrolled dumpsite	
Kunming China	Public	Bahrain	Yaoundé Cameroon	No info	Benin Nigeria	No info
Ghorahi Nepal	Public	CIGRES Brazil	Bishkek Kyrgyz Republic	Public	Tangier Morocco	No info
Belo Horizonte Brazil	PSP	Lusaka Zambia	Chongqing China	PSP	Accra Ghana	Public
Chongqing China	PSP	Quezon Philippines	Maputo Mozambique	Public	Dar Es Salaam Tanzania	Public
Curepipe Mauritius	PSP			Public	Kolkata India	Public
Varna Bulgaria	PSP			PSP	Managua Nicaragua	Public
Surat India	PSP				Nairobi Kenya	Public
					Qena Egypt	Public

Among the established local goals of Maputo, CIGRES and Surat was the improvement of disposal facilities. While the long term goal is always to have a sanitary landfill it is worthwhile to have a look at what models are chosen to improve the situation in the meantime as it is well known that the planning and construction of a new sanitary landfill can take decades. Clean Development Mechanism (CDM), used by the World Bank primarily as

a mechanism to generate money from operating disposal sites properly was an enabling condition for improving disposal in a number of countries. The current low prices for greenhouse gas emission reduction units make this option currently less feasible.

Maputo has no legislation requiring safe disposal. Nevertheless, Maputo has done improvements through

investment in equipment by the World Bank that has helped to move from an uncontrolled dumpsite to a controlled dumpsite. The amount of investment is conditioned by availability of financing and affordability. The refinancing and operation costs are currently recovered from the fees. The operation stays with the municipality and there are no plans to change that.

CIGRES has done a major improvement of disposal standards through the **inter-municipal model**. The governance objective of **a more efficient use of resources and reduction of price was achieved** through this initiative, especially given that prices were artificially high before. **Brazilian legislation has requirements regarding safe disposal and this gives an additional push** to embarking on these improvements. **The public financing and the tax breaks made the investment possible and affordable**. All municipalities benefit through **economies of scale of the regional engineered landfill**, as unit costs per ton for implementation and operation would be much higher in case of small municipal landfills. In addition, the regional approach led to a **professionalization of management and operation**, which would be hard to achieve in case of small municipal landfills. In fact, these aspects are the very reason for the Brazilian national waste law to incentive inter-municipal waste management structures.

The sanitary landfills in Surat are newly built and in the middle of the procedure for getting Environmental Permits. The plan of the municipality is to implement a PSP model for each, by contracting private operators through concession contracts. India, like Brazil has specified legal requirements for waste disposal practices.

From the field

For the island of Santiago, Republic of Cape Verde, eight operational and management configurations were identified, discussed and evaluated with the nine municipalities.

Based on scoring of objective criteria and by application of the solidarity principle between the municipalities, the inter-municipal approach was defined as the most appropriate model to operate one transfer station and one sanitary landfill.

Table 28: Operator models for improving disposal standards

Case study	Relevant governance objective	Model	Operator	Contract	Management	Investment/Refinancing
Maputo From open to controlled dumpsite	Affordability	Municipal	Municipality		Daily management through permanent staff	World Bank for equipment/waste fee
CIGRES disposal facility (part of treatment plant)	Correct prices set by market monopoly in the sector; Increase efficiency of resource use	Inter-Municipal	CIGRES, Inter-municipal Association	Standard contract required by law for Public Associations	Through representation of the municipalities in decision-making structures	Public financing/ From sale of recyclables and fees from member municipalities

Case study	Relevant governance objective	Model	Operator	Contract	Management	Investment/Refinancing
Surat Sanitary landfill for mixed municipal waste	Cost efficiency	PSP		Aiming for concession contract		Public financing/ local budget
Surat Sanitary landfill for inert waste (refuse from treatment)	Cost efficiency	PSP		Aiming for concession contract	Did not obtain the Environmental Permit	Public financing/ local budget

The evidence suggests that...

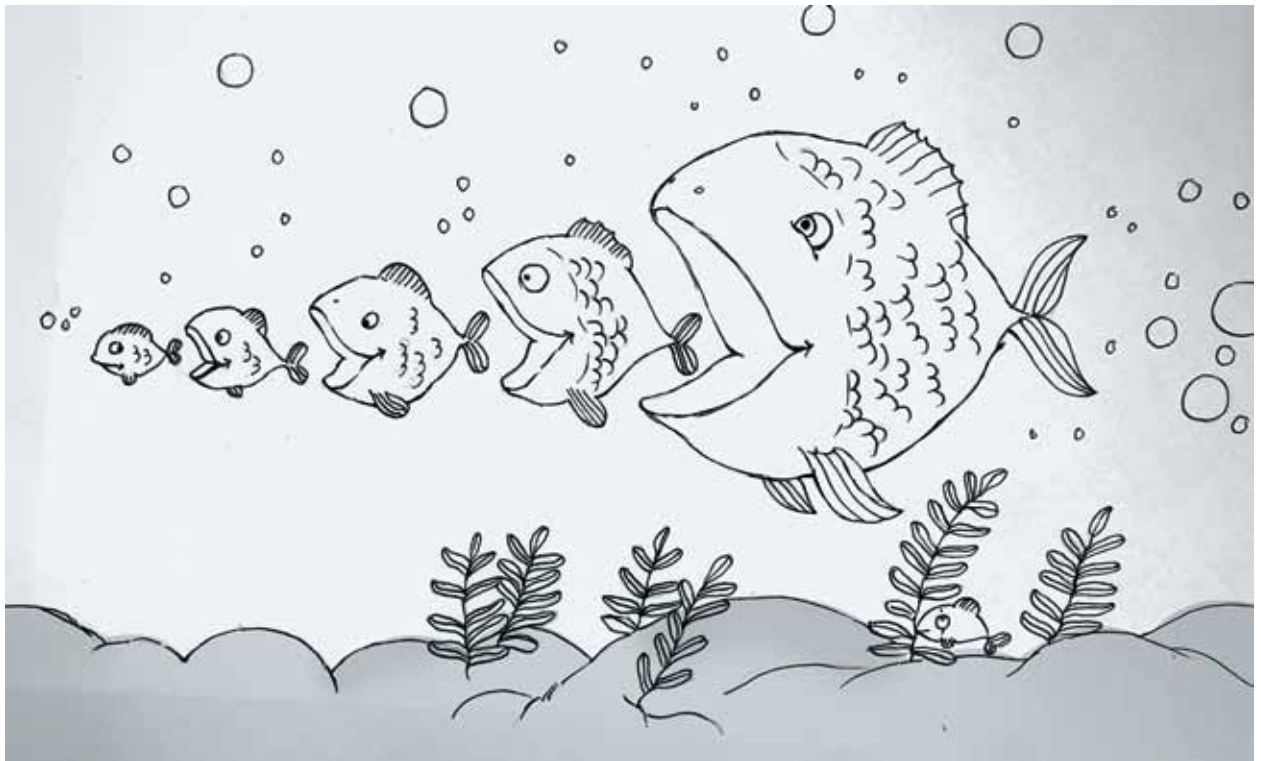
- The operator model most commonly selected is a municipal model with municipal ownership, through public or donor investment.
- PSP for operation through concession or service contract is more likely and more attractive for the private sector in case of sanitary landfills as opposed to controlled dumpsites because of the higher gate fees.
- PSPs where financing is private are less desirable because the operation costs have to comprise the cost of financing resulting in higher overall costs.
- Legislation with requirements regarding safe disposal gives an additional push
- Public financing and/or tax breaks makes the investment possible and affordable
- Inter-municipal solutions may enable economies of scale and professionalization of management and operation

6.4.8 Increasing private sector participation

The choice between a private or public operator seems to depend on a belief in one or the other that either rests on past experience or is simply embedded in the culture or the value system of the decision-makers in that city.

In Surat, India, for example there was a strong belief among the leaders of the municipality that private sector is more cost efficient than public sector. This was supported by the generally higher wages in the public sector. In the role of client, building a good partnership with the private sector is important. Surat has managed to achieve this through paying the contractors in time.

The municipality has gone further to set up a system of penalties for both service and payment delays which have proved to be effective. Surat was very successful to attract private sector, but by attracting medium to large scale operators, it might have squeezed out the micro-scale providers for primary collection and recycling



Cartoon 10: Big fish eat small fish just like big operators tend to squeeze out smaller ones from the market.

In contrast, the performance of local private service providers in Accra (Ghana) has been affected by late payments from the municipality. This situation is further aggravated by weak supervision and monitoring due to inadequate resources, lack of staff, low remuneration and corruption. In CIGRES the private sector was regarded as malice due to the unfair, oligarchic market practices that the member municipalities could not handle by themselves. In Qena there was limited experience with the private sector and thus also a reluctance to involve them.

Increasing private sector participation might be part of the agenda of supporting local companies and local economy. In other places this may be a strategy to attract private investors and decrease the burden of the city to invest in modernizing the sector. If such a governance goal is in place and depending on what precisely it aims at, it can be decisive to the selection of the operator model.

6.4.9 Integrating the informal sector

A pre-condition for establishing this goal and opting for the appropriate operator model is a high level of awareness of the benefits the informal sector activities mean to the municipalities. It is also necessary that the environmental standards in the country are such that

they would work well with the existing practices, or only small changes to the practices would be required for compliance. This objective works together well with the objective of increasing recycling rates or introducing primary collection services.

Incorporation of the informal sector in Belo Horizonte and Quezon into the respective solid waste management systems has had the effect of increasing recycling rates and streamlining the material recovery process. Historically, CBOs have provided collection services where these were lacking or not to the required standard as was the case in Bamako, Dar es Salaam, and Yaoundé. The benefits of integrating this type of providers in a formal model can be seen in Maputo.

Where there is no specific attention paid to this type of providers and the service contracts tendered are large and capital intensive (Surat) or the service is kept municipal (Qena) the micro-providers will be automatically squeezed out of the market. They may become employees or subcontractors of the large providers directly contracted by the municipality.



Photo 14: Cleaning of plastics in the RECICLA recycling station in Maputo, Mozambique (© GIZ/AGRESU)

6.4.10 Increasing employment

A decade ago, when the waste management service was modernized in Qena, this was perceived as an opportunity to combat unemployment through assuring a job in the sweeping and collection service.

However, this objective prompted the municipality to overstaff and as economic conditions have changed over time, wages increased and the municipal budget decreased, so a lot of the staff has been laid off.

Another model to reach this objective could have been the PSP model implemented in Maputo for primary collection with multiple micro-scale service providers.

CIGRES currently employs 77 employees, among them 71 operators with public jobs. Most employees hired live close to the base of CIGRES. Thus, the Consortium injects a significant amount of money into the local economy, approximately 300.000 Euro per year only through salaries and beneficinations.

In this way, there is a **balance between the benefits** to the local economy **and the burden** to shoulder the environmental assets and liabilities, such as augmented traffic flow of waste collection trucks or environmental aftercare of the landfill, both - benefits and burdens - caused by the operation of the waste treatment unit.

The Public Model for increased employment in Qena, Egypt

There were a number of public health-related issues that lead the authorities in Qena (Egypt) to take action and improve the sweeping and collection services. A few specific *conditions and capacities* lead the authorities to choose the public municipal model among all the options:

- The local governance objective to decrease unemployment
- Limited experience with private sector participation
- Lack of a coherent legal and institutional framework for waste management
- Availability of public financing for operation budget and re-financing

The model was successful both in attaining its objectives, the service was improved and the employment rates were improved. In the long term, however due to a number of reasons that are not necessarily related to the operator model, the system proved not to be able to maintain the high level of performance. Conditions have changed dramatically in Egypt since the revolution and dependence on the central government budget for operation and re-financing made the system vulnerable.

These points to the importance of adhering to the general good practices that are essential to all models and make them more resilient to changing conditions. In this case, there was an over-reliance on government funds for the operating budget and lack of cost accounting and recovery.

6.4.11 Getting citizens involved

Having mechanisms in place for awareness raising, feedback, redressing grievances and participatory decision-making can make or break a waste management system. From the review of the case studies it emerged that public awareness is very important especially when changes in the services or the user fee are implemented. Another important point was the benefit of involving the public in decision-making and letting them take ownership of the problems and the solutions. The conditions and capacities specific to **Maputo** lead to user inclusivity being high on the agenda. The exact goal as specified in their plan was to have „citizens actively involved in improving waste management services”. This is due to a general attention from the public to waste and the mass media often covering waste management related problems such as obstructions in the streets. The authorities responded to this by involving the people in decision-making, asking their input to the kind of service they wanted and

the willingness to pay. This was done in a more informal way through direct contact with people and small-scale contractors and through the mass media.

User inclusivity was easy to integrate in the multiple micro scale provider PSP model for primary collection in Maputo. The providers are local and already had connections to the neighbourhoods they are serving. Management in a decentralized manner allows authorities to keep in touch regularly with the customers. Services were introduced after awareness raising campaigns and consultations with the public to understand their needs and ability to pay for the service. This led to the acceptance of the introduction of fees and their increase over time. This was **especially important to achieve the goal of sustainable financing for the system that is cost recovery while maintaining affordability.**

Surat took a less pro-active approach to listening to the needs and expectations of the people, putting in place an open and transparent complaint handling system and sending inspectors and littering squad out to the field. Another method to involve the public was involving the resident associations for maintaining cleanliness through sweeping. Customer satisfaction with the service was checked through a specific study in the pilot areas where the collection system was introduced before rolling it out. This worked out well in Surat, where **full cost recovery from fees was not a local objective. The model chosen in this context where affordability was not a key issue is a PSP model with a few and larger companies, longer service contracts and less proximity and familiarity between user and provider.**

The involvement of citizens in Qena and CIGRES was neither a goal, nor is it important in the models implemented for modernization in these case studies. In Qena, this may be due to the overwhelming economic problems of the country which make it difficult to keep

the level of service up coupled by the lack of attention paid to cost recovery and affordability. **No conclusion may be drawn between these conditions and the municipal operator model selected.**

The secondary case studies bring a few examples where the lack of citizen involvement and public consultation were detrimental to the efforts to improve or sustain waste management services. In Benin (Niigeria) for example on one occasion, the municipality wrongly assumed that the opinions of traditional and community leaders who were consulted reflected the views of local residents.

This affected affordability and willingness to pay. In Dar es Salaam, Tanzania, among the reasons listed for poor performance on payment of waste collection fees was a lack of public awareness regarding the importance of solid waste management. Due to the lack of awareness, many households felt that the local authorities should provide waste services free of charge, as it used to be in the past.

6.4.12 Cost recovery and affordability

Financial goals referring to affordability, cost efficiency and cost recovery are frequently part of the agenda. This is due to the fact that all the local budgets have limitations and waste management is competing for local resources with other priorities such as sanitation, health care, education, etc. Likewise, users are limited in their payment capacity or willingness to pay.

Often, lenders or private investors link their investment to a cost recovery requirement. For implementing these goals, accounting, transparency and management control are all very important. In Maputo, the specific goal of cost recovery and affordability were set as a local objective. Cost recovery in this case was a requirement of the lender, the World Bank that co-financed the modernization in this sector. Since cost recovery is done through fees, affordability was key to the implementation of the project. This played an important role in the careful design of the technical solutions and in choosing the operator model.

6.4.13 Cost efficiency

A slightly different perspective on the financial goal played a role in selecting a different model in Surat. Surat recognized its limitations in dealing with the financial capacity issues by itself. The identified problem was that the municipal service was inefficient; it was costing a lot also due to the relatively higher salaries. Since cost recovery was neither a goal nor an objective, affordability of tariffs was solved by keeping the tariffs very low and complementing the budget from other local sources. Cost efficiency was achieved by externalizing services across the physical elements of the system in different operator models. A key feature in keeping the waste management costs to the municipality low is that the PSP operator charges no gate fee, this being a very rare situation in case of waste treatment plants.

The specific problem in CIGRES was related to the artificially high prices imposed by the monopolistic practices of the service providers. This was the main reason for CIGRES to aim for cost efficiency, resource efficiency and reduction of costs, which they specifically named „resolve the problem of distorted pricing of private actors offering services in a monopolistic fashion”. So, clearly the operator model has to be changed. Nowadays, the choice of this specific operator model to solve waste management problem is more closely related to the fiscal facilities offered by the Federal Government to Municipal Associations after passing of the national waste law in 2010.

6.4.14 Improving monitoring and control

The commissioner of Surat, S.R. Rao who prompted the changes to the waste management sector identified as the underlying reason for the dirty aspect of the city the lack of monitoring, inspection and control. As cost efficiency was thought to be achieved through private sector participation, managing the outsourced services became important in the PSP type operator models implemented for the different physical elements from sweeping to treatment.

Responsibilities were decentralized, task descriptions were written for inspectors, specifying time needed to be spent in the field, responsibilities to issue fines and penalties for littering or non-compliance in the framework of any contract.

The revenues collected from the fines were an important part of financing the system, especially until the people and organizations involved became aware of the expectations regarding cleanliness and waste management. The system in Surat has stayed and grown stronger at

least in part to the fact that change was institutionalised, and subsequent commissioners kept using the same structure after S.R.Rao.

The other example where monitoring and control was important, though not stated as a goal, was Maputo. Here, the donor community recognized the limitations of the institutional capacity of the Municipality to carry out certain tasks such as conducting cost calculations or writing terms of reference for service contracts.

As part of their efforts, they provided technical assistance to the waste management department, including initiating changes in the institutional structure and financing a resident technical consultant for 7 years, providing on-the-job coaching and capacity building to the local team. This resulted in many positive changes, but there is still room for improvement, because the traditionally hierarchical structure remained for decision-making. Also, the availability of technical staff with higher education is still limited.

6.4.15 Increasing transparency

Increasing transparency or maintaining transparent management and control was mentioned in the in-depth case studies where some kind of partnership was in place, be it among municipalities (CIGRES, Brazil) or between public and private partners (Maputo, Mozambique and Surat, India). Mechanisms such as open bidding procedures based on technical criteria, cross checking inspection through unexpected spot-checks, using e-governance or other transparent methods for complaint handling, having decision-making committees and decentralizing decision-making are common

mechanisms to reduce the threat arising from economic influence. Keeping accurate registries of quantities and costs is an efficient way to increase transparency.

A lesson learnt from the Surat example is that the introduction of weigh bridges with a computerised recording system weighing gross and net weight of vehicles for each trip has **increased transparency and reduced double-counting**. In CIGRES **weighing input and output allowed for transparent reporting that forms the bases of charges** to the member municipalities.

In-depth case study - Maputo, Mozambique

The Maputo Case Study presents the challenges and solutions for a large city in the context of one of the poorest countries in the world where in recent years the importance of Solid Waste Management (ISWM) increased significantly. Not only amplified by the public sensitivity and consciousness about the issues but politicians also acknowledged the importance of ISWM for the urban environment.

The Municipality of Maputo is divided into seven urban districts, five of which comprise the city on the main land and include inner-city, suburban and peri-urban areas while Catembe, a small settlement with little influence on the city that lies opposite to it in Maputo Bay and Inhaca, an island located 40 kilometres from the coast are part of the rural area.

Maputo is a **PSP model** with multiple operators for collection and a municipal operator for the disposal site. The revenue collector is the Electricity Company.

Waste Management profile:

Waste collection, transport and final disposal of Solid Waste are the sole responsibility of the Municipality of Maputo. Services are either operated by Maputo City Council (CMM) itself or by a contracted service provider. Areas such as separation, recycling or composting are private (sometimes donor supported) activities with support, but no operational intervention of CMM.

Street sweeping: Sweeping services focus on the inner city, the paved roads in the suburban areas and hotspots of littering such as bus stations and markets with the municipal district administrations being responsible for the service.

Collection services in Maputo vary depending on the area where these are delivered. This is the reason there are 5 different collection models:

- In high density inner city, there is communal collection with containers and compactor trucks run by a private operator through service contract with CMM

- In the inner city residential areas there is door to door collection with CMM's own operation.
- In suburban areas primary waste collection is executed by microenterprises with a manual door-to-door service and block collection; both services covered by private operators through service contracts with CMM.
- In rural areas there is a pickup service from several collection points with tractor, operated by CMM.
- Collection from non-household large-scale producers, who are not allowed to use the public collection system with contracts between producers and private providers licensed by CMM.

The current system does not have any built **transfer** stations, except the small containers used in the inner city high-density area and the large containers in the suburban areas.

Maputo does not have a formal separate collection service for **recyclables**. There are, however, several recycling initiatives and the sector is constantly developing in recent years. Also, the informal sector plays the vital role in all recycling activities. Separate collection of recyclables is still too expensive and exceeding the organizational capacities of CMM. Therefore, all separation is based on the capacity of the Informal sector to provide such materials.

Composting is not a common practice in Maputo and despite the high organic content of the waste only one pilot project exists at the moment. CMM only provided the space for the project, while investments and technical assistance have been provided by an NGO. The project collects organic waste from markets (less than 1 ton/day) and operates anaerobic composting within boxes and the product has sufficient quality as fertilizer and is currently being marketed for broader acceptance.

The Municipality of Maputo operates one official disposal site on the main land and one very small open dump on Inhaca (island) and Catembe. The main dumpsite was an open one but has been reshaped and equipped in 2004. The site has no facilities for treatment of leachate water or protection of air and soil but it is now managed and controlled to some extent. It has a fence and it is equipped with a weighbridge, compactor and caterpillar, thus it classifies as a semi-controlled open dump site.

Table 29: Waste management performance indicators

City:		Maputo	
Country:		Mozambique	
G1	Country income level	World Bank income category	GNI per capita
		Low income	\$510
G2	Population	Total population	1,131,149
G3	Waste generation	Total municipal solid waste generation (tonnes/year)	508,000
No	Category	Indicator	Results
Key Waste-related data			
W1	Waste per capita	MSW per capita (kg per year)	449 (or 316 without fine fraction)

City:		Maputo			
Country:		Mozambique			
W2	Waste composition	Summary composition of MSW for 3 key fractions – all as % wt. of total waste generated	-		
W2.1	Organic	Organics (food and green wastes)	65%		
W2.2	Paper	Paper	8,5%		
W2.3	Plastics	Plastics	8,0%		
Physical Components				Traffic light code	
1	Public health – Waste collection	Waste collection coverage	82%	●	●
1Q		Quality of waste collection service	Medium/High (65%)	●	●
2	Environmental control – waste treatment and disposal	Controlled treatment and disposal	0%	●	●
2Q		Environmental quality of waste treatment and disposal	Medium/Low (25%)	●	●
3	3Rs – reduce, reuse and recycling	Recycling rate	< 5%	●	●
3Q		Indicator of the 'quality' of 3Rs provision	Medium/Low (31%)	●	●
Governance Factors					
4U	User inclusivity	Degree of user inclusivity	Medium (50%)	●	●
4P	Provider inclusivity	Degree of provider inclusivity	Medium/High (75%)	●	●
5F	Financial sustainability	Degree of financial sustainability	Medium/High (71%)	●	●
6N	Sound institutions, proactive policies	Adequacy of national ISWM framework	Medium/Low (29%)	●	●
6L		Degree of institutional coherence	Medium (58%)	●	●

Maputo has a well-developed waste management system with good collection coverage compared to other cities in Mozambique. The quality of collection services is relatively high. Reasons are continuous development support over the recent years and a strong political commitment within the Municipality.

Disposal is still under developed. The official disposal site received several improvements such as access control and a weighbridge, but it is not fenced nor has it any form of emission retaining system. Occasional fires and frequent litter blowing do occur.

The recycling rate is less than 5%, but constantly increasing in recent years. The formal and informal recycling sectors are still developing and markets for

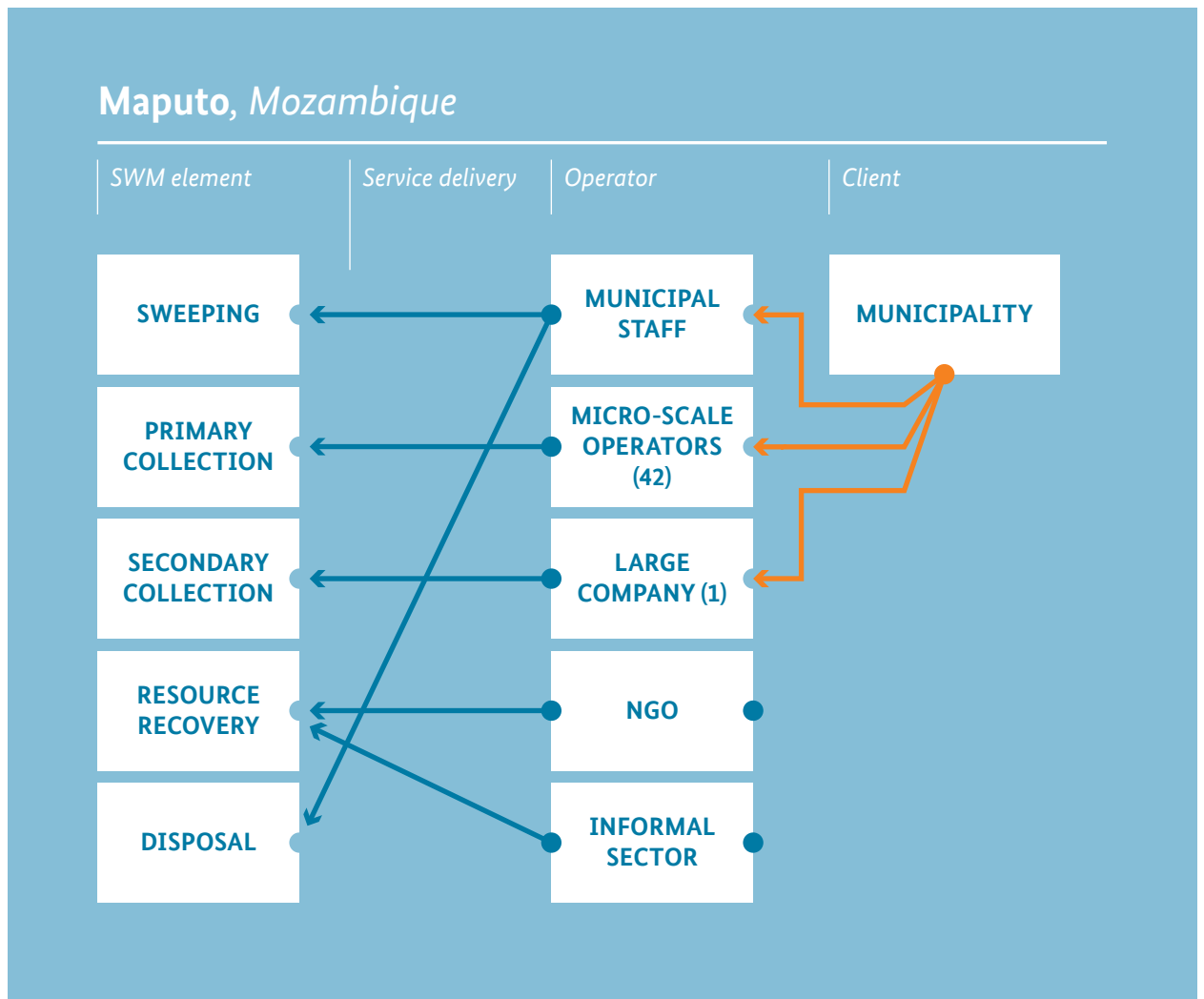
recyclables are improving. First initiatives are increasing the amount of separately collected waste.

Citizens are benefitting from decent services almost all over the city. While the type of service differs in the various areas of the city, collection is regular and covers most of the city. Users are serviced independent of their income level. Formal feedback systems, whilst in place are not overly efficient. However, community and local structures provide the opportunity to citizens to complain about deficiencies in service provision. The private sector, from large to small scale enterprises, is formally represented in the legal and strategic framework with licensing procedures and contractual frameworks in place.

Key to the development of SWM and improvements in service delivery in Maputo was a significant increase in revenues through the waste fee. The system covers above 90% of all households. Fees increase according to the social-economic level of the users and the commercial sector cross-subsidizes household waste collection in poorer areas. However only 65% of the total costs are covered by fees, requiring the Municipality to further adjust their revenue system.

The Municipal Master Plan for SWM provides a stepwise approach to bridge the gap between increased service delivery and subsequent improved revenues. With the support of international cooperation partners a consistent way of achieving sustainable services for all has been laid out.

Figure 31: The relations between the client and operator in Maputo, Mozambique in-depth case study



7. Lessons learnt

The research focused on analysing the tangible and objective aspects of understanding what triggers the choice of an operator model and which operator models are favourable in delivering the services in the local context and condition. All operator models studied are hybrid; different option for service delivery may be preferred for different districts of a city, for different users, for different physical elements.

In the landscape of the various conditions and capacities and along the different elements of the waste management chain certain operator models have shown to be a good choice in a number of the reviewed cases. Such is for example the choice of PSPs through area based short to middle term contracts with micro-scale providers for primary waste management. Other models or mix of models were more rare or featured in just one of the studied cases but have shown sufficient advantages and lessons learned to earn a place in this presentation, as for example the sanitary landfill of Ghorahi (Nepal) that was financed through the local budget and is operated by the municipality.

We have also encountered situations where there was a very similar set of conditions and capacities and the choice of the model was different as in one case the authorities opted for a municipal model and in the other case for private participation. One such example is the motorized secondary collection services provided through the municipal service in Qena and through a concession service contract based PSP model in Surat.

Here governance objectives played an important role, Surat aiming at cost efficiency preferred private sector

participation while Qena aiming for high employment preferred keeping the service public. But at the same time there was a strong underlying belief in Surat that private sector is cost efficient and innovative, while in Qena it was believed that private sector participation would not bring any benefits to the system. **And these beliefs are held by the local authorities for no apparent reason**, or have come about based on a few specific experiences.

They could have equally believed that private sector participation leads to increased employment in Qena and that municipal service provision is more efficient than private sector participation in Surat.

This points to the importance of the **human factor** in choosing operator models and making them work.

The presentation of the lessons learned focuses on trends, similarities in the process of choice and implementation following the sequence below for each presented model type:

- Description of the favourable model, including who is involved, how the operation is financed, what monitoring and management practices need to be paid attention to
- Conditions that favour the choice of the model, including economic, social, policy and cultural context and technical, management, financial capacities of the organizations involved
- Key benefits and drawbacks of the operator model presented.

7.1 Characteristics of a good model

Although it is hard to point out general characteristics of operator models that have worked without running the risk of being too general and not adding any value to the on-going effort on how to improve the waste management sector, the research points to a few characteristics that were common to the operator models that worked well in the case studies. These emerge as relevant for all and any mix of operator models.

7.1.1 Capacity

The **client**, the authority responsible for ensuring the provision of a reliable MSWM system meeting the required standards, has a pivotal role. A strong client and local political will to change things made a very big difference in the case studies.

Technical and financial capacity of both client and operator are important, but perhaps more important is a good understanding of where the strengths and weaknesses are in terms of these capacities and managing things accordingly. This meant for example knowing in Maputo that there would be a need for donor support for contracting out services for collection due to limited financial capacity of the client and obtaining that support.

The **management capacity** of the client was important in all cases. Regardless of whether a model is municipal, inter-municipal or has private sector participation (further on referred here to as PSP), it is important that the institutional roles of client, operator and revenue collector are recognized. Each of these roles have a different function in providing waste management services and they each require a different set of capacities and skills.

7.1.2 Management

As far as **management** is concerned a few aspects stand out:

High user inclusivity - the extent to which the users of the system have access to and influence on how the system works - is relevant to the management of services under all model types. This includes efforts spent on increasing level of awareness, measuring customer satisfaction, involving people in decision-making and having a good complaint and grievance-handling mechanism in place that creates a solid foundation for civil society involvement in the waste management system.

Choosing solutions based on technical and financial assessment and criteria ensures investment in systems that are suitable and connect well into the systems, infrastructure and technologies already functioning on ground, while making sure that the upgrades are affordable.

Ensuring a low level of corruption through transparency in both decision-making and procurement will result in a better system. Simply put, the available resources are going where they are supposed to, maximizing the benefits to the citizens (customers) of the service.

Data management: Having a good basis of reliable and consistent data to use when choosing technical solutions, designing scaling and planning logistics enables better decisions. Availability of regular data also allows for tracking and monitoring, and is a great tool for managing the delivery of services.

Starting small and scaling up or rolling out reduces the risks that are associated with any change made in the system. It is better to first test out the idea, learn the lessons on a small scale and improve the solution before extending it to an entire city.

Decentralized management and monitoring, especially in collection services, have proved to be efficient in many of the cases studied. This might be due to the fact that, unlike other utilities, metering cannot be applied to waste management services, nor can the supplier turn off a tap and stop the provision of the service. Therefore it is important to have a good knowledge of the practices in the field and an ability to react to the immediate needs and correct the problems at the level of districts.

Institutionalizing good management practices is beneficial to any operator model. Once the good practices and of monitoring, control and management are identified and tested, these will outlive their initiator if there is a management system in place for keeping these alive.

Focusing on household waste helps concentrate scarce resources and efforts, and leads to better results in municipal ISWM. This means dealing with large commercial waste generators, or with inert, hazardous, agricultural or other special waste through different (or parallel) arrangements.

7.1.3 Financial Management

Some models are inherently weak in financial management practices and some are inherently strong. For example in a PSP model, the monitoring and control capacity and skills of the client, and the attention to this activity will be inherently stronger as compared to monitoring and control in a public model. This is simply because in a public model the authority is not being checked by an external party and there is less imminent threat that a publicly run service will run bankrupt or will be penalized for lack of performance as it is with a privately operated service.

On the other hand, the public models will be perhaps more likely to start small and scale up different solutions, being more focused on the successful outcome than on making a profit and on economies of scale. Intervention projects should pay special attention to improve these practices where appropriate through technical assistance and capacity building components, or through monitoring management practices and evaluating these as part of the condition to financing.

Nevertheless, there are financial management practices that are equally important to the successful implementation of any model:

Practicing cost accounting is a common sense good management practice. Cost accounting is more regularly and robustly done when private sector is involved but is equally important regardless of the model type chosen.

Working towards paying for operational costs and refinancing from local (municipal or inter-municipal) budget, either through user charges or local taxes, keeps the service running at a reliable quality.

Being aware of costs and revenues and working towards balancing the budget increases the reliability of the service. This may be because the participants in the model anticipate potential problems and gaps, and work together to find solutions. As with technical and financial capacities, financial management practices are important in order to keep client, operator and user aware of the cost of the service and the budget available, and bind them together in a service-payment relationship.

7.2 Public Models

In terms of basic model types, the public model may be chosen at various governance levels, most commonly at municipal or inter-municipal level. This model type may be the traditional model that nobody ever thought of changing, or it may be a chosen option. Municipal models are chosen when one or more of the conditions listed below are present. Difficult conditions are not liveable to all fish, just like not all local conditions are attractive to all types of operator.

There is an embedded belief that the public model will ensure higher cost-efficiency as opposed to a PSP model. Such beliefs are often based on unfavorable experience with the private sector or lack of experience with the private sector.

There is a focus on social objectives such as increasing employment and protecting livelihoods. In such cases waste management modernization may be a secondary objective of the authority or the local community and they may see the sector as an opportunity to attain a social objective rather than focusing on the economic and technical issues in the sector itself.

Interested operators may be hard to find. A lack of interest or limited availability of suitable private sector operators occurs usually when there is not sufficient possibility for profit making. Either the market is not big enough, payment rates or user charges may be non-existent or low making it impossible to make profit or there are other market barriers such as corruption. The lack of a coherent policy framework also increases risks of investments.



Cartoon 11: Difficult conditions are not liveable to all fish, just like not all local conditions are attractive to all types of operator.

There are policies nationally or locally to favor public models. There are instances where legislation favors public models either by setting up subsidies, making financing more readily available or by providing incentives, such as tax cuts.

Unfair market practices, such as cartels or monopoly are a trigger to switch back from a private service provision to a public one. In such cases the price of waste management may be kept artificially high, making the service unaffordable to the citizens and municipalities.

On the positive side, there are a few inherent advantages to choosing a public model, as municipalities

- have a lot of experience in providing waste collection and disposal services in the specific local context,
- have full control over assets and services and
- may be exempt of paying VAT or equivalent taxes.

As for disadvantages, in public models, municipalities as operators tend

- to pay less attention to feasibility studies when modernizing, since there is no tendering involved

- to cost accounting and cost recovery or maximizing revenues since there is no pressure to make a profit or immediate threat of bankruptcy

- to have less experience in operation of modern resource recovery facilities as compared to their private counterparts who do this as their core business and are more market oriented.

The good practices listed above tend to increase the resilience of an operator model over time to changing conditions, making sure that it keeps delivering high quality waste management service to the satisfaction of the users of the service.

7.3 PSP Models

There is a wide diversity of PSP models in municipal waste management services around the world. The discussion below focuses on the lessons learned from the range of PSP models in the primary and secondary case studies for the different elements of the service.

7.3.1 Sweeping

No matter what operator model is chosen, getting Citizen's Association or district level local government involved in monitoring and control improves the service. Sweeping is often contracted out together with collection. Other PSP models in sweeping respond to a special cultural aspect or a special need in the serviced areas.

Civic participation models are chosen in places where there is a cultural tradition to participate in ensuring cleanliness in and around the household. For example involving Resident Associations and making them compete against each other for becoming the cleanest areas in Surat worked out very well. In Brazil, there are similar traditions, thus in the CIGRES member municipalities sweeping service is ensured in the centre by the municipality and the rest of the streets are cleaned by the citizens.

Contracting specialized services for busy commercial areas is a model choice. In these areas higher level of cleanliness is needed and there is limited access during daytime. In Surat, working with a contractor in the busy areas where motorized sweeping was needed during the night, was an obvious choice. This service came to complete the regular manual municipal street sweeping service.

7.3.2 Primary collection

When the collection service is unable to reach all areas of a city in a „one step” collection system, then manual collection is needed to get waste out from under foot.

to implement based on the case of Maputo. For these contracts, tendering can be done locally and based on invitations.

A PSP model with multiple micro-providers through short term area based contracts and decentralized management stood out as an efficient and flexible model

There were a few specific conditions in Maputo that favoured this choice:

Implementing the block collection system needed the cooperation of the users. When the collection cart comes by, the collector blows a whistle and the people bring their waste to the cart. This system works better if the service provider and the user know each other and work on a trust-based relationship.

The road infrastructure did not allow the use of motorized collection. 90% of the people lived in under-serviced or un-serviced poor infrastructure suburban areas before the start of modernization in 2004.

Micro scale service providers were available, while the municipality had limited capacity and was unable to get engaged as an operator and larger operators were not interested in primary collection.

Important benefits of the model are that:

- it creates jobs locally and develops micro-enterprises, involving community members in service provision in their own area or district;
- it is a flexible solution, making it easy to start small and roll out the service step by step

The main drawbacks of the model are:

- The monitoring and management effort in this model and in primary service collection in general, as other cases show, is significant. Management happens at the district level through regular meetings and constant monitoring.

- Micro-scale providers have very limited financial capacity and may need micro-financing schemes to be able to provide the service at the required standards.

A variation of this model was implemented in Surat, where the 5 SMEs contracted for collection could decide whether they would subcontract micro-scale provider or hire staff directly. In Surat only 10% of the population lives in suburban areas that were unserved and needed

to be reached. As there were already local SMEs engaged in providing the rest of the service, who were providing a good service in the rest of the city, these same companies were chosen to extend the service further.

This approach spared the extra effort that would have been needed in management from the side of the municipality if the micro-providers were directly contracted by the municipality.

7.3.3 “One-step” or secondary collection

When waste collection is extended and modernized, the option of private sector participation in motorized collection arises.

The PSP model for this service based on the evidence is a medium to long term service contract with medium to large scale companies that may be active nationally or internationally stood out as the most suitable one for this service. Public bidding increases the transparency of

such contracts. The model is suitable for the door to door collection systems in relatively high income and good infrastructure neighbourhoods. The capacity of the municipality in striking a balance between keeping control over operations and user charges while benefiting of investments and knowhow of the private parties is decisive for the successful implementation of the PSP model. Conditions and capacities that favoured this choice:

There is an underlying belief of the decision-makers that private sector is more efficient and cost effective at providing this service and a matching local objective to increase efficiency through privatization of the service

There is interest from suitable private companies. The private company's interest in bidding for a contract depends on whether they believe it's a profitable business, profitability depends on the amount of waste handled and the user charge or fee per ton that can be obtained. Sometimes companies will enter into markets at a loss to gain market share but over time they will always want to raise fees such as to be able to make a profit margin.



Cartoon 12: Trying to catch the fish that does not exist is waste of time and resources, just like trying to choose an operator that is not interested to provide the service.

The municipality (client) is able to manage a transparent selective bidding process for selecting the operator. These contracts usually involve motorized equipment therefore more capital intensive and one contract usually covers a rather large area of the city. This also means that there is more money involved in contracting and in operation, making the risk of corruption higher.

The municipality is aware of the risks and benefits of such models and is able to negotiate contract terms that are beneficial for the entire contract duration from the point of view of quality and affordability of the service.

The main benefits are that:

- Involving the private sector allows the municipality to push some of the burden of investment in vehicles and containers onto the private company.
- The service providers acting on the national and international markets are experienced companies with proven track records that are able to ensure and efficient and modern service.

On the negative side:

- The more the municipality relies on investment from the private company the less it will be able to negotiate terms such as the level of user charges and the less entitled it will be in profit sharing. Giving up equipment ownership may also lead to reduced ability to intervene in emergency situations.

7.3.4 Transfer stations

Close monitoring of the quantity of waste handled is an important management practice for transfer stations, regardless of the operator model chosen. Transfer stations receive payments based on the quantity of waste handled either by charging a gate fee or by maintaining a registry of the received waste and billing the authority based on the number of tons. Thus, there is a threat for double counting in order to increase income. Monitoring should preferably be done with a weighbridge and an electronic log for a registry.

Selecting a separate contractor for collection and transfer station operation is encouraged. If the same company is contracted it will have an incentive to put through the transfer station as much waste as possible, potentially diverting materials away from resource recovery. Transfer station operation may be under the same contract with landfilling, transport and treatment of waste.

Service contracts may be chosen for outsourcing the operation of the municipally owned modernized transfer stations as it was done in the case of Surat.

PSP through design finance build operate (DFBO) type of concession contract would be preferred if the operator is required to invest in construction and facilities.

7.3.5 Recycling

Informal sector integration whether a model in itself or part of a larger model, needs to be considered whenever the baseline situation shows that informal sector activities are present in the sector. Informal sector participation in recycling was present in all the in depth case studies and was the main force behind the recycling activities in most of the secondary cases reviewed.

The integration of the informal recycling system (IRS), is to seek win-win solutions that increase current recycling rates and thus further reduce costs to the authorities; while at the same time ‘professionalize’ the IRS as an integral part of a city’s ISWM system, by moving away from ‘dirty and illegal’ recycling to ‘recycling that protects livelihoods, protects health and safety, reduces or eliminates child labour and recognizes the recyclers as citizens, with the rights and obligations that that involves’. For this model to work well some conditions need to be met:

- Protecting livelihoods should be important on the agenda of the local authorities and there should be an openness to recognize the added value of the IRS.
- Once there is awareness at the decision-making level, this needs to be transferred to the public through awareness campaigns.
- Attention should be paid in capacity building and assisting the sector to eliminate child labor and increase health and safety and environmental practices of their activities.

PSP model that works through a Design Finance Build Operate type of agreement or a Joint Venture with the local authority for a long term concession contract may include a wide range of resource recovery activities and may function with or without the participation of the informal sector, depending on the baseline situation. The contracts are usually long term, for 30 years or more, in order to allow for recovering the investments. The private companies are usually implementing state of the art technologies but usually charge a gate fee to the authorities.

The private sector will be interested in investing in an MBT or other resource recovery plant that includes recycling if:

- The waste quantities are large enough and the waste streams are rich enough to make the business attractive.
- There is a market for recyclables.

- A set of environmental legislation in place and implemented such as the polluter pay principle in waste management involving at least a gate fee and/or tax on landfilling and user charges

Benefits of the models are:

- Implementation of state of the art technologies
- large capital investments from the private sector

The drawbacks are:

- High operation costs that are charged partially or completely to the municipality and thereby the citizens
- Lack of flexibility in some of the facilities operated through this model, potentially locking waste streams to one solution for a long time

7.3.6 Resource recovery

PSP model through a large company engaged in a long term Build Finance Operate Transfer type of concession contract is the most common model for resource recovery at commercial scale. Private companies are interested in running commercial scale treatment facilities. These types of treatment facilities usually include a stage of sorting either mechanical or manual and then various treatment and recycling options for the sorted streams.

These facilities are usually attractive for investment if they are financed through a combination of gate fee and sale of recyclables, compost, RDF, energy and or greenhouse gas reduction units. Municipalities are regularly receiving offers for the building and operation of treatment for RDF production or thermal processing or co-processing of waste for energy. Nevertheless the best way to choose a private operator is through an open bidding procedure based on tender documents. This has worked well in Surat for an MBT producing recyclables, compost and RDF.

A weighbridge is needed for recording inputs to treatment facilities and this is the basis of monitoring and control from the point of view of the contracting authority. The environmental regulator has an important role in monitoring recycling plants, since these are considered significant impact activities and are operating based on environmental permits in most of the countries.

Conditions and capacities that need to be in place for choosing this model:

- A market for the products of the MBT plant.
- Sufficient waste quantities to make economies of scale possible
- Incentive from the local authority to attract investors,

such as offering land or other assets or other favourable conditions through the contract that increase profitability of the investment

- Capacity of the municipality to assess the proposed technology's reliability and applicability to developing countries as well as the cost implications of such projects to the citizens.

The benefits of such models are:

- Attracting private investment capital to waste management
- High capacity and knowhow of the private sector in the building and operation of treatment facility
- Opportunity to divert waste from landfilling to resource recovery and treatment

Drawback of the model:

- such facilities is that they tend to become financially feasible only at large scale and the contracts often ask for guaranteed input amounts
- there is a risk of squeezing out informal recyclers from the market if the development of the project and contracting is not properly done

- With the high investments the risk of economic influence and corruption is high
- The facilities may function without environmental permits or without making sure that upstream and downstream the products are used in an environmentally sound way.

PSP for resource recovery through non-profit or profit sharing initiatives is most commonly done for small or community scale facilities usually in cooperation with NGOs. When treatment is implemented at community level, the members of the community often form cooperatives or other types of joint venture and share the revenues of the treatment that is attained through common efforts.

Some technologies available for treatment, such as biogas production, charcoal production and composting may be done at many different scales, starting from a capacity of a single household to a few tons a day to hundreds of tons a day. Composting has the highest chance of success and capacity to sustain itself due to the high organic fraction of waste in low and middle-income countries and favourable weather conditions for bio-degradation.

The conditions that favour this choice:

- Capacity and know-how to operate the facility
- Existing demand for the output of the facility within reach

Source separation increases the quality of the end product and is likely to increase the potential of marketing the product.

This applies only for the case if a MBT is implemented while blocking the activities of IRS. MBT is a treatment technology for mixed waste, not an OM. MBT could be combined with the informal sector or waste picker associations, focusing on both recovery of recyclables and biostabilization of the residual waste. (Example: São Sebastião, Brazil)

7.3.7 PSP for disposal and treatment

The basic model options for improving disposal and treatment are similar to those described in case of resource recovery. The main difference of these activi-

ties is that there is no economic incentive in the intrinsic value of the materials and that this service is a traditionally public service provided by municipalities.

PSP for disposal and/or treatment through a large company is usually chosen for the operation of a sanitary landfill and not so commonly for a dumpsite or a disposal site, regardless if this is financed through public funds or private funds. The typical contract for landfill operation is a long term concessions contract either a Design Build Operate and Transfer (DBOT) type or a variation of this that includes financing (DBOFT) as well. In case of a DBOT, the ownership and control is retained by the authority. In case of DBOFT, the company operating the landfill has a higher negotiating power and may be able to obtain high gate fees that may prove unaffordable over time.

The feasibility of taking up the task of landfill operation depends on the quantity of waste entering the landfill, since the operators are usually paid through a gate fee. Therefore, similarly to the resource recovery facilities, the operators may try to push for guaranteed amounts

of waste and guaranteed gate fees an increase of both over the years of the contracted period. For an efficient management and monitoring the contracting authority should have a weighbridge at the landfill site.

7.4 Inter-municipal Models

Inter-municipal models may be either public or private implemented at a higher level of governance through the cooperation of municipalities. Different levels of governance may be chosen for administrative or economic reasons.

In some cases this means a waste management system organized through the cooperation of local authorities within a county, region, province or country, depending on the size of the country and the administrative units in which it is organized.

For example in an island state, with a small territory and a few municipalities such as St. Lucia, organizing waste management at national level makes sense.

Often, inter-municipal models are chosen to achieve economies of scale. By this principle recycling, treatment, incinerating and landfill facilities cost less per ton at higher capacities until they reach a certain capacity.

There is then a trade-off between the cost of traveling the distance to the facility with the waste and the savings that may be achieved in a lower cost per ton facility. There are however a series of conditions that favour the choice of a certain level of governance:

- A tradition of good cooperation between municipalities in the region in waste management or other sectors and a consensus on the solidarity principle between municipalities
- A focus on sound management and operation through professional structures, economic efficiency and cost recovery as governance strategies
- The availability of fiscal facilities for inter-municipal models

- Availability of a legal framework for establishing and running inter-municipal organizations
- Feasibility studies show that an inter-municipal model will result in savings due to economies of scale

The strong positive aspects of inter-municipal models are cost efficiency in investment and operation that allows smaller municipalities to enjoy benefits from waste management services that they would not have had the capacity to achieve on their own. Another important positive aspect is the possibility for municipalities to learn from each other and build on each other's experiences.

The drawback of these systems smaller municipalities may lose decision-making power over their waste management activities for a long term to the larger municipalities or the metropolitan city in the area.

What have we learned?

The research behind this sourcebook started at the end of 2011 following award of a consultancy contract by GIZ to the companies ERM and RWA-Wasteaware. We had put together a great team of practitioners working in the field of *garbology* in different parts of the world and were eager to get started on the task.

At that time we did not understand what the term ‘operator model’ was really supposed to mean. Whilst this is a widely understood term in the German language referring to the contractual relationship between the public authority and the operator, most of the team was not German, and it was and still is not a commonly used term in the English language.

Thus, the journey of writing this book began by trying to define what it is we were actually going to research and talk about. This was not so easy as it seems, and we spent plenty of time arriving at the definition of operator model used as the basic theorem of this work. We ended up with a more inclusive definition, including the role of the revenue collector and the entire interrelationship between the three actors.

It was equally challenging to decide how the book was to be structured. Should it be organised in chapters according to the operator model types? Or by stages in the ISWM chain? By institutional functions & perspectives? Or presented case study by case study? In the end we opted for a blend of all four, and we hope that the way we have done it gives a structured, informative, but also a pleasant enough read.

It is not, however, very easy to make the subject of ISWM operator models very ‘light’. We are chronicling the diversity of ways human societies go about organizing and delivering an essential public and environmental service, and a valuable sector of the economy. It is important not to trivialize this, rather to give as much structured information, examples and tools as possible to a professional audience. From our involvement in preparing this book, we come closer to the realization that ISWM is an *applied social science* worthy of recognition as a field in its own right.

It seemed a good idea to use this work as an opportunity to build on other recent international publications, in particular the UN Habitat Solid Waste in the World’s Cities, which contained a review of ISWM practices in 20 of the world’s cities, rather than trying to *reinvent the wheel*. Thus, the team applied and further developed the methodological tools used for that publication to the purpose of this research, in particular we were able to prepare and test a next generation ‘ISWM benchmarking’ tool, which now continues to be further developed and applied around the world through parallel initiatives.

During the process of writing this book – we have been able to ‘unpack’ and describe what we believe is a useful methodology for making decisions how to organise, manage and pay for ISWM.

Intuitively, people seem to follow a structured process of identifying problems and framework conditions, formulating objectives, and understanding enabling conditions and capacities, before selecting and implementing their specific ISWM operator models. We felt that reflecting these intuitively logical steps within the structure of the book may be helpful as a guide for local decision-making processes.

We have been surprised by the extent of the diversity of ISWM operator models. It has been possible from the research to classify 42 common operator models (coms) that are used in multitude of different combinations. The *coms model* is a specific invention that was neither envisaged at the start of this research – or should be considered a finished product. Rather, it is a work-in-progress conceptual tool that can be used for designing ISWM systems.

Interestingly, we have not been able to conclude that any particular ISWM operator model is inherently better than any other. The research that our team has conducted leads us to the conclusion that stable political and financial backing, and the existence of professional *client* organisations, working transparently in a non-corrupt environment, matters far more than whether the ISWM service is operated by either the public or private sector.

This is not *'sitting on the fence'*. We just cannot find evidence to suggest that the private sector is any better at delivering ISWM services than the public sector, or indeed vice versa. If this helps to prevent decision-making on ISWM getting bogged down in traditional left-right ideology, then we will have perhaps helped in some modest way to unblock future developments.

Simply put, decisions made by people within cultures, designing the systems that suit them best, leads to a colourful diversity of outcomes. And we feel that this diversity needs to be better understood and respected. It is our hope that this work will be used and applied, tested and critiqued – and that over time, practitioners in the field of ISWM will have better and better methods and tools to work with.

During the process of writing this sourcebook – and the daughter guidance paper – we have benefited from working with an excellent group of people.

The GIZ team, Sandra Spies, Sofia Garcia-Cortes, Barbara Ölz, Ellen Gunsilius and Johannes Frommann have been very patient with us throughout, and contributed to the quality and consistency of this work.

From KfW - Wolfgang Pfaff-Simoneit, Bernd Hasel and Bernhard Schenk, have kindly provided their comments, experiences and advice.

Our research and drafting team, Michael Cowing, Joachim Stretz, Sanjay Gupta, Thilo Schmidt, Borislav Mourdzhev, Jennifer Kanjogera, Sonia Yankova, Nikola Doychinov, Shafiul Ahmed, Monir Alam Chowdhury, Beth Baylay, Kevin Kerwin, Brian McCarthy and Sonia Dias, have all made important and timely contributions to this work.

As a field, ISWM is not very well known, and perhaps even less well regarded within mainstream development assistance. For many years, German Development Cooperation has consistently supported the improvement of ISWM practices in developing countries. On behalf of the millions of people who work hard every day to clean up our planet, we would like to thank the BMZ for their support in helping to make this publication possible.

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Imprint

Published by

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Registered offices

Eschborn, Germany

Advisory Project Concepts for Sustainable Waste Management

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In cooperation with

ERM Germany, **RWA** UK, **Green Partners** Romania, **Wasteaware** UK

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Design and layout

Ecuson Studio Romania

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As at

September 2013

GIZ is responsible for the content of this publication.

On behalf of

Federal Ministry for Economic Cooperation and Development (BMZ)

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