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Privatization of solid waste collection services as tool to sustainable waste management in developing country cities. Lessons from the case of Kigali, Rwanda Capital City

Pius NISHIMWE

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Privatization of solid waste collection services in developing country cities. Lessons from the case of Kigali, Rwanda Capital City

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by
Pius NISHIMWE

Supervisors
Prof. Wil Thissen

Mentors
Dr. Jaap Evers

Examination committee
Dr. Ir. Leon Hermans

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Summary

Keywords: *Privatization, Developing countries, Kigali, solid waste collection, sustainability*

Many developing countries, particularly African countries, have adopted a monopoly privatization of solid waste collection service where a monopoly zone is provided to a private firm, and Rwanda is no exception. Kigali, the Rwanda capital city, is the only city in Africa where the solid waste collection service is fully provided by the private sector and the bill submitted directly to the households since 2012. The involvement of private sector in solid waste collection in Kigali has been triggered by the shortcomings of the City Council to provide the service alone where the KCC owned only three vehicles to serve the whole city. While the service quality has been evidenced to improve with the growing involvement of the informal private sector, the financial viability of both evolving informal service providers and KCC was a problem associated with the loss of control of the latter on both service providers and households. Since 2011, KCC has proven the willingness to improve the situation from the recognition of the role played by informal sector up to the monopoly privatization which is into force since 2012. The implementation of the monopoly privatization has been initiated by creating monopoly zones and involving RURA as an independent regulator to have control on service providers and households.

The creation of monopoly zones has followed the administrative structure of Kigali. This is the contrary for countries in the same region with Rwanda such as Tanzania, Kenya and other developing countries such as Ghana where monopoly zones were created without following administrative boundaries and one district could be served by more than one companies. Generally, Kigali, like other provinces of Rwanda, is subdivided into districts (Nyarugenge, Kicukiro, and Gasabo), districts into sectors and sectors into cells up to villages. Three assumptions have guided the selection of a sector as a monopoly zone. Firstly, although the capacity of local operators was weak, the KCC assumes that each operator can, at least, provide the good service to one sector. Secondary, aiming the equity in cost distribution at the same time ensuring the financial viability, the KCC assumes that a sector records high disparities in terms of income of households which can help companies to recover all involved costs even when a cross-subsidy for the urban poor community is applied. Finally, admitting the weak monitoring and management capacity for the public sector, the KCC assumes that this capacity is enough to manage the contract and control the service quality and performance of private operators in general at the sector level.

However, after four years of implementation, no study has been done to evaluate the outcome and sustainability of this form of privatization in Kigali. This study aims to explore the mechanisms of collection service in Kigali after privatization and key individual and environmental factors shaping the outcome. To explore the outcome of privatization of solid waste collection and to explain variations in the outcome for different operational zones (sectors), a framework combining the elements of sustainability for solid waste management and the determinants of the sustainability has been used. For the determinants of sustainability, the study has focussed on four concepts: the capacity (physical and human) of service providers; the involvement of households; physical and general characteristics of the operational zone (sector); and service provision regulation such as contracting mechanisms, licensing processes, local authority inclusivity at planning level. For the elements of sustainability, the study focused on the three concepts: Environmental sustainability (waste ending into disposal sites, waste separation at household level and recycling, sanitary conditions and waste overflows); financial sustainability (cost recovery using user charges, reduced transactions costs and zero subsidy from the public sector); and social sustainability (fair cost distribution through cross-subsidy for urban poor community, extra costs to households, service quality and affordability). The data for this study have

been collected from six private companies, six sectors (operational zones), hygiene and sanitation for KCC and water and sanitation for RURA departments where solid waste collection service falls, the author's field observation in sectors and at the dump site, the secondary data from published and unpublished reports, guidelines and solid waste strategic plan (2012) and the discussion groups with companies' user charges collectors and households. Forty (40) households were selected from each sector and a total sample size of 256 respondents was the target of this study.

The creation of monopoly aimed to increase the control of the public sector on households and service providers and to accommodate the weak capacity of the latter at the same time ensuring the inclusivity of the urban poor community as discussed earlier. The lack of privatization experience associated with the weak monitoring and management of the public sector and the weak physical capacity of companies have been evidenced during this study. This is resulting in the re-centralization of the system combined with the intervention of new actors such as Rwanda National Police (RNP). As the target of the Rwandan government is to make Kigali, and other cities, attractive places to promote tourism, any action or process that harm this target is considered as a "menace" which requires the intervention of RNP, which has been the case for solid waste collection service early after privatization. The weak capacity of companies and that of sectors to monitor the performance of the latter failed to respond to the expectations of the country which has led the KCC to break the administrative structures by creating direct permanent and sequential relations with sectors and companies. Together with RNP a joint competition between companies and between sectors is organized every six months evaluating the security and hygiene and three first companies and sectors are awarded. Though this evaluation is strongly shaping the outcome of the privatization and contributing to the improvement of general cleanliness, it is creating a re-centralization of solid waste collection monitoring where KCC with RNP tend to control the whole system. This results in a lax attitude of sectors affecting the performance of some companies which may also result in the manipulation of some figures such as service coverage and collection coverage to win the competition though the research failed to evidence this assumption.

In terms of environmental sustainability, this study has evidenced the improvement in some aspects such as collection coverage (from 44% in 2012 to more than 90% in 2015); and the general cleanliness of sectors before and during service delivery, sanitary conditions at household and sector levels. But the environmental sustainability has not been achieved as 90% of collected waste ends into the communal dump site. Furthermore, the dump site is among vectors of environmental degradation and health problems in Kigali such as poor occupational health and safety of dump site workers and families surrounding the dump site. The sensitive location of the dumpsite has also been evidenced where it is located on the top of the hill surrounded by valleys making wetlands for urban agriculture and water bodies. The current mismanagement of the dumpsite has been evidenced as a hazard to collection vehicles which can lead to the illegal dumping of collected waste in surrounding valleys and hence, affect the urban agriculture.

There is a simplistic attitude to attribute the "no waste sorting at source" to the insufficient and inadequate physical capacity of companies and the lack of willingness of the population to separate waste. But this study has evidenced that the ultimate factor influencing the current waste separation performance is related to the lack of adequate corresponding institutions and weak enforcement associated with the lack or weak institutionalization of existing waste separation regulations. Currently, there is no fine for the company when waste is mixed during collection. For this, for many companies, there is no need to involve the costs related to separate waste collection while it is again mixed at the disposal site. It is evident that this mismanagement of the dump site and the lack of institutionalization of waste separation in sectors, as it has been done for collection service, is a disincentive to households to separate waste and to companies to provide adequate collection vehicles allowing separate collection. In addition, currently, there is no specific solid waste management Policy and waste recycling policy in Rwanda. But waste management is ruled by the Water and Sanitation sector Strategic Plan (2013/14 - 2017/18) ignoring practice-based challenges related to waste collection service provision and

their consequence on the environment. Furthermore, households do not separate waste because the city does not provide civic amenities allowing separation. In contrast, for the sake of the general cleanliness of Kigali city, the transfer stations and other sites allowing separation and recycling are prohibited.

In terms of financial aspect, the privatization of solid waste collection is not leading to the financial sustainability. While the choice of the government is that the costs incurred by the service provision must be covered using user charges collected from service recipients (households), the study has evidenced that there is no full cost recovery, ranging between 50-100% (only 2 out of 6 companies record full recovery) alongside with big portion of household (31% of the respondents) willing to pay less than the current user charges. Even for the two companies which record full cost recovery, there is no insurance of sustainability as they have adopted unsustainable strategies (reduction of operational costs by reducing the number of owned vehicles and increasing rented vehicles; and reducing the labor costs by employing cheap workers). Others use the bank credit line to fill the gap which is also not a sustainable solution as it incurs unnecessary transaction costs, such as bank interests. It has then been evidenced that the system strongly depends on other sources of income such as money collected from the waste collection service to commercial activities, selling recyclables, consultancy works, gardening and pest control services, tax collection services, etc. Furthermore, while the choice of the government of Rwanda was a “Zero subsidies” option for solid waste collection, the study has evidenced that the principle of zero subsidies has not been respected. This has been evidenced by the fact that sectors engage incurring transaction costs to pay the bill of indiscriminately disposed of waste by non-paying households and small street businesses. But this study has failed to evidence the decrease of transaction costs before and after privatization as KCC does not have full information on involved transactions from sectors.

Though various factors have been evidenced to influence the financial outcome, the study finds that the financial viability is more influenced by three main factors: (1) the general physical characteristics of sectors; (2) companies’ human capacities (supervisor efficiency) and their level of organization; and (3) service regulatory framework, especially weak capacity of “Jyanama” and sector officials involved in user charge setting process. On one hand, Kigali is recording a progressive urbanization process from areas with peri-urban characteristics, i.e. mixture of agricultural activities and small businesses. For this, many sectors are generally characterized by populations living an everyday lifestyle and large financial differences between households. This mixture affects the performance of solid waste collection service providers where poor families tend to rely on rich families (free riding), poor roads damaging the physical capacities of companies which increase maintenance costs, and poor families living of the agricultural activities making home-composting and burying non-biodegradable waste in their free spaces and hence, affecting their willingness to pay. The influence of regulatory framework on cost recovery and particularly the user charges setting has been evidenced by the weak capacity of sector executive secretaries and “Jyanama” translated into inadequate user charges. This has been evidenced by a big fraction of households willing to pay less than the current user charges. Furthermore, the study has evidenced the influence of companies’ supervisory capacity where companies have evidenced weak follow-up on user charges collection by assigning one staff at the company level to monitor all payments.

In terms of social sustainability, the study has evidenced that the objectives of privatization were dominated by social priorities which have led to the tremendous improvement of social aspects. As discussed earlier the main objective of privatization include the inclusivity of poor families as a way to increase the service coverage; the creation of more jobs; and the improvement of the service quality. The inclusivity of poor families (social equity) has been achieved by implementing the cross-subsidy of households where user charges are set following “Ubudehe” classification that classifies households in three categories (High, middle and low income) though it does not ensure service affordability as evidenced by the above willingness to pay. The average user charge for each category is 5,000, 3,000 and 1,500RWF (approximately €2, 4, and 6) per month, respectively.

The involvement of private sector has increased the service coverage where more than 90% of households have access to the service in 2015 from 50% in 2012, regardless their income. The service coverage was influenced by the cross-subsidy increasing the inclusivity of poor families. Before privatization the service provision was mainly guided by the market incentives i.e. companies providing the service to the households that are able to pay the service which led to the exclusivity of poor families and hence, to low service coverage. In contrast, with the involvement of private sector and the creation of monopoly zones, the service is more shaped by social equity through the implementation of cross-subsidy – where rich families subsidize poor families, which have increased the service coverage.

This study has also evidenced that the service quality has improved. The main indicator of service quality improvement for many households was the level to which companies respect collection frequency and schedules and how the company meets the expectations of households compared to the last 3 or 4 years bad experience. This could not reflect if the company respect the service standards as specified in the contract signed between the company and households or not and the author could not go beyond this reality. Despite this challenge, it has been evidenced that only two sectors out of six are experiencing an unreliable service (Rwezamenyo and Kinyinya).

The service quality has been evidenced to be influenced by physical capacity (number and state of vehicles) and organization and planning capabilities of companies. The companies with high physical capacity in terms of the number (P1, P4, and P6), evidenced to provide good quality service while those with low capacity provide unreliable service (P2). The influence of the state of the vehicle (old or new) has been evidenced by the company P5 having three owned vehicles – a minimum requirement to serve one sector – provides bad service due to old owned vehicles which increase the number of vehicle breakdowns (at least 4 breakdowns a week) and service unreliability. The mixed result of the influence of the planning capacity has been evidenced showing good and bad examples. For example, in Remera sector, while P1 company needs 5 days to service the sector based on physical capacity findings, the company has evidenced the high planning capacity where the service is provided in 2 days. In contrast, for Kagarama sector, while the physical capacity findings have evidenced that the company needs only 2 days a week to serve the sector, the weak planning and organization capacity lead the company to provide the service the whole week (5 days) which is the case for the remaining interviewed companies.

About 1,000 permanent jobs have been created while the city was predicting the creation of 63 jobs from the private sector and 23 jobs from the public sector varying from waste collection to office work. The increase in job creation was influenced by the extension of the service coverage to new sectors and to the decentralization enforcement where companies are requested to provide more channels to respond to households' complaints and hence, creating new jobs in companies. The types of created jobs are dominated by field related jobs such as waste pickers counting a big fraction followed by user charges collectors and supervisors, respectively and office jobs (officers and top management) counting the smallest fraction. Even though many jobs have been created, the study has evidenced that there are opportunities for improvement such as the increase of salary ranges (currently ranging between 30,000-500,000RWF, approximately €38-586, per month), enforcement of safety measures and reduction of working hours as defined by Rwanda Labor Law, especially working hours.

All in all, the above evidenced improvement in social aspects does not ensure sustainability as the study has evidenced the conflicting effect of the cross-subsidy with the profit of companies. While various studies have suggested the cross-subsidy as a solution to social equity, the study has evidenced that this is a challenge to private operators as it is not contributing to the full cost recovery. The companies are compulsorily required to provide the service to every household regardless their income where some households even receive the service free of charge (exempted). This affects companies' cost recovery and does not allow companies to renew collection vehicles while they are key to service reliability.

This study has also evidenced that the privatization is not contributing to environmental and financial sustainability. About environmental sustainability, the main challenge is the huge amount of waste that ends into the dumpsite due to the lack of the institutionalization of solid waste separation at source and recycling. This study has recommended the integration of waste separation at the source with collection service associated with a new regulatory framework preventing the conflict of interest between recycling and collection actors. The study has evidenced that 70% of disposed of waste is organic. It has also recommended a cross-sectoral or ministerial partnerships, such as the partnership between Ministry of Agriculture, KCC and Ministry of Infrastructure to reduce the impact of organic waste disposal related hazards by promoting the composting.

For financial sustainability, the study has evidenced that there is no full cost recovery for many companies which has pushed the companies to find other sources of income including mainly the money collected from waste collection service in commercial activities. This situation is influenced by the weak follow-up and planning capacities of companies resulting in poor user charges collection practices and unnecessary operations costs, respectively. And it is influenced by inadequate user charges set by the local authority. For this, the capacity building for supervisors and user charges collection team have been recommended to companies and to the local authority (“Jyanama” and sector officials) to optimize the collection of user charges and ensure adequate user charges, respectively. A combination of waste collection and other public utility fees such as electricity has also been recommended to optimize user charges collection. An intersectoral cross-subsidy such as “Households-commercial activities cross-subsidy” has been recommended to compensate the cost recovery gaps that may result from the option of “zero subsidies” adopted in Kigali.

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Abbreviations

CBOs	Community Based Organization
CoK	City of Kigali
DCs	Developing countries
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
KCC	Kigali City Council
MINALOC	Ministry of Local Government
MINIFRA	Ministry of Infrastructure
MINIRENA	Ministry of Natural Resources
NGOs	Non-Government Organization
PAYT	Pay-As-You-Through
RDB	Rwanda Development Board
REMA	Rwanda Environmental Management Authority
RURA	Rwanda Utility and Regulatory Authority
UK	United Kingdom
USA	United States of America
UNEP	United Nations Environment Programme
RCA	Rwanda Cooperative Association
RNP	Rwanda National Police
MINAGRI	Ministry of Agriculture
EAC	East African Community

CHAPTER 1

Introduction

This chapter introduces this study by providing the general overview about problems faced by developing countries which opens literature gaps on monopolistic privatization which has been initiated in Kigali. This literature gap explains also the relevance of this study. To achieve this, the chapter is organized into six sections. Section 1 presents the background information; section 2 presents the problem statement; section 3 presents the research questions; section 4 presents research objectives; section 5 presents the relevance of the research and section 6 presents the organization of the thesis report.

1.1. Background information

Urbanization has often been given attention due to its contribution to the wealth of countries and to rapid demographic dynamics and Rwanda is no exception. But, recently various studies have tried to examine some of its adverse consequences such as pressure on natural resources; urban poverty and related problems such as spatial inequalities and inequality in access to public infrastructures and services including solid waste collection services ([Satterthwaite, 2014](#)). The growing level of urbanization is contributing to high population density in urban areas, commercial and industrial activities which are the main sources of increasing solid waste for many developing countries ([Bartone et al., 1991](#)). This has overshoot the financial and managerial capacity of public sectors to provide alone solid waste collection services which have then, opened doors to private sector involvement in solid waste collection and entire management chain as well ([Oduro-Kwarteng et al., 2006](#)).

Various reasons explain the involvement of private sector in solid waste collection service which include, but not limited, making authorities free from day-to-day management of solid waste collection services, increasing the coverage of service, reduction of the costs involved in service provision and gaining free or cheap knowledge, technology and experience from private sector ([Oteng-Ababio, 2009](#)).

Although the private sector can lead to the improvement of solid waste collection services, many developing countries are facing three main challenges: (1) On the side of the Public sector, there are inefficient contract negotiation and monitoring, and unclear regulatory framework to avoid preventable burdens on private service providers ([Bartone et al., 1991](#)). (2) On the side of the citizens, the laid-back attitude of the citizens with regards to their participation in solid waste collection leads to an increasing free riding, less willingness to pay the service, waste illegal disposal and/or street littering ([Oduro-Kwarteng et al., 2006](#)). (3) On the side of the Private firms, the lack of physical and human capacities for many private companies results in the inability to analyze the system and to optimize the operations which leads to inefficient use of time and resources. This is translated into the high costs of collection service to users, truncated productivity and unfortunate service quality ([Cointreau-Levine, 2005](#)). Moreover, the stumpy cost recovery associated with a limited fund or subsidy from the central government affects the financial capacities of many service providers ([Oduro-Kwarteng et al., 2006](#)).

Despite the above challenges, some researchers have presumed a success story for private sector involvement in solid waste management, both in developed and developing countries. For the developed countries, [Donahue \(1989\)](#) has evidenced that in United States, Canada, and the United Kingdom, the service provided by public sector costs 25 to 41% more than the service provided by the private sector companies. For the developing countries, the study done by [Bartone et al., \(1991\)](#), on the four cities of Latin America (Santiago, Buenos Aires, Sao Paulo and Rio de Janeiro), has evidenced the financial

stability and good service quality in Santiago even when poor families were exempted from paying the service charges.

All the above studies have examined privatization of solid waste collection where citizens are the one to make the buying decision on the contrary to the monopolistic approach adopted by many developing countries, particularly African countries and Rwanda is no exception. For Kigali, the monopoly has been implemented through a “One Sector, One Operator” program where a sector is taken as a minimum operational zone for a company. Administratively, Rwanda is subdivided into five provinces – Western, Eastern, Southern, Northern and the City of Kigali, the capital city of Rwanda and the case study of this study. Each province is divided into Districts, District into Sectors, Sector into Cells and cell into Villages as shown on Figure 1.



Figure 1. Rwanda Administrative Structure

(Source: Developed by the Author from MINALOC (2015))

Three main reasons explaining the choice of the sector as an operational zone ground on three assumptions. Firstly, there is an assumption that the financial, human and physical capacity of local private companies is low and that it can be limited to a sector to ensure the good quality service. Secondary, the KCC assumes that the regulatory and monitoring capacity of the public sector is limited and that it can be limited to the sector ensure its effectiveness. The third assumption the sector can cover the impact of population diversity in terms of households' income as the financing mechanism for solid waste collection service is built taking into account the ability of the population to pay the service.

1.2. Problem statement

Solid waste management has been and is a challenge for many cities in developing countries ([Oteng-Ababio, 2009](#)) and Rwanda is no exception. The rapid urbanization and administrative and economic potential of capital cities, including the City of Kigali, are attracting many people seeking for jobs and welfare in general. This resulted in growing demand for services including solid waste collection and the public sector is unable to deliver the service alone which required the involvement of private sector.

Though various researchers have presumed a success story for private sector involvement in solid waste management, for both cities of developed and developing countries respectively ([Donahue, 1989](#); [Bartone et al., 1991](#)), few researchers have evaluated the post-privatization of waste collection services in developing countries where full and monopoly privatization is adopted. This is the case for the City of Kigali where the service is fully provided by the private sector since 2012 and until now, whether privatization is making its promise it is incognito. This research explored the mechanisms of solid waste collection in Kigali after privatization and has drawn various practice- and regulatory-based recommendations to improve the privatization outcome toward the sustainability of all aspects of solid waste collection service (environmental, social and financial).

1.3. Research questions

The main question of this study was: How does the provision of solid waste collection service work in Kigali after privatization? To address this question, the following specific questions have been answered: (1) What reasons do explain the privatization of solid waste collection service in Kigali? (2) What is the impact of privatization of solid waste collection on service coverage, service quality, and financial viability of service providers in Kigali? (3) What individual and environmental factors explaining variations in results of privatization of solid waste collection services for different monopoly zones while the same

regulatory framework is applied to the whole City of Kigali? and (4) What can be improved based on the functionality of the whole system? And how to improve it?

1.4. Research objectives

The main objective of this research was to explore the mechanisms of solid waste collection service in Kigali after privatization and to draw practice- and regulatory-based recommendations for improvement toward the sustainability of all aspects of solid waste collection service (environmental, social and financial). To achieve the main objective, the following specific objectives have been addressed. (1) To examine how and why solid waste collection service has shifted from public sector to private sector in the City of Kigali; (2) To examine the impact of privatization on service coverage, financial viability of service providers and service quality in the City of Kigali; (3) To examine individual and environmental factors explaining variations in solid waste collection in different monopoly zones (sectors) while implementing the same guideline; and (4) To provide recommendations for improvement based on the research findings.

1.5. Relevance of the research

What makes this study relevant is the uniqueness of the City of Kigali concerning solid waste collection privatization. The City of Kigali is the first city in Africa to implement full monopolistic privatization for which the garbage bill is directly submitted to citizens. For other African countries, there is a mixture of both public and private service delivery and the bill is paid by either the municipality or citizens, respectively. Whether full privatization is making its promise in Kigali, it is in incognito because until now there is no any study done in Rwanda, particularly in the City of Kigali, to evaluate the outcome of privatization and the functionality of the service delivery system in general. This study is of great importance to examine the outcome of the involvement of private sector in solid waste collection in terms of environmental, financial and social aspects and to explore the crucial factors that shape the outcome and to draw recommendations for improvement based on the current functionality of the whole system. This study will also inform other developing countries whether the private sector alone can contribute to the improvement of waste collection service and to what extent this approach is sustainable in terms of financial, social and environmental aspects.

1.6. Thesis report organization

This report is organized into five chapters. Chapter 1 introduces this study by providing the general overview about problems faced by developing countries which opens literature gaps on monopolistic privatization which has been initiated in Kigali. This literature gap explains also the relevance of this study. To achieve this, the chapter is organized into six sections. Chapter 2 gives the overview of solid waste problems and challenges in developing countries, how and why the private sector is involved in the solid waste collection and discussion some of the privatization-related concepts. Chapter 3 presents the research methodology. Chapter 4 discusses the findings of this research and Chapter 5 presents the conclusions, implications on theory and recommendations.

CHAPTER 2

Literature review

This chapter gives the overview of solid waste problems and challenges in developing countries, the evolving involvement of private sector in solid waste collection and discussion some of the privatization-related concepts. To achieve this, it is divided into six sections. Section 1 presents problems and challenges of solid waste management in DCs. Section 2 presents the broad perspective of involvement of private sector in solid waste collection. Section 3 discusses the privatization of solid waste collection in DCs. Section 4 provides the most common forms of privatization in solid waste management in DCs. Section 5 presents the types of private sector representations in solid waste collection services in DCs. Finally, Section 6 presents the sustainability features of solid waste collection services.

2.1. Solid waste problems and challenges in developing countries

This section is divided into two sub-sections. Firstly, it discusses the common problems faced in solid waste management by many developing countries. Secondly, it presents the main challenges.

2.1.1. Common Solid waste problems in developing countries

Though private sector is partnering with the public sector in solid waste collection, developing countries are still suffering from poor solid waste management and related problems. The current services are characterised by relatively similar problems which include the low service coverage – especially for the urban poor communities with only 60 to 70% collection rate –, irregular service increasing the amount of uncollected waste, sloppy attitude of people regarding illegal waste disposal, non-payment of service fee and street littering ([Bartone, 1991](#)). Many cities are roughcasting severe environmental pollution and degradation and related health risks due to uncollected waste, waste disposed of in streets, in open areas, and in urban drainage systems. In addition, water resources located near dump sites are polluted through leaching and other water resources are polluted by surface run-off especially during the rain seasons. ([Onibokun and Kumuyi, 1999](#); [Bartone, 1991](#); [Wilson et al., 2013](#)).

2.1.2. Solid waste collection challenges in developing countries

Although the private sector can lead to the improvement of the situation, for many developing countries there is lack and or limited adequate policies, rules and regulations promoting the participation of private sector in solid waste collection and that create an enabling environment ([Oduro-Kwarteng, 2011](#); [Wilson et al., 2013](#)). The nature of solid waste service as “public good¹”, associated with weak enforcement of existing guidelines, rules and regulations regarding solid waste management, contributes to the laid-back attitude of the people, leading to illegal disposal of waste and street littering, and less willingness to pay the service ([Oduro-Kwarteng et al., 2006](#)).

Though theoretically, the private sector can help to improve the efficiency and effectiveness of solid waste collection, there is a lack of physical and human capacities for the private sector and Rwanda is no exception. The inability of the private sector to analyze the system and to optimize the operations leads to inefficient use of time and resources. This, in turn, results in a high cost of collection service, truncated productivity and unfortunate service quality ([Cointreau-Levine and Coad, 2000](#)).

¹ *Solid waste management as a Public good* – unlike water or electricity, it is not possible to exclude those who don't pay users charges from solid waste collection service ([Cointreau-Levine, 1994](#))

The stumpy cost recovery associated with a limited fund or subsidy from the central government is common in many developing countries due to solid waste service competition with other governments' priorities and limited involvement of households which affect the financial capacities of service providers (Odoro-Kwarteng et al., 2006).

Many developing countries suffer from the "no service standard" or the variation in private sector performance (productivity and service quality) which has been evidenced by different researchers such as Odoro-Kwarteng and Van Dijk (2008), Rushbrook (1991), Oteng-Ababio (2009). This results in a cyclical causal relation, where the poor service quality and inequality in access to the service affects the accountability of the service providers, which in turn affects the willingness of the population to pay the service. Finally, this becomes a financial burden to the private sector as it leads to the dysfunction of any established financing mechanism.

2.2. Broad perspective of involvement of private sector in solid waste collection

Broadly, "privatization" is defined as a full or partial transfer of ownership or control over state-owned or public services to private operators (Bennel, 1997; Cointreau-Levine, 1994). This term has been used by various authors to explain all forms of engagement, activities or programs aiming to increase the responsibility of private sector at the same time reducing the responsibility of public sector. The overall reason behind this reform was to improve the performance of public sector by reducing its intervention areas (Stocker, 1997; Kassim, 2006).

Since the 1970s, the involvement of private sector in solid waste collection emerged in developed countries and then spreads throughout different developed and developing countries (Eggerth, 2005). By 1990, In United States, more than 10,000 private operators were recorded in solid waste collection services and more than 80% of collected waste were collected by them (Cointreau-Levine, 1994). In developed countries, private operators are also involved in the whole value chain of solid waste management including landfill management, treatment and recycling activities. Generally, the slow involvement of private operators in all development sectors has been evidenced by different authors (Bennel, 1997; Li and Akintoye, 2003) in developing countries, and particularly in Sub-Saharan countries, with a little exception of French-speaking countries. The involvement of private sector in the solid waste collection has then been accelerated since the 1990s, by the involvement of World Bank, advocating for the privatization of public services, as presumed into World Development report (World Bank, 1994) and by the involvement of other international bodies (Bennel, 1997).

Solid waste management is now recognized as an emergent issue at local, national, regional and international levels. The issue of solid waste is addressed in the Agenda 21 of the United Nations declaration about environmental sound solid waste management. The emphasis is made on the whole chain of waste management and put a particular emphasis on the extension of the coverage of waste services, which is one of the main concerns of waste collection services for many developing countries (UNEP, 2015).

2.3. Solid waste collection service privatization in developing countries

Traditionally all public services, including solid waste collection, have been in the responsibility of the public sector. Due to the growing financial limitations and inefficiency, governments of many developing countries failed to deliver public services. This triggered the adoption of market-based service as a solution to perpetuate the service provisions. This principle faced many challenges in developing countries. Generally, the market to function requires a perfect competition which is possible when there is a big number of sellers (private sector) and buyers (citizens), information symmetry, full cost recovery and no externalities (Odoro-Kwarteng et al., 2006). Though DCs governments would ensure the market contestability by creating exclusivity and competition in monopoly area; though there is growing demand

for solid waste services; the market has failed because solid waste collection service entails information asymmetry and externalities (negative impacts on the environment). In addition, even though the citizens do not pay the service, they have to be serviced otherwise they dispose waste in public places and then harming the law of exclusivity, which would make the market function. For this, different authors argued that the provision of public services, including solid waste collection, would remain in the responsibility of the government (Cointreau-Levine, 1999; Roth, 1987; Gidman et al., 1999). This explains the intervention of the public sector in solid waste management even when a service is privatized. Solid waste service market cannot work without strong and functional regulations which are the main challenge for different DCs.

For many developing countries, despite a suspicious functionality of market - based solid waste service provision, governments could not go away from this solution as the public sector failed to provide alone the service. NGOs also failed to solve the problem as they rely on donors' support to recover the costs related to the service provision (Kassim, 2006). This means that the service would be provided when there is an aid, and at the donation absence, the service would be paralyzed while there is no substitute for such public service. This paradigm supported the privatization of solid waste collection for many DCs. Appendix B summarizes general reasons explaining the intervention of private sector in the solid waste collection for DCs, but the cost reduction and efficiency are the main ones.

For both developed and developing countries, various researchers have evidenced that the results of privatization are inconsistent based on empirical and statistical econometric studies. For the developed countries, the first study, done by Hirsch (1965) in 24 municipalities of USA (St. Louis and Missouri) has evidenced that there is no significant difference between costs of the private sector and public sector. The same results have been evidenced by Pier et al. (1974) and Collins and Downs (1977) through the study was done again in USA's municipalities in Montana and Missouri respectively. Table 1 summarizes mixed results illustrating examples of efficiency in solid waste collection services provision in developed countries.

Table 1. Cost efficiency for solid waste collection in developed countries

<i>Reference</i>	<i>Location</i>	<i>Year</i>	<i>Number of cities</i>	<i>Comparison of costs (Private & Public)</i>
Hirsch, 1965	USA	1960	24	There is no difference
Pier et al., 1974	USA	1970s	22	There is no difference
Kitchen, 1976	Canada	1970s	48	Public greater than Private
Collins and Downes, 1977	USA	1970s	53	Private greater than Public
Pommerehne and Prey, 1977	Switzerland	1970	103	Public greater than Private
Domberger et al., 1986	UK	1985	305	There is no difference but with competition
Szymanski and Wilkins, 1993	UK	1994	>300	Public greater than private but with competition
Callan and Thomas, 2001	USA	1997	110	There is no difference but with a specific form of organization
Dijkgraaf and Gradus, 2003	Holland	1997	85	There is no difference but with competition
Dijkgraaf and Gradus, 2007	Holland	2005	491	Private Lower than public but deteriorates over time
Ohlsson, 2003	Sweden	1989	115	Public Lower than private
Bel and Costas, 2006	Spain	2000	186	There is no difference but with a specific form of organization

Source: Edited by the Author from Bel and Warner (2008)

These results show that there are other factors that can influence the costs which include market competition (Szymanski and Wilkins, 1993); the form of organization (Callan and Thomas, 2001) and or time effect (Dijkgraaf and Gradus, 2007).

Few empirical and statistical econometric studies have been done on cost efficiency in services provided by private operators in DCs. Table 2 summarizes few examples of cost efficiency and service quality in some DCs.

Table 2. Cost efficiency for waste collection and quality of service in Developing countries

<i>Reference</i>	<i>Case study</i>	<i>Year</i>	<i>Number of cities</i>	<i>Cost recovery</i>	<i>the quality of service</i>
Bartone, 1991	Latin America	1990	5	Private < Public	Equal or better
Post et al., 2003	India, Ghana	2003	2	Private > Public	Improved
Massoud et al., 2003	Lebanon	2003	1	Private > Public	improved
Lohri, 2014	Ethiopia	2014	1	No recovery	improved
Karanja, 2002	Kenya	2002	1	Partial recovery	Improved, low coverage
Obiri-Opareh, 2002	Ghana	2002	1	Partial recovery	Improved
Awortwi, 2003	Ghana	2003	3	Partial recovery	improved
Kassim, 2006	Tanzania	2005	1	No recovery	Improved

Source: Edited by the Author from [Oduro-Kwarteng, 2011](#)

2.4. Common privatization forms in solid waste management in developing countries

There are different forms of privatization which concession, contracting and open competition are the most commonly applied in solid waste management in DCs based on whether the service is managed by the public or private sector or by the community, and/or on the fact that the assets are owned by private or public sector (Cointreau-Levine, 1994; World Bank, 1994). These four forms are discussed below.

2.4.1. Contracting

A short-term contract is awarded to the private operator for the provision of solid waste collection service or any other public service such as street sweeping, recyclables collection, operations of transfer stations, operations of landfills (dumpsites) or fleet management. The contract is awarded to the private operator through a competitive tendering process. The government is responsible for payment of service delivered as for is specified in a contract. The ownership of infrastructures and equipment remains with the government. There are no real financial risks for the contractor. Quality control should be regulated where the service standards can be used as an option.

2.4.2. Concession

The government awards a concession to the private operator which allows the later to build a facility that uses the state-owned resource (solid waste). With concession, the private firm is allowed to use waste for other purposes such as recycling activities; resource recovery from waste; or waste transfer or disposal. Concessions are granted for a longer term. In principle, the facility goes back to the government after the concession period but also, the ownership and operations of the facility may remain in the responsibility of the private operator. The concessionary has to take care of the facility in place during concession period both for rehabilitation and asset renewal. The responsibility of the private operator and their financial commitment are very high. There is also risk that the facility may be neglected by the end of concession. This type of privatization can be applied to the management of the disposal facilities.

2.4.3. Franchise

The public sector awards a short-term zonal monopoly to a private operator to deliver a public service where qualifications of the service provider are based on competitive process. The private operator submits a performance bond to the public sector and a paid license fee is utilized to cover the public sector's monitoring costs. This form of the privatization is now being promoted in most African countries associated with concession. For the City of Kigali, solid waste collection service is fully privatized where a Franchise or zonal monopoly (sector) is awarded to a private firm. The private firm costs are covered directly through user charges paid by service beneficiaries. The government control tariffs by developing adequate competition and controlling price agreements or regulating prices by setting unit prices.

2.4.4. Open competition

The public sector allows free competition of qualified private operator for collection, recycling and or disposal of waste. Independently, households and other establishments make an arrangement with private firms for collection of refuse and/or recycling. There is no zonal monopoly awarded to a private firm and different firms can compete in the same zone. The private firm to compete should own the license from the public sector. Then the role of the government is to provide a license to private operators and monitor their activities. Service costs are directly recovered using user charges paid by consumers. This form is applied in the City of Kigali for all commercial activities and establishment that are able to undergo a tendering process such as hotels, complex malls, schools, and diplomatic agencies such as embassies.

2.5. Types of private sector representations in solid waste collection services in developing countries

This section discusses the two main types of private sector representations (local contractors and community) in solid waste collection service found in many developing countries.

2.5.1 Local contractors (private companies)

[Furedy \(1989\)](#) defined the local contractors as any private sector representation model categorized as being the formal sector with regards to the public administrative procedures or private sector corporations and specific to a registered business. It is also characterized by an organized labor force which is ruled by national labor law, with access to investment capital and improved and modern technologies. The service contracted out should base on the written agreement, between the local contractor and public sector, which defines the tasks and responsibilities of both parties.

In principal, a local contractor is attracted by the gaps in service provision which they turn into business opportunity of providing the service and income generation from payments of the service ([Kassim, 2006](#)). It is expected that local contractors are highly qualified to efficiently perform a given task as they are profit- and customer-oriented provided the competitive bidding, existence of private enterprises with adequate physical and organizational capacity and effective regulatory framework are granted ([Pfammatter and Schertenleib, 1996](#)). This is discussed in detail in the following section about determinants of sustainability of solid waste management.

This form of representation is the most common in the City of Kigali where private operators are registered as a business with Rwanda Development Board (RDB). Though they are recognized as a business, they have to be awarded a license by RURA allowing them to provide the service of solid waste collection based on the bureaucratic procedures defined in the solid waste collection Guideline No.001/EWASTAN/SW/RURA/2014. Finally, the local contractor should sign a franchise contract with the administrative representative of the sector which is the minimum zonal monopoly.

2.5.2 The community

This category of private sector representation is composed of the organization growing from the community due to the shortcomings in service provision and deprivation to access to the service. These representation forms include Community-Based organizations (CBOs) and NGOs.

- *Non-Government Organizations (NGOs)*

For many developing countries, NGOs are involved in solid waste management by playing an intermediary role between citizens (users) and municipalities. But this representation is quite absent in Rwanda in solid waste management services. Different motives explain the involvement of NGOs in solid waste management which includes, but not limited, the beneficiaries awareness intensification, community mobilisation on various issues (waste source separation, recycling, reuse, why to pay user charges), to facilitate various researchers, to disseminate new information, to provide financial and technical know-how in solid waste collection and to strengthen the capacities of CBOs involved in solid waste management activities (Pfammatter and Schertenleib, 1996)

- *Community-Based Organizations (CBOs)*

CBOs take origin in the community as an affordable solution to service delivery gaps. The primary motivation of CBOs is not to make a profitable business but to solve social problem including inadequate access to solid waste collection services, especially for urban poor communities. In developing countries, many CBOs have also been initiated as a way to support marginalized people such as widows, street children, people who left the prostitution profession and people living with HIV/AIDS (Kassim, 2006) and Rwanda is no exception where these groups are legalised as cooperatives through Rwanda Cooperative Association (RCA). On one hand, it is believed that CBOs, cooperatives and other forms of community representations in solid waste collection, have brought many advantages in solid waste management. This includes social benefit such as reintegration and promotion of disadvantaged groups by providing non-farming jobs. Moreover, Haan et al. (1998) also discussed their importance on financial sustainability and service quality improvement by arguing that their “*social pressure encourages prompt payment and good practices in service*”. As far as they originate from the community, CBOs are closer to the population which may result in a high rate of payment recovery. There is also a high chance that the needs of the citizens will be met including service coverage and affordable service with their involvement.

On the other hand, many CBOs lack the financial, managerial and technical capacities which make them dependent on other private operators for waste transportation and disposal. This may result in expensive service – while it is their hint point to compete with small and medium size private firms and into low-quality service.

2.6. Sustainability features for solid waste collection services

2.6.1 Definition of sustainability

Sustainability has various meaning and application in environmental and development studies and business according to the matter to sustain – system, project, process, program, system, resources, etc. (Oduro-Kwarteng, 2011). For the development studies, it is defined as the capacity of a project or activity to deliver continuously its intended benefits for a specifically defined period of time (James, 1996 and Duncan, 2003). This definition was adopted for this research considering solid waste collection service as one of the activities or stages (sorting, storage, collection, and transportation, treatment, recycle and disposal) of solid waste management.

2.6.2 Sustainability elements for solid waste collection service

The sustainability of solid waste collection service is achieved when it delivers an appropriate and equitable service with regards to quality of service and affordability over a long period of time without having a negative effect on the environment. [Van de Klundert and Anchutz \(2001\)](#) argue that sustainable solid waste management requires a system that, considering the local context, responds to environmental, financial and social elements and sustain itself over a long time without facing a shortage in resources needed.

- *Environmental sustainability*

Environmental sustainability implies that solid waste collection and disposal should be transformed into a closed-cycle to minimize its burden on the environment and resources. This is possible through the implementation and enforcement of waste separation at the source to increase the recycling rate which reduces waste ending into dump sites.

Referring to the mapping of the waste flow ([Kurdve et al., 2015](#)), problems have been evidenced in all stages of waste management (sorting, collection and transportation, recycling and reuse, treatment and disposal) in DCs. Last decades presumed that low-income countries service coverage are only 10%-40%, and middle and well-organized country, from 50% to 80% ([Cointreau-Levine, 2000](#)). But [Wilson et al. \(2013\)](#) presume that many countries have recorded improvement where low-income countries record the service coverage ranging from 40-60% and middle-income, from 99-100% in 2012. Though there is an improvement, this shows that there is still a huge amount of waste that remains uncollected serving as a vector for different diseases. In most cases, they also contribute to amplification of flood damage by blocking waterways during heavy rain seasons ([Majani, 2000](#)). During collection and transportation, many private operators use open and old pickups or trucks which contribute to street littering, air pollution and other health related hazards alongside the collection route.

Various studies evidenced some improvement in many DCs, in regards with environmental cleanliness and waste related burden-free due to service coverage increase. These Kenya ([Karanja, 2003](#)), Tanzania ([Kassim, 2006](#)), Ghana ([Obirih-Opareh, 2002](#)) and ([Awortwi, 2003](#)) and India ([Post et al., 2003](#)). Yet few has been done on improving disposal practices where solid waste is accumulated on free open spaces and for many countries on the top of mountains or hills and Rwanda is no exception. For many countries, waste is left to those open spaces, buried or burnt ([Cointreau-Levine, 2000](#)). All these practices contribute to air pollution and pollution of water resources (ground and surface water) through leachate or surface run-off, especially during rain periods.

As far as environmental sustainability is concerned, the sustainability indicators are context-based which requires thorough waste mapping to come up with realistic and measurable indicators. Based on the context of the City of Kigali, this study has proposed four indicators that were used to assess the result of privatization of solid waste collection service on environmental sustainability perspective. These include (1) 100% waste collection, (2) citizen's willingness to sort waste at source, recycle and reuse waste, (3) amount of waste ending into dumpsites, and (4) amount of recycled waste or number of recycling initiatives based on the measurability of the indicators and solid waste management context.

- *Financial sustainability*

Among the reasons for privatization of solid waste collection, relieving the public sector from the financial burden is crucial. It is then expected that financial sustainability is achieved if cost recovery is sustained through user charges without relying on subsidies from the government and other sources of income ([Oduro-Kwarteng, 2011](#)). [Cointreau-Levine \(1994\)](#) argues that: "*there is a simplistic argument that public goods should be paid for by public funds and delivered by public agencies while private goods should be paid for by private individuals and delivered by the private sector.*" For many DCs, this principle has

ruled for many years in solid waste collection service where it had been provided free of charge by the public sector.

Cointreau-Levine (1994) also argues that the issues of involvement of private sector in the solid waste collection should not be confused with a recovery of costs. On one hand, the author argues that there are some activities or stages of solid waste management that are totally public based on the fact that they directly benefit at large public than any specific individual. These activities include street, public parks and lands cleansing and disposal of waste. These activities should remain in the responsibility of the governments. On the other hand, solid waste from households and private establishments can be considered as a private good as the generation and management are under the control of the individuals. From this perspective, solid waste collection, which in most cases is done at door-to-door, involves household-to-household-based collection costs. Even for those using communal collection centers or containers, contribute to the total cost for collection by increasing the volume to be collected and then a number of trips per collection vehicles. This explains why citizens should pay for waste collection service as a private good.

Different waste management charges have been adopted as cost recovery mechanisms. The main goal of these charges is not only to reduce environmental hazards related to waste management but also to financially sustain waste services. These waste management charges include flat rate and quantity-based charge (QBC) (Welivita, I., et al., 2015). With the flat rate method, a fixed waste management cost or part of it is charged with an establishment or individuals. The payment of the charge may be done directly or added to other bills of utility such as water or electricity or to the property right. All these payment vehicles shape the outcome of the methods but the surcharge vehicle has proven to be effective. QBC is also defined as “unit price”, “Pay-As-You-Throw” (PAYT) or “variable rate charge”. Charges are fixed based on the quantity of collected waste and collection frequency (Diaz et al., 1996). The dimension of the amount of waste collected can be weight or volume (using bags, cans, bins or tag/sticker) and also influenced by the frequency of collection which may affect the amount to be collected per unit of time (week or month) as for defined by the regulations of a particular area (Welivita, I., et al., 2015).

While different DCs have deliberately chosen a “no subsidies” option and encourage user charges as financing mechanisms for solid waste collection, there is an increasing laid-back attitude of the people in paying the service and Kigali is no exception. This leads to growing illegal dumping for non-paying and then paralyzing the cost recovery and increasing unfold transaction costs or unintended subsidies, from the public sector (Oduro-Kwarteng et al., 2006). It is then the responsibility of both the governments and the service providers to sensitize the population about why they have to pay the service and to enforce the payments based on the agreements between users and service providers (Cointreau-Levine, 1994).

Moreover, GIZ (2015) argues that the use of user charges only to cover the full cost incurred during service provision, for many DCs, may result in a user charge which is not affordable for a considerable number of the population, especially for the urban poor community. It is then important to consider the whole range of economic instruments which include property taxes, user charges, disposal fees and product taxes. It is also advised to consider the economic incentives aiming to improve solid waste management such as subsidies, feed-in tariffs from energy and exemption of taxes for service providers on solid waste management technologies (imported trucks, recycling machines, bags or bins) and on other waste collection related activities. This can reduce the operations costs which is translated into low user charges or service affordability for citizens and urban poor communities in general.

- *Social sustainability*

Though the ability of the population to pay the service varies, the social sustainability is achieved when all segments of the community have access to the service without considering their income. This is

possible if the government establishes a financial mechanism that enables self-financing to cover service cost– such as cross-subsidy for urban poor communities, at the same time comprehending all strata of the society.

2.6.3 Determinants of sustainability for solid waste collection services

Many developing countries are facing rapid urbanization and challenges of dysfunctional solid waste management facilities and services. [Zurbrügg \(2012\)](#) argues that it is imperative to local governments and policy-makers of cities, to develop economically sustainable and socially acceptable solutions at the same time meeting environmental goals. For many years, the selection of waste management systems has been dominated by technology-oriented perspective neglecting other aspects which have resulted in the failure of many systems. To ensure the sustainability of any waste management system, [Van de Klundert and Anschütz \(2001\)](#) recommend the consideration of all stages of a waste management system including waste collection and transportation; all involved stakeholders including private sector, households and public sector; and all scopes that play as enabling environment including service regulatory framework. This study focused only on the following four determinants of the sustainability which are (1) Private sector capacity (2) Involvement of households, (3) Service provision regulation and physical and general characteristics of operational zones.

- *Private sector capacity*

The involvement of private sector in urban solid waste collection aims to ameliorate the efficiency of the service provision and to benefit from private investment. Different studies have identified key individual factors explaining the performance of private sector with regard to solid waste management sustainability ([Cointreau-Levine and Coad, 2000](#); [Donahue, 1989](#); [Bartone, 1991](#)) among which the (1) company size and (2) operations management capability are of great importance.

- Company size (scale of operation)*

There are few pieces of evidence about the linear positive relation between company size and its performance ([Oduro-Kwarteng, 2011](#)). The mixed results of an empirical test of the relationship between company size and performance have been evidenced by [Nachum \(1999\)](#). Other researchers such as [Boyne \(2003\)](#) argue that there is no linear relationship between company size and performance because a small organization may perform well than medium or big ones or vice versa. Though the results on the relationship between organization size and its efficiency seem to be mixed, [Stevens \(1978\)](#) has evidenced that improved technology, sufficient number and bigger trucks with regards to the number of customers has contributed to the efficiency of private firms in large cities by using smaller groups. From this statement, it is clear that the performance and efficiency are influenced, in one way or another, by the number of trucks and the number of required staff which both are determined by the characteristics of users to service. For this study, the influence of the number of vehicles and employees has been studied by computing the estimated vehicle and supervisor efficiencies and their impact on service quality.

- Skills and Operations management capability*

[Grant \(1991\)](#) defined the organizational capability of a firm as the ability to repeatedly implement a productive activity which is related to the capacity of that firm to create values that contribute to the transformation of inputs into outputs. It is also argued by [Lusthaus et al. \(2002\)](#) that the internal capacity – in terms of human resources and physical capacity – shapes the performance of the organization. However, the simplistic theorisation in public services tends to put a linear relationship between the resources and better results, but the resources must be managed effectively to maximize the potential benefit. Public choice theorists presume that the maximization of budget results into allocative efficiency (meeting the demand) but not into productive efficiency ([Oduro-Kwarteng, 2011](#)). In this perspective,

the service quality may be expected to deteriorate while resources (budget) are increasing. In contrast, for private operators, the increase in resources associated with wise management of operations, has a high probability to result in performance improvement as they are driven by the maximization of profit. [Boyne \(2003\)](#) also confirmed the positive relationship between resources and improvement of service for the private operators.

The performance of firms is influenced by managerial capabilities which are also influenced by the qualifications of employees. The provision of service is a task that changes with time as it is shaped by various factors including users (customers), regulatory agencies and internal players (employees). This means that it requires innovation, iterative learning, and creativity. It is very crucial to firms to make a managerial effort and to build their capabilities to cope with changes. The management literature suggests various measures to select good managers including, but not limited, years of experience and the qualification level ([Nachum, 1999](#)). Moreover, [Hansen and Wernerfelt \(1989\)](#) and [Boyne \(2003\)](#) evidenced the relationship between companies' performance and operational and strategic processes management. Among the management variables, the above authors mentioned strategic variables (leadership styles and management of human resources) and operational variables (planning capacity, operations supervision capacity, and improvement of operations, service design, and management of maintenance). During this study regarding capabilities, operational variables have been studied.

- *Involvement of households*

Theory of community development suggests an early involvement of all concerned actors which leads to an optimal solution. As discussed above, the privatization of solid waste collection service involves three main actors which are the community (households), private operators (service providers) and the public sector (enabling environment). The relationship between all actors ranges from formal to informal, but the sustainable partnership is the one striving for the benefit of all the above actors ([Karanja, 2005](#)).

With the privatization of solid waste collection service, there is a direct and important relationship between private firms and households. Households play an important role in the delivery of the service in the interest of both public sector and service providers. For service providers, they can contribute to their efficiency by paying the service and/or putting waste outside their premises on the day of collection. On the other hand, households help the public sector to get the feedback on the service providers performance and hence, playing the role of on-site monitoring. It is then important for both private and public sector to adopt the customer-oriented approach to ensure service efficiency, effectiveness and equitability as proposed by [Cullivan et al. \(1998\)](#). The community involvement requires to private and/or public sector to provide the framework that facilitates the information sharing, serving as complaints channel, a discussion platform for some common issues, and resolution of differences of opinions. The involvement of households influences their willingness to participate and increase the probability of success of the process or service. Therefore, households' involvement helps the community to exteriorise their opinions, perceptions, service appreciation and their needs or expectations ([Oduro-Kwarteng, 2011](#)). High level of trust, associated with the considerable level of participation, can easily lead to a consensus regarding crucial and divergent opinions and needs of beneficiaries. This helps the service providers to make convenient decisions regarding implementation, operations management and service delivery in general.

- *Service provision regulation*

The involvement of private firms in solid waste collection service requires clear and efficient regulation specific to the sector. Regulation is defined in different ways. [Van Dijk \(2006\)](#) defined the regulation as a "sustained and focused control, exercised by a public agency over activities of a private sector which are valued by a community". It is also defined by [Chang \(1997\)](#) as an activity of the government has

undertaken with the intention to directly affect the private operators' behavior in order to bring them into the line that responds to the public interest.

The reason behind the regulation for many governments is then to remedy market malfunctions such as monopoly powers, externalities and lack of information or asymmetries in information sharing. Generally, with a monopoly approach, customers (citizens) do not have the power to choose the service provider (Oduro-Kwarteng, 2011). The market may then be asymmetrically controlled by the seller (service provider) which may result in the higher prices for buyers (customers). On the other hand, you cannot exclude the customers who don't pay the service (free riders) which affects the capacity of service providers in recovering costs (Cointreau-Levine, 1994). Public services are then regulated in two ways: (1) market conduct regulation and (2) market regulation (Ballance and Taylor, 2005).

Market conduct regulation

The regulation of the market conduct is done by an independent regulator and normally applied to control monopoly powers. This regulation method shapes the behavior of private operators (market suppliers) in patterns like pricing, service quality, and information access (Ballance and Taylor, 2005). The monopoly regulation is firmly limited to service that cannot be split into its constituent businesses i.e. services that do not respond to the exclusivity rule based on the set market conditions. For the regulation of monopoly, the government creates the competition conditions using service contracts, concessions, leases, and organizations compete not for serving some individuals in the market but for the right to serve the whole market (Oduro-Kwarteng, 2011). The role of the government is then to regulate monopolies by developing and enforcing incentives and sanctions framework. The most important element of regulation of market conduct is to regulate the prices. Two main types of regulations have been used internationally which are "price cap regulation" and "rate of return regulation". With the price cap regulation, the prices are controlled using the cost of an efficient organization in the service sector as a reference. For the rate of return regulation, the price is allowed to increase up to a maximum profit margin on the investment which is determined before (Ballance and Taylor, 2005).

Four reasons for price cap regulation have been given by (Ballance and Taylor, 2005). Firstly, the price cap regulation can induce productive efficiency by pushing the suppliers to reduce the operational costs during the price cap period. For the future review of price, this efficiency can be translated into lower prices in benefit of consumers. Secondly, price cap regulation has been alleged to provide negligible incentives for overinvestment and efficiencies. Third, price cap regulation is appreciated for providing large freedom to a regulated organization over the structure of the charges. Finally, the implementation of cap price regulation was considered to be modest than rate-of-return regulation. Practically, this has been found to be more complex than it was envisaged because all assumptions are based on underlying costs of efficient operation instead of considering the entire costs generated by operations over time.

Market regulation

The market regulation or either defined as regulation of the structure of the industry pursues the promotion of competition using contracts and legal restrictions as tools of regulation. It regulates the entry into the market but also the shape of players in the market. This form of regulation is preferable than regulation of market conduct for services that can be unbundled as it is expected to be cheaper due to its less demanding implementation with regards to information requirements. However, in practice, both regulation forms are combined.

- *Physical and general characteristics of the operational zone*

Various researchers (Watson, 2014; Brenner et al., 2012; Neil Brenner and Christian Schmidt, 2014) have evidenced the divergent definitions for "urban areas" which can have an impact on governments'

priorities in allocating resources and development activities and Rwanda is no exception. From the above authors, the urban definition is context-dependent where it depends on the country-even different in the same country-, the function of the one who defines it, the purpose of the definition (infrastructure development, historical analysis, health studies, environmental planning, etc.), and the power relations where urban definition is linked to institutions or political priorities.

For Rwanda, the definition of urban is not coherent in Rwanda's legislation framework. Various definitions of the urban area are used, that are often not compatible with each other. For this, the National Use Master Plan suggests three approaches to defining the urban area. The urban area should be defined in terms of the built-up area, the functional area and should comprise all areas for which public services and facilities are provided. This Master Plan defines the urban area as *"...a built-up agglomeration with an area of more than 20 Km² and a population of more than 10,000 permanent residents, which results in a population density higher than 500p/km²"* (MINIFRA, Strategic Plan 2012).

From the above definition matters, it is clear that before the development of the cities' Master Plans, the urban areas were not a result of planning activities, but a result of a random population distribution and settlement based on the existing economic and development activities and Kigali is no exception. Various researchers (Watson, 2014; Satterthwaite, 2014; and Brenner et al., 2012) have concentrated more effort to explore the effect of weak planning and the adoption of northern planning concepts on southern cities and related consequences including the urban poor exclusion or deprivation on public services such as water supply and sanitation services. For Watson (2014), the planning effort made by many developing countries is creating new socio-economic and governance problems which include the exclusion of urban poor communities living in slums and in "so-called informal settlements". This is the case for Rwanda where the country records tremendous infrastructural development in all cities and particularly the City of Kigali, but the poor families are left to inaccessible areas having little access to improved roads. This may affect the provision of public services such as public transport and waste collection services in those areas. This is also the case for many developing country cities where they are recognised by their dominant informality, diversity in urbanization levels, high demographic internal inflows, inequalities in opportunities in terms of infrastructures and public services, and severe disparities in income between the rich and urban poor creating socio-cultural tendencies such as free riding, and low willingness to pay the public services including solid waste collection services and indiscriminate waste disposal (Oldfield and Parnell, 2013).

Like for other developing countries, all sectors in Kigali are recording a progressive urbanization process from areas with peri-urban characteristics, i.e. mixture of agricultural and other economic activities such as small businesses. For this, many sectors are generally characterized by populations living an everyday lifestyle; the co-existence of formal and informal actors such as waste pickers and dealers; and large Socio-economic differences. It is then important to understand the above divergent characteristics of operational zones and how they are influencing the performance of solid waste service providers and the level of households' participation. It is also important to the policy- and decision-makers to consider these factors for the optimization of private sector involvement in the solid waste collection by developing adequate settings such as contracts' conditions, regulations allowing various options for collection practices and user charges.

CHAPTER 3

Research Methodology

This research aims to explore the mechanisms of solid waste collection service in the City of Kigali after privatization and propose ways to improvement based on the research findings. To achieve this objective, this study examined how and why solid waste collection service has shifted from public sector to private sector, the impact of privatization; and explored the crucial factors explaining variations in service provision for six different sectors while implementing the same guideline. This chapter is organized in four main sections. Firstly, it presents the Research Conceptual Framework. Secondary, it presents Research strategies and Operationalization of indicators. Thirdly, it provides the description of the study area, entity of analysis, and sampling procedures. Finally, it presents procedures for data collection and analysis and related challenges.

3.1. Research conceptual Framework

To explore the outcome of privatization of solid waste collection and to explain variations in the outcome for different operational zones (sectors) in Kigali, a framework combining the elements of sustainability for solid waste management and the determinants of the sustainability is used. For the determinants of sustainability, the framework considers the four concepts discussed in the previous section: the capacity (physical and human) of service providers, the involvement of households, physical and general characteristics of the operational zone (sector) and service provision regulation by the public sector. For the elements of sustainability, the framework considers three concepts: Environmental sustainability, financial sustainability, and social sustainability referring to [Van de Klundert and Anschütz \(2001\)](#) framework. Figure 2 summarizes key indicators for each concept which are operationalized in the following section.

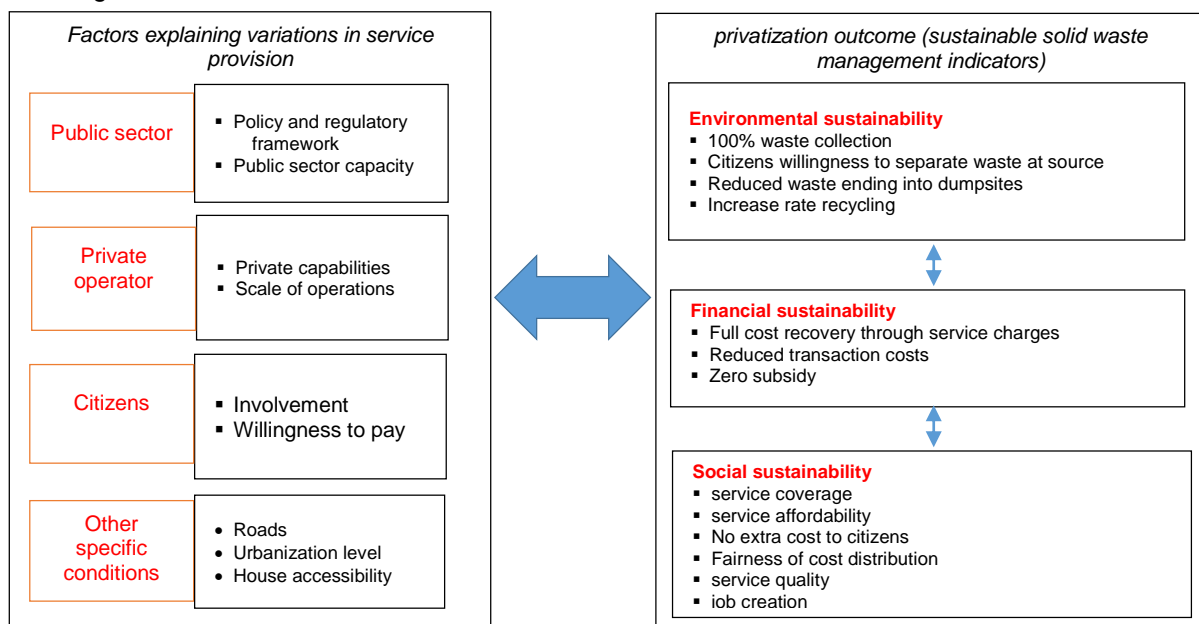


Figure 2. Research Conceptual Framework

Source: developed by the Author based on the literature review (2015)

Both human and physical capacities are internal factors that influence the performance of the service providers and hence, leading to outcome variations for different sectors. The indicators for company capacity seeks to explore the company's organizational capabilities to optimize existing resources such

as vehicle utilization (vehicle efficiency) and labor utilization (supervisor efficiency). Both the company's supervisory capacity and physical capacity are explored during this study by determining supervisor and vehicle efficiencies, respectively. [Bartone et al. \(1991\)](#) proposed a way to measure the labor and vehicle output for residential waste collection. The labor efficiency is measured by recording the number of serviced households per company's worker. The vehicle efficiency is measured by recording the number of serviced household per vehicle per unit of time (day, month, or year) for a specific operational zone. The same method was used for this study where the labor (supervisor) and vehicle efficiencies were analyzed and compared to different companies.

The external factors include regulatory mechanisms such as contractual frameworks, user charges setting and licensing processes and conditions that influence the performance of service providers such as general characteristics and level of urbanization of the operational zone, by drawing the market working framework. The service regulation indicators help to explore the types and conditions of contracts and licenses and contractual relationship and how they influence the service providers' performance for different sectors. Likewise, the indicators for households' involvement are explored to assess the level of involvement of households and willingness to pay and their influence on the performance of the private sector and cost recovery.

As discussed above, the sustainability of solid waste collection service is achieved when it delivers an appropriate and equitable service with regard to quality of service and affordability over a long period of time without having a negative effect on the environment and the system should consider the local context as argued by [Van de Klundert and Anchutz \(2001\)](#). The indicators for environmental sustainability seek to assess the environmental hazards related to solid waste collection service provisions such as the collection coverage and level of waste separation at source and recycling rate which all determine the amount of waste ending into dump site and related environmental degradation hazards. The indicators of financial sustainability seek to explore the financial viability (full cost recovery) of service providers using user charges and other sources of income that contribute to the survival of collection service for households. The indicators of social sustainability seek to inquire the quality of the current service and social equity in regards to the service quality and affordability, especially for the urban poor community.

The measurement of service quality coins with several challenges because the customers' benchmarking for a good service is based on divergent expectations and perceptions. In most cases they are satisfied when the quality of the service provided exceeds their expectations even though it does not respond to the service standards enclosed in the contract. [Folz and Lyons \(1986\)](#) argue that the service quality standards reflect the extent to which the pre-set standards are achieved, the extent to which customers may rely on the service, appropriateness of the service and blameless aesthetics. To deal with the consequential difference from various expectations of customers, the terms and conditions stated in the contract, signed between the private companies and sector administration, especially collection frequency and schedules, have been used as a baseline to assess the achievement of private sector involvement in terms of service quality standards.

3.2. Research strategy and indicators operationalization

This section presents the strategies and evaluated indicators to explore the mechanisms of solid waste collection in Kigali after privatization. the section is divided into three subsections. Sub-Section 1 presents the strategy used to evaluate the reasons and process of privatization. sub-Section 2 presents the strategies and operationalization of indicators to evaluate the impact of privatization. Sub-Section 3 presents the strategies used to explore factors shaping the outcome.

3.2.1. Strategy to explore the evolving involvement of private sector in solid waste collection service in Kigali and reasons

The use of secondary data from previous studies and interviews to RURA and CoK agents in charge of the solid waste collection service have been used to assess how private sector has been involved in solid waste collection service and the reasons behind the privatization. The semi-structured questionnaires guided the interviews which have been developed based on various theoretical reasons of privatization which have been presumed by various researchers. These include [Oteng-Ababio \(2009\)](#) who argues that the involvement of private sector firms in waste collection services aims to make authorities free from day-to-day management of solid waste collection services, to increase coverage of service – especially to the urban poor communities –, to reduce the cost involved in service provision, and/or to gain free or cheap knowledge, technology and experience from private sector

3.2.2. Strategy to examine the impact of privatization of solid waste collection in Kigali

This research collected data from private companies, population and interviews with sector executive secretaries and district officers in charge of solid waste management to assess the impact on environmental, social and financial aspects. Table 3 summarizes indicators that have been measured and how.

Table 3. Operationalization of variables

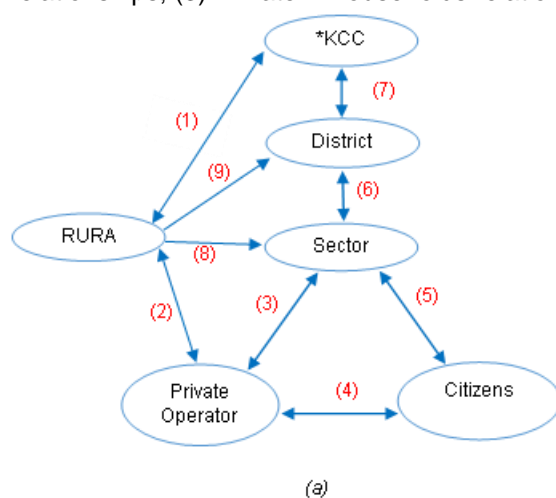
Variables	Indicator	Measurement of indicators
<i>Environmental sustainability</i>	Sanitary conditions and waste overflows	Perception of households of environmental cleanliness, cleanliness of operational zone during and after service provision
	Zero waste uncollected	Waste collection rate (%)
	Citizens willingness to sort waste at source, recycle and reuse waste	% of households willing to sort, recycle and reuse waste at source compared to households composing the operational zone (sector)
	Amount of waste ending into dumpsites	Ratio of waste disposed of with regards to the waste collected (%)
	Increased recycled waste	Ration of recycled compared to collected waste
<i>Financial sustainability</i>	Full cost recovery using user charges	cost recovery level (%) using user charges for private companies
	Reduction of transaction costs (on the side of public sector)	Tendering costs, monitoring and enforcement costs (transport and communication costs)
	Zero subsidies based on the choice of the public sector	unfold subsidy for indiscriminately disposed of waste in public places
<i>Social sustainability</i>	Fairness of cost distribution considering income levels	Perception of citizens of cross-subsidy for urban poor communities
	Extra costs to citizens	Example: manpower paid to put waste on the site of collection on the day of collection
	Service affordability	Citizens' perception of current user charges
	Service coverage	The ratio (%) of households having contract with the company compared to total number of households composing the sector
	Service quality	<ul style="list-style-type: none"> ▪ Reliability of service (regularity in waste collection on specified day, frequency of service per specific unit of time) ▪ Customer satisfaction (type of service, behavior of private workers) ▪ Responsiveness to households' complaints related to service delivery

Source: Modified by the Author (2015) from [Oduro-Kwarteng \(2011\)](#)

3.2.3. Strategy to analyze the factors influencing the outcome of privatization of solid waste collection service in Kigali

- *Regulatory framework and important relationships among key actors*

As discussed above, the regulation of the industry and regulation of the market conduct are combined in practice which is the case for Kigali. The regulation of the market conduct is applied to the City of Kigali where RURA plays the role of independent regulator. This aims to shape the behavior of service providers regarding the service quality, prices, and information access. The regulation of the industry has been used to shape the structure of solid waste collection market. Figure 3 describes in which ways main actors (public sector, the private sector, and citizens), are involved in solid waste collection in Kigali after privatization and crucial relationships between them. These relationships can be grouped into four main types: (1) Intergovernmental relationships between public sector agencies; (2) Public-Private relationships; (3) Private – Households relationships; and (4) Public-Households relationships between sector and households.



Intergovernmental relationships

Figure 3 shows that the solid waste collection service provision involves the City of Kigali (CoK), its constituent districts and sectors and RURA (Rwanda Utility Regulatory Authority) as public stakeholders. Though generally, the solid waste management is the responsibility of CoK, RURA has been mandated by the Government of Rwanda to independently regulate certain public utilities including sanitation services where solid waste collection service falls. RURA owns this mandate through the Law n° 39/2001 of 13 September 2001, reviewed and substituted by the Law N° 09/2013 of 01/03/2013.

Figure 3. Framework to analyze regulation and key actors in solid waste collection for Kigali
Source: Developed by the Author (2015) from the RURA Guideline No 001/EWASTAN/SW/RURA/2014

The main focus of RURA is to balance the profit of service providers with the satisfaction of customers. The CoK is more concerned with the public and environmental health aspects related to collection service provision to ensure “public interest” considering collection service as a “merit good” to all city dwellers. Both RURA and CoK collaborate as shown on Figure 3, relation (1), to shape the environment of private sector involvement even though their targets may sometimes conflict.

The sectors represent the public sector during the implementation of the privatization and they must report to the KCC every month following the administrative structure for Kigali, i.e. to districts and the latter report to the KCC as shown on Figure 3, relations (6) and (7). It is also supposed that the KCC organizes various mechanisms with districts and sectors to evaluate the progress and various outcomes informed with delivered reports. The regulatory framework also supposes that RURA organizes the tours to evaluate the service quality and factors that influence the performance of private companies through sectors and districts as shown on Figure 3, relations (8) and (9).

Public-Private relationships

Figure 3 shows two possible relations between the private operators and public sector agents, namely RURA and sectors. It is compulsory that any private operator must own the license from RURA to have the right to market competition as shown on Figure 3, relation (2). The enforcement of licensing process is the responsibility of sectors as shown on Figure 3, relation (8). The operationalization of this

enforcement is made through the tendering conditions where the license is among mandatory documents that are requested by sectors during market competition as shown on Figure 3, relation (3). RURA provides three categories of licenses as defined in the Solid waste collection and transportation guideline No 001/EWASTAN/SW/RURA/2014 (*to be translated into English*). This study targets the private operators belonging in the category (1) which defines the requirements for the private sector that provide the service in sectors composing the CoK. Appendix A summarizes the list of companies of this category having the valid license during the research period.

Private – Households relationship

The relationship between the Private firm and citizens is shaped by the Sector which defines the market framework through a Franchise Contract. The Private operator should sign another contract with each household. The private firm is expected to provide the service which the quality is defined by the Sector at the same time responding to the need of each customer (household) with whom they sign a contract as shown on Figure 3, relation (4). The company should also provide the information channel to facilitate the households in providing their dissatisfaction on service quality.

Sector – households relationship (5)

On one hand, though the public sector, represented by the sector administration, represents the interest of the citizens, it is necessary that the households are informed about the new service provider and defined service framework. On the other hand, the service framework should avail the room or channel for the complaints of the households about disservices or non-compliance of the service provider. For this, sectors should install channels to facilitate households to address their complaints.

- *Operationalization of variables*

As discussed in the previous section, there is an assumption that the performance of service providers and the outcome of their involvement in the solid waste collection are influenced by internal and external factors. Internal factors include the planning and management capabilities and scale of operation of companies, which both are interdependent. The external factors include the above described regulatory framework, the involvement of households and the specific physical and socio-economic characteristics of the operational zone (sectors) such as roads, disparities in income levels, household's accessibility, etc. Table 4 summarizes the variables that have been assessed to explore various relationships among key stakeholders involved in solid waste collection service provision after privatization and indicators for each variable and how they were measured.

Table 4. Operationalization of variables for factors influencing privatization outcome

Actor/Item	Variables	Definition	Measurement of indicators
<i>Private operator</i>	<i>Private firm capabilities</i>	Private firm capability can be defined as what a firm needs to be able to do to achieve its objectives	<ul style="list-style-type: none"> Operations planning and scheduling (vehicle routing, service schedules) Supervision of operations (supervisor efficiency, i.e. the number of households/supervisor) Vehicle maintenance capacity and schedule (maintenance schedule, owned mechanics)
	<i>Scale of operations</i>	This can be defined as the physical capacity of the firm	<ul style="list-style-type: none"> Number of firm owned trucks, their state, vehicle efficiency (number of households/vehicle) Market share (number of households/company)
		Public sector set of mechanisms to access information, to control user charges, ensure	<ul style="list-style-type: none"> Access to information (operations report frequency, monitoring frequency)

<i>Public sector</i>	<i>Regulatory framework</i>	good service quality, clarifies responsibility and roles in partnership	<ul style="list-style-type: none"> ▪ User charges (user charges setting, flexibility in user charges review for private firms, negotiation process between company and households) ▪ Service Quality (adherence to regulations, service standards specified in contract, standard compliance) ▪ Regulatory capacity and autonomy (regulatory framework compliance, sector official availability) ▪ Contractual obligations (adherence to conditions of contract) ▪ Contract mechanism (duration and competition for contract)
<i>Citizens</i>	<i>Participation and attitude</i>	Willingness to pay the service, Perception and attitude, Income level	<ul style="list-style-type: none"> ▪ Ratio of household willing to pay current user charges, willing to pay less or high ▪ Citizens satisfaction on provided service, service reliability
<i>Other conditions</i>	<i>Physical conditions of the operational zone</i>	State of Roads, Households accessibility, impact of scavengers to payment rate, level of urbanization	Observation on roads improvement, the perception of operators on roads, observation, and comments from service providers on households' accessibility, other constraints.

Source: Developed by the Author from the literature review (2015)

3.3. Description of the study area and entity of analysis

This section is divided into three sections. Section 1 presents the description of the study area. section 2 defines the entity of analysis, sample size and sampling procedures and section 3 presents the data collection and analysis procedures and methods.

3.3.1. Description of the study area

The study area is the City of Kigali due to its economic and administrative outstanding. It is a home city for several commercial activities, industries (Rwanda industrial park), private and public universities (University of Rwanda science and technology and education colleges, Universite Libre de Kigali, Univerisity of Kigali, Carnegie Mellon University Rwanda Campus, Kigali Institute of Management, Central Adventist University, etc.) and banks (I&M bank, Bank of Kigali, GTBank, Banque Populaire du Rwanda, KCB Bank, Equity Bank, etc.). Not only it is the capital city of Rwanda, but also, it contributes to the economy of the country where it generates 50% of the total GDP which makes it an economic engine of Rwanda (MINIRENA, 2012). Administratively Kigali is composed of three districts (Kicukiro Nyarugenge and Gasabo and Figure 4 summarizes its administrative and organizational structure.

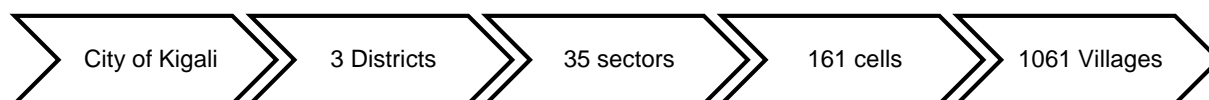


Figure 4. Organizational structure of the City of Kigali

Source: Built by the author from the CoK (2015)

Kigali is the largest city in the country. It has started as a colonial outpost in 1907 and in 2012 it was counting 10% of the total population of Rwanda, i.e. approximately 1 million out of 10 million of inhabitants. The general topography is distinguished for its consistent small convergent hills disconnected with large valleys. The estimated area of Kigali is 730Km² and the estimate population density is 1370 inhabitants/Km². This population density is the highest in East African community country

members where Rwanda falls. Partly, this is due to the inter-cities and inter-countries immigration as now Kigali is said to be among the safe and clean cities through different media such as [HowAfrica \(June 2015\)](#) and [Architectonics and style \(November 2015\)](#). The annual population growth rate is 4.4% which is two times higher than the national growth rate. However, the rapid population growth and the concentration of economic activities in Kigali are contributing to the high demand for public infrastructures and services including water supply, energy and waste management services as the current infrastructures, made in colonial times and the first two republic states, were made to service small population size. The big fraction of the City of Kigali is urban but it is surrounded by a considerable rural fraction (approximately 30%) as shown in Table 5. This peri-urban area makes a home for a big part of an urban poor community growing into informal settlements and lacking adequate infrastructures, especially narrow and non-paved roads which is the obstacle to the provision of public services including solid waste collection service.

Table 5. Population distribution in districts in Kigali

District	Total population per district		Rural fraction per district	
Nyarugenge	235,544	26%	18%	42,398
Kicukiro	246,284	27%	15%	36,943
Gasabo	426,150	47%	45%	191,768
Total	907,978		30%	271,108

Source: Edited from [Kigali SWM Strategic plan \(2012\)](#)

While there is a high demand for public infrastructure and service, the topographic characteristics of Kigali and the progressive urbanization process leading to the distinctive disparities between rich and poor families, the above characteristics of Kigali have a significant role to shape the access of city dwellers to public infrastructures and services, including solid waste collection service. This has also been discussed in chapter 2, in section 2.6.3 discussing the determinants of solid waste management sustainability and possible ways in which they can influence the outcome of waste service provision. Furthermore, this is again discussed later for different sectors in chapter 4 of this study discussing the outcome of private sector involvement in solid waste collection service in Kigali, in section 4.2.2 discussing the mechanisms of solid waste collection service in six sectors where, the first paragraph of the section discusses the general characteristics of each sector.

3.3.2. Entity of analysis, sample size and sampling procedures

This study has selected the sample sectors from the three districts of the City of Kigali (Kicukiro, Gasabo, and Nyarugenge). The selection of sectors has been guided by one main criterion. The study has considered all service providers with a valid license and one sector per each service provider has been selected making sure that all districts are represented as summarized in Table 6. Currently, eleven solid waste collection private companies have valid licenses (Appendix A), from which seven are involved in the municipal solid waste collection in the City of Kigali (Table 6). These 7 companies have been selected but 6 have been accessed for interviews. In total, 6 companies and 6 sectors have been interviewed. For each sector, 40 citizens have been sampled from different administrative cells, one sector staff in charge of solid waste management and the Manager or any authorized representative of the service provider for that sector.

The staff in charge of solid waste management at the CoK and District levels have also been interviewed and the Director of Water and Sanitation in RURA.

Table 6. Sampling of private operators and their operational zones in Kigali

Private operator	Province/District of operations	Total Operational zones serviced	Proposed operational zones for this research
AGRUNI Ltd	Gasabo, Kicukiro, Nyarugenge	Nyarungunga, Kanombe, Rwezamenyo, Kimironko, Nyamirambo, Gatsata, Rusororo, Jali	Rwezamenyo (Nyarugenge)
COPED Ltd	Nyarugenge, Gasabo	Nyarugenge, Kacyiru, Remera	Remera (Gasabo)
Ubumwe Cleaning Services Ltd	Kicukiro	Kicukiro, Gatenga, Niboye, Gikondo	Kicukiro (Kicukiro)
ISUKU KINYINYA	Gasabo	Kinyinya	Kinyinya (Gasabo)
Real Environmental Protectors	Kicukiro	Kagarama	Kagarama (Kicukiro)
BAHEZA General Services	Kicukiro	Kigarama	Kigarama (Kicukiro)

Edited from [RURA \(2015\)](#)

In total the sample size of this study was 256 as summarized in Table 7.

Table 7. Sample size for the research

Number of Private operators	Number of Operational zones	No. of districts	No. of Regulator (RURA)	Sample size				
				Citizens	Private	District	Sector	RURA
6	6	3	1	40*6	1*6	1*3	1*6	1*1
Total sample size				256				

3.3.3. Data collection instruments and analysis

Semi-structured questionnaires and open interviews have been used to collect data for the entire sample size. Due to the limited availability of citizens during day time related to the fact that most of them work from morning to evening, more interviews appointment were scheduled during the night time and 234 out 240 households have been accessed for the interview. Other targeted local authorities and companies have also responded to the interviews, except 2 sectors and one company. The main challenge was the limited availability of sector executive secretaries due to two main reasons: (1) sectors and districts are implementing organs of all ministerial plans and strategies which make them too busy every day. (2) The data collection coincided with the election activities for the referendum and Mayors election. As sectors and local authorities are main organizers and implementers of elections, their availability at this time was limited. For this, two sector executive secretaries (Kinyinya and Kigarama) have not been reached to cross-check the information provided by service providers and households. Furthermore, all companies have not provided detailed financial information. Only the fraction of their costs covered using user charges has been provided in percentage. Three private companies have also refused to allow the field observation and pictures shooting for their personal reasons. The other minor challenge was the changes in fixed appointments but they were rescheduled to other days. In addition to the data collected through interviews, secondary data have been collected from previous studies and other relevant published and non-published reports and the city's solid waste management strategic plan (2012). The latter document played a crucial role as the main official document of the City of Kigali in the solid waste management domain. Furthermore, the researcher made a field observation in three sectors (out of six) and at the dump site taking relevant pictures. The collected data have been qualitatively analyzed based on the indicators discussed in the previous sections. A comparative analysis served to compare the outcome of private involvement in the above six sectors and key factors that are shaping the outcome for the three elements of sustainability (environmental, financial and social aspects) as discussed in detail in the following chapter 4.

CHAPTER 4

Data Analysis and Discussion

This chapter discusses the evolving involvement of private sector and Monopoly privatization of solid waste collection service for the City of Kigali. To achieve this, the chapter explores the reasons and how the private sector has been involved in solid waste collection service and the harmonization of this involvement through full and monopolistic privatization. It also discusses the mechanisms of service provision for each of the six sectors and compares the outcome for the six sectors to find out similarities and differences in terms of environmental, financial and social aspects and the main internal and external factors shaping those outcomes.

4.1. Evolving involvement of Private sector and Monopoly Privatization of solid waste collection services in Kigali

4.1.1. The reasons and evolving private sector involvement in Kigali

Traditionally, districts were responsible for managing the waste generated by their residents. The commonly used waste management model was the use of vehicles provided by the City of Kigali to collect and transport waste to a collective open dump site, Nyanza, located in Kicukiro district in 10 km from the center city. The collection schedules were prepared by the KCC for each district. The development and operation of the dump site were, and remains, the responsibility of the KCC and the system was financed by the city's general budget. The cost of providing the collection service was covered using taxes paid by the district residents as per defined in Organic Law N° 04/2005 of 08/04/2005, determining the modalities of protection, conservation, and promotion of environment in Rwanda.

The taxes were fixed by the management committee of districts based on the context of the district and implemented in all sectors composing the district. The collection of taxes was the responsibility of local authorities from the village and gathered to the sectors which reported them to the districts. The rate of taxes collection was low affected by the very long value chain of collection and the social affinities between residents and local authorities associated with their weak monitoring capacities. Furthermore, this model failed because some districts recorded many poor families living in slums. Many of the latter do not pay income taxes and property taxes while they could not be excluded from the service. For this, the KCC lacks the financial capacities to provide regular, even basic level, waste collection service.

This has opened the doors to the evolving involvement of informal private sector, especially serving rich families since 1999 (one cooperative at the moment COOPED). With rapid urbanization and rapid population growth, around the year 2010, the KCC has recorded explosion of many cooperatives and companies involved in solid waste service, to fill the growing shortcoming of KCC to provide the service. From the SWM strategic plan of Kigali (2012), the city recorded 2 private companies and 30 semi-private cooperatives. This has then been a good sign to the KCC that they can combine the “Thirsty of Entrepreneurs” of creating jobs through “waste business line” and the problem of low service coverage, low service quality and the target of the KCC to make Kigali an attractive and clean city. Since 2011, KCC has started the process of formalization of the private sector by involving RURA which had the mandate to regulate the public services as discussed in previous sections. The KCC's Hygiene, Environment and Sanitation Officer argued that the formal privatization of solid waste collection aimed to: (1) Increase the coverage of service – especially for the urban poor communities; (2) Reduce the cost involved by KCC in service provision; (3) Create jobs for talented and creative local private operators; and (4) Improve the service quality, especially collection frequency and schedules.

4.1.2. Monopoly Privatization of solid waste collection service in Kigali

The formal privatization of solid waste collection in Kigali has evolved in two distinct phases. The first phase has been the recognition of the role played by informal private sector in waste collection service by the KCC. The second phase has been the formalization and harmonization of the involvement of private sector where sectors are considered as monopoly zones.

- *Recognition of Informal sector in solid waste collection service by KCC*

The first initiative of the KCC has been the recognition and acceptance of its limitations in the provision of waste collection service in terms of financial, management and service quality aspects. Secondary, the city has recognized the role played by informal private sector to increase the service coverage and investing their own money in buying the collection vehicles and other equipment.

The main challenge has then been the opportunistic spirit of some informal private sectors investing little capital to gain many interests without meeting the residents' expectations. Furthermore, too many operators evolved in waste collection service which made the control and monitoring difficult. Though the service coverage was increasing, the KCC received a lot of complaints from households about the service quality received while they have started paying the service.

The user charges were agreed between service providers and users without the intervention of the KCC. Neither the service provider nor the user and the KCC had no idea about how much to charge. Some service providers priced little which led them to fail to respect the collection frequency and schedules. Others set high user charges which made the service not affordable to the poor and then leading to street littering and illegal waste disposal in water drainage. In addition, the service quality, especially service reliability, was not guaranteed to households while the KCC was losing more and more the control over the service providers.

Since 2012, the KCC started the initiative on regulating the service providers and user charges by involving RURA. This gave the city the power to control both users and service providers and the room to conflict management between both parties if need be. The KCC could take enforcement measures on service providers to improve their operational and physical capacities such as the number of vehicles. The KCC has also initiated situational analysis studies to have an overview of waste flows and key stakeholders. It is in this regard that the city run a study on solid waste management in Kigali in 2012, in collaboration with Belgium Technical Cooperation (BTC) which played as a baseline for the development of the SWM Strategic Plan in the same year (2012). From this, the KCC has also updated the existing guideline on Hygiene and Sanitation (to be translated in English), and particularly the Chapter 1, Paragraph 1, determining the way solid waste management should be managed and Paragraph 113, defining sanctions to defaulters.

- *Formalization of the involvement of private sector in solid waste collection service*

Since 2012, as mentioned above, 2 companies and 30 semi-private cooperatives were annually licensed by RURA to make a contract with households, commercial, industries, and healthcare. Nowhere, a step ahead was made because the sector and the service providers would have a consent on prices to be used during the process of contract negotiation. But the service provider had no obligation to cover any monopoly zone. This means that the competition was open where the service provider was allowed to provide the service to households from different sectors.

Through this framework the KCC had again no full control over the service provider as the latter could accept the fixed price or not. The KCC was supposed to be submissive in favor of the service provider because few alternatives were available. Furthermore, the probability to have the service for many areas, especially slums where live poor families, was very low as the households-service provider

relation was purely market-oriented. This means that the buying power was dominated by the service provider. The latter was much interested in areas where a big portion of households is composed of rich families, i.e. areas with market potentials. On one hand, the service knew many cut-offs because service providers could start providing a service to a certain area and jump to another with a high economic potential. On the other hand, some households used to shift from one service provider to another as a way to do not pay the bill submitted to them. For some districts, such as Nyarugenge where the Headquarter office of the City of Kigali is located, unfold transaction costs were involved in paying the private companies for non-paying households and littered waste. The KCC has again lost the control over the service providers and on households while neither the service quality nor the service coverage was not improving, especially for urban poor families as the latter could not afford the price set by the service providers.

On the technical side, most companies and cooperatives use collection vehicles with low capacity (<12 m³) and ¼ of used vehicles was rented. Some hotels, street sweeping companies, and cleaning companies transported waste to the landfill using pick-ups and small vehicles (<5m³). The average of sixty vehicles was recorded per day at the disposal site and the total waste disposed of was estimated to 180 tons per day. While the waste generation rate in Rwanda is said to be low (0.4Kg/day/household), the estimated collection rate was 44%. But some districts argue differently that this collection rate considers the rural fraction while this doesn't need the service as the informal household composting is practiced. For this, they argue that 70% of the total dwellers of the City of Kigali, i.e. 700,000 dwellers, are concerned with waste collection services. Based on this, the collection rate would be estimated to 64%. Therefore, since the end of 2012, the KCC has initiated the monopoly privatization as a way to improve the situation as discussed in the next section.

To conclude with, the gaps in service provision by the KCC has opened doors to the evolving involvement of private sector in solid waste collection services. This has generated new governance-related problems such as the loss of control for the KCC on both households and emerging service providers. The service coverage has been progressively increased but the financial capacity on the side of KCC and service quality aspects have continued to be the main challenge. There had progressive tentative initiatives to improve the solid waste collection services on the side of KCC, from recognition of the role played by informal private sector up to the monopoly privatization which is currently in operation. However, there is a need to know if a small number of private operators with valid licence (11 companies) and the physical and human capacities, the management and monitoring capacity of public sector to ensure their control over service providers and Households and the whole system management, and the participation of households are responding to the reasons for privatization. This makes the object of discussion in the next section.

4.2. The mechanisms of solid waste collection service after the formalization of Private Sector Involvement in Kigali

This section discusses the current mechanisms of solid waste collection service in Kigali after the formalization of the involvement of private sector. Firstly, the section discusses the regulatory Framework of the provision of solid waste collection service after privatization in Kigali. Secondly, it explores the mechanisms of solid waste management in Kigali after monopoly privatization using the six selected sectors (Remera, Remera, Kicukiro, Kinyinya, Kigarama, and Kagarama).

4.2.1. Regulatory Framework for solid waste collection in Kigali after privatization

The involvement of Private sector in solid waste collection service in Kigali has been harmonized since 2012 by recognizing the sector as a monopoly zone and involving RURA as an independent regulator as discussed in previous sections. Many researchers, including [Wilson \(2013\)](#), argue that the public sector remains with the responsibility of solid waste management even after private sector involvement.

It has been also evidenced that the public sector responsibility is exercised through regulation aiming to shape the behavior of the service providers regarding the service quality, prices, and information access (Odoro-Kwarteng, 2011). Two types of regulation, i.e. the regulation of the industry and regulation of the market conduct, have been discussed in previous sections and they are combined in practice which is the case for Kigali where the regulation of the market conduct is applied by RURA playing the role of independent regulator. The regulation of the industry has been used to shape the structure of solid waste collection market by setting various settings for environmental, financial and social aspects which are operationalised through a franchise contract. The following section discusses the service regulatory Framework proposed during privatization process and how it works in reality as shown on Figure 5, (a) and (b) components, respectively.

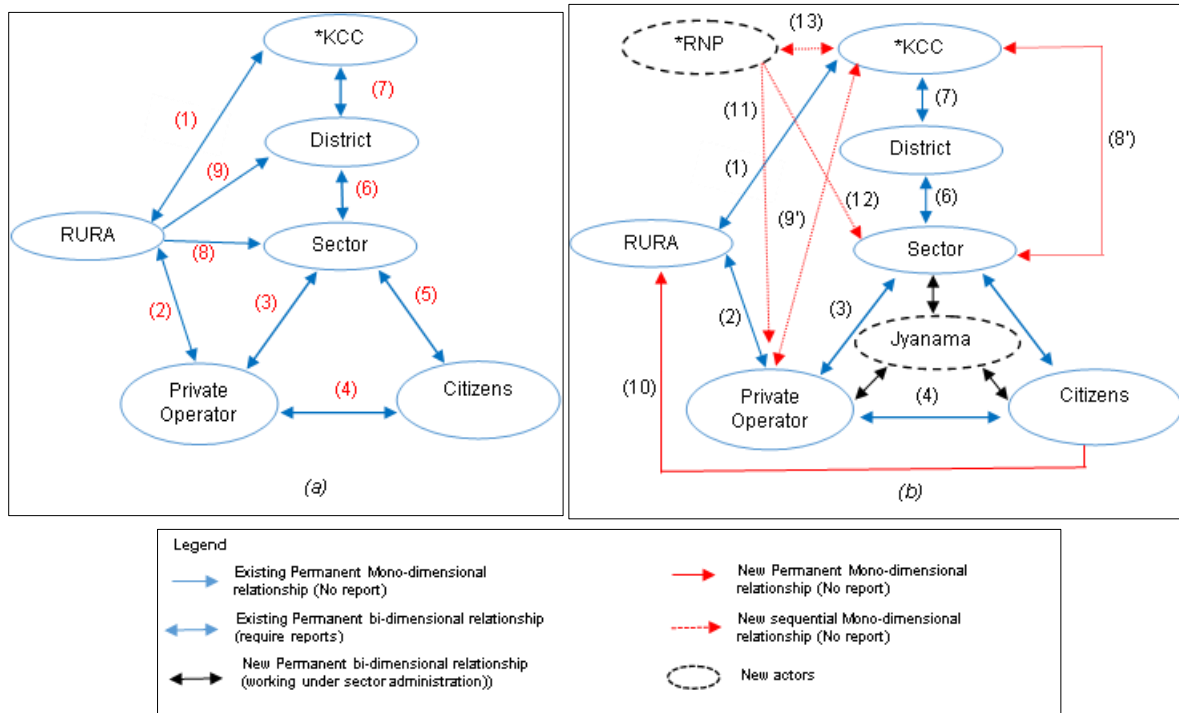


Figure 5. Solid waste collection service regulatory Framework in Kigali after privatization
(a) Represents how solid waste collection should be regulated, (b) represents how it works in reality. (Source: developed by the Author from the literature and interviews (2016)), *RNP-Rwanda National Police, *KCC-Kigali City Council

As discussed above, the service regulation aims to shape the behavior of service providers regarding the service quality, prices, and information access aspects. This composes the mandate of RURA in regards to solid waste management in Kigali. In general, the regulation of solid waste collection service in Kigali is becoming more complex with the involvement of new actors such as Rwanda National Police (RNP) and “Jyanama” of sectors and related permanent or sequential relationships with existing predefined actors as shown on Figure 5, (b). There is also the creation of new permanent or sequential relationships between existing actors such as the new relationship between the KCC and companies and sectors and the new relationship between citizens and RURA, respectively. With this complex regulatory framework, the sector and RURA are losing the control and the power assigned to them with the monopoly privatization while the KCC tends to control the whole system together with the new actors (RNP and “Jyanama”). The following sections explore how each aspect (service quality, user charges, and information sharing) is regulated after the involvement of private sector as shown on Figure 5.

- *Service quality and information access*

RURA in collaboration with KCC set the service standards as shown by relation (1) on Figure 5, (a) and (b). RURA uses these standards to set the performance indicators for service providers which are part

of the conditions to get and renew the license as discussed later. In practice, there is little responsibility for RURA in service quality monitoring in sectors and districts as shown on Figure 5, (b) which shows that there is no relation between RURA and sectors or districts. This has also been argued by the Director of water and sanitation, where solid waste collection service falls, that they don't monitor the quality of service in sectors and districts while it is supposed to be done as they have to ensure the interest and performance of service providers.

Likewise, there is information asymmetry about service quality where RURA relies on households' complaints (Figure 5, relation (10), (b)) and service providers' reports (Figure 5, relation (2), (a) and (b)), which both can be biased by their perceptions and expectations. Companies provide quarterly reports to RURA which report on service performance indicators (collection rate, waste separation, and service coverage) and on financial viability indicators (households' arrears on user charges, cost recovery and total user charges collected). As discussed earlier, companies lack the human capacity which leads to the lack of full costs information. This shows the incomplete information provided to RURA while the latter relies on this information to set user charges caps which can be translated in inadequate user charges. Likewise, RURA argues that they lack human capacity to assess the financial viability of companies although there is a plan to hire a financial expert to help them.

While sectors are responsible for overseeing the service quality and to provide reports on performance of companies following the administrative structure of Kigali, Figure 5, (b) shows that there is a sequential direct relationship between companies and the KCC, relation (9') on Figure 5, or between KCC and sectors (8'). These relationships are growing into permanent relationships and hence, leading to the dilution of the power and control of sectors over companies. From this, it is also clear that districts play little role in solid waste collection service regulation. This has been evidenced by Nyarugenge sector where the Hygiene and sanitation officer had little information about solid waste collection service provision which is also the case for other districts. The attitude of the City council to oversee the whole system can lead many districts and some sectors to lose the responsibility ownership on solid waste collection service while the decentralization of the service to sectors aimed to increase the control of service providers and households. For many sectors, there is no regular service quality and companies are fully independent. This is evidenced by sectors with poor or fair service quality, especially collection frequency and schedules, and no sanction is applied to them as will be discussed later.

For many sectors, the service quality is generally controlled through households' complaints. For the service dissatisfaction, households send the complaints directly to the company (relation (4) on Figure 5, (a) and (b)). But, when there is a cause to conflict or dissatisfaction on provided response, the households address the complaints to the sectors (relation (5) on Figure 5, (a) and (b)). Companies are required to provide channels facilitating households to address their complaints which include, but not limited, a hotline for calls and installation of office in their operational areas at the village, cell and sector levels. Likewise, sectors use "Umuganda meeting²" as the main information and household involvement platform where households per village meet to discuss various issues including waste management service.

Since 2013, there is a growing collaboration between Rwanda National Police (RNP) and KCC (relation (13), on Figure 5, (b)), where a joint evaluation is organized every six months, i.e. two times a year. This evaluation targets sectors and companies. For sectors, there is an evaluation of the security and hygiene

² Umuganda – "is defined as a community work that is organized every last Saturday of each month where population in all corners of the country gather to do organized various public works. These include the public infrastructures development such as roads and schools and environmental protection." [Online] <http://www.rwandapedia.rw/explore/umuganda#sthash.qtQ7UaOp.dpuf>, accessed on 19/02/2016

and sanitation performance where solid waste collection service falls. About solid waste collection service, for both companies and sectors, waste collection coverage, service quality, service coverage and currently user charges collection are the main indicators for the evaluation. Although this evaluation is playing an important role in the outcome of private sector involvement in the solid waste collection, it is also changing the focus of some sectors from the monitoring and management of the franchise contract to winning the competition. While the sectors should focus on the performance of service providers there is a tendency for many sectors to focus on satisfying the evaluation committee and this lead to the maneuvers of figures of user charges collection, service coverage and other indicators of evaluation and then hiding the reality. Every sector wants to show the good side and hide the challenges which reflect the reality and the losers are companies and households. It is important that this evaluation is revisited and change some of its objectives to be incorporated in regular inspections of sectors to evaluate the realities and hence, leading to the sustainability in all aspects.

- *Prices (user charges) setting*

Prices (User charges) caps for solid waste collection, like for other public services such as public transport, are set by RURA. The difference from other public services is that for solid waste service RURA sets user charges caps playing as a baseline for the sectors to discuss with companies while for other services, the set prices are directly implemented by users. The process of setting user charges caps is informed by financial information from service providers, especially operations costs, and the service targets of the KCC as shown by relations (1) and (2) on Figure 5, (a) and (b), respectively. At this level, neither sectors nor households are not involved as shown on Figure 5, (b). It is supposed that sectors are inclusively represented by the KCC as the sector is a decentralized organ of the local government as well as the city council. But, this can have a drawback back-side. While the sectors have more information that would inform RURA to set adequate user charges they are not involved which can be translated into inadequate use charges. The following costs are considered in setting user charges:

- ✚ The number of households composing the operational zone (Sector);
- ✚ The quantity of waste generated per week per household (2 bags of 25kg each);
- ✚ The depreciation of vehicles;
- ✚ The communication and office work related transport costs;
- ✚ The marginal interest per household by using the revenue permit formula;
- ✚ The loss that can be caused by big number of non-paying households;
- ✚ The households categories using “Ubudehe”³ categories;
- ✚ The vehicle prices on local market;
- ✚ The quantity and price of fuel;
- ✚ The days that the vehicle is used per month (26 days - from Monday to Saturday);
- ✚ The number of tours per vehicle per day to determine the dumping costs;
- ✚ The number of waste collection crews per vehicle (estimated at 12 persons);
- ✚ The Rwanda Revenue Authority Tax;
- ✚ The Bank interest (19%);
- ✚ The RURA regulation fee (1% of the total revenue per year); and
- ✚ The distance from the operational zone to the dump site and the distance made throughout the operational zone of a door-to-door collection.

For RURA, user charges caps can help companies to make a profit for various reasons. RURA assumes that the above-discussed process of setting user charges has considered detailed costs that would

³ *Ubudehe* -“refers to the long-standing Rwandan practice and culture of collective action and mutual support to solve problems within a community” [Online] <http://rwandapedia.rw/explore/ubudehe#sthash.NbYNjncp.dpuf>, accessed on 28/02/2016

affect the price and this leave the room for profit to service providers. The key parameters that can affect the profitability are the number of households which rarely changes and on the low rate; distance from operational zone to dumpsite and internal distance which remains constant; and the price of fuel as this business is based on transport. To accommodate the variations in fuel costs, the maximum fuel price of 1,100RwF (approximately €1.8) in 2011, has been taken. Today, the highest price, since the user charges were set, has been 1,000RwF (approximately €1.7). Then from this, the profitability is assured which can be affected by other factors such as the weak human capacity for private companies translated into unnecessary operational costs.

Furthermore, the effectiveness of user charges set by RURA is strongly affected by the process followed by all sectors to set the final user charges up to the household level, as proposed by KCC (Figure 6). The implementation of this process gives the final decision power to the sector “Jyanama”⁴ on the user charges baseline to be used by the company. From this, it is evident that the responsibility of RURA to set prices have almost shifted to the KCC and its constituent decentralized organs, especially sectors, as shown on Figure 5, (b) and Figure 6 summarizing the process of end-user charge setting.

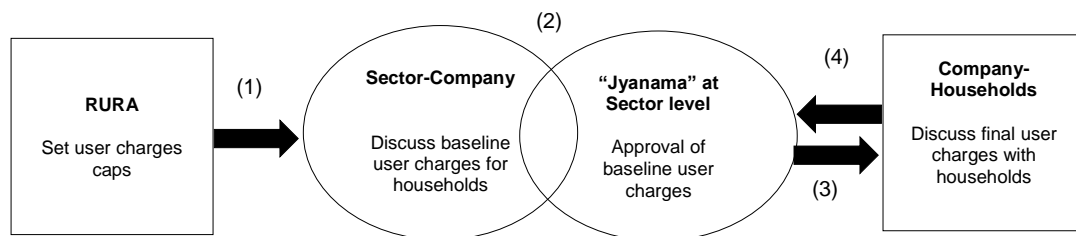


Figure 6. End-user charge setting process for solid waste collection service in Kigali

Source: developed by the Author from the interviews information (2015)

The previous section on user charges setting has discussed the relation (1) on Figure 6 where RURA set user charges caps. These user charges caps are used by the sector to discuss the baseline user charges that the companies use to discuss with each household (relation 3 of Figure 6). The discussion between sector and company refers to these user charges and must respect the households' income categories as it is for user charges caps. This discussion is also assisted by the “Jyanama” at sector level which finally approves the baseline user charges. That is why the “Sector-Company” relation and the approval of the baseline user charges are not separable as shown by relation (2) on Figure 6. The approved user charges are included in the contract between the sector and the company after the company won the market competition as shown by relation (3) on Figure 5, (a) and (b). This means that the company negotiates the user charges after the tender process. This shows also that the company analyzes the market, including the profitability after it has committed to provide the service. There is also a tendency that the user charges responsibility is dominated by “Jyanama” while it was among the mandate of RURA.

Finally, the company discusses with each household the end-user charge based on the income level, the quantity of generated waste and collection frequency which can be more, but not less, than once a week (relation (3) on Figure 6). The agreement between the company and households are legalized through a contract as shown by relation (4) on Figure 5, (a) and (b). This contract serves as the baseline for conflict management for sectors if there is a cause to conflict between the company and households as shown by relation (3) and (5) on Figure 5, (a) and (b). But, it may happen that the company does not get the compromise with the households, one of the party reports the situation to the sector which plays

⁴ “Jyanama”- is part of the decision-making organ in local government, elected by the population and represented from the Province up to the village levels.

the role of mediator between both parties as shown by relation (4) on Figure 6 and relation (3) and (5) on Figure 5, (a) and (b).

The above-discussed aspects of regulation, i.e. service quality, user charges and information need tools and various settings on the side of KCC and RURA. Among these settings, RURA has developed the price determinants discussed above and the licensing mechanism but nothing has been done about service quality evaluation. This again evidenced that the responsibility of RURA in service quality monitoring has been diluted into the routine practices of companies and monitoring activities of the KCC and its constituent districts and sectors. On the side of the KCC, various settings have been developed shaping the market for service providers which include the highlights for waste separation at source, waste disposal and contract format for sectors as discussed in the following sections.

- *Licensing process*

The company to enter the market competition is compulsorily required to have a license as shown by relation (2) on Figure 5, (a) and (b). The company must comply with the following requirements to get licensed:

- ✚ Be registered with Rwanda Development Board (Companies) or Rwanda Cooperative Association (cooperatives);
- ✚ Approve the payment of application fee of 100,000RWF (approximately €117);
- ✚ Approve the payment of the Licence fee of 2,500,000 RWF (approximately € 2,934) for every five years;
- ✚ Have at least 3 owned collection vehicles with for each the capacity of 5 tons; and
- ✚ Present at least a 5-year business plan.

The companies argued that the licensing process is very quick, as the license is delivered within 15 working days after the submission of the request, but that it is expensive. The fact that the license is expensive has also been evidenced by the Director of water and sanitation in RURA where solid waste management falls, arguing that the most complaints received from private companies are about license fee. The license fee has been evidenced as a limiting factor for new start-ups and small companies. As discussed in the previous sections, before privatization 2 companies and 30 semi-private cooperatives were recorded in solid waste collection in Kigali. But now, only 7 companies have valid licenses and 4 have provisional licenses. These provisional licenses have been offered to companies which do not fill the above-mentioned conditions.

The reason explaining the provisional licenses is that the current companies lack the human and physical capacities to respond to the current market demand. This evidences that not only the license is expensive, but also it doesn't solve the problem of the weak performance of companies and service quality as well. On one hand, while the license aims to increase the effectiveness and efficiency by allowing competent companies to compete, the current situation evidences the contrary where it fails to create fair competition by allowing non-licensed service providers to operate. On the other hand, RURA argues that it is hard to find the company that can fill the gap if the current companies fail to deliver the service. As short term solution, RURA provides the provisional licenses. There is the divergent point of view on this issue between RURA and companies as the latter finds this as a source of unfair competition while for RURA is a short-term solution to prevent shortcomings in service provision. Furthermore, while companies find the license conditions heavy, RURA is planning to review some of these conditions, such as the 3 owned vehicles, because this is the minimum to serve one monopoly zone. Some companies provide the service to more than one operational zones while they own only 3 vehicles which affect the service quality. This is the case for P2 Company serving 13 sectors while it owns only 4 vehicles as discussed later. As enforcement mechanisms, the plan is to revise this condition by requiring companies to apply for a "license annex", which is under development, showing extra owned vehicles if

the operator is applying for extra monopoly zones. It is important that RURA thinks about this plan as it can lead to low service coverage where some operational zones, especially sectors with low economic potential, i.e. with big fraction of urban poor community, may lose completely the service because the service providers have evidenced low physical capacity and the low probability to be improved due to the current low-cost recovery as discussed later.

- *Franchise contract format development and company selection process*

One contract format is developed by the KCC and provided to all sectors as shown by the direct relation (8') between the sector and KCC. While the proposed regulatory framework for the privatization process defines that the relation between the company and KCC should follow the administrative structure, i.e. from the KCC to districts and from districts to sectors (relations (7) and (6) on Figure 5, (a) and (b), respectively and from sectors to companies (relation (3) on Figure 5, (a) and (b), the development of the contract format is informed directly by the experience of companies, as shown by the direct relation (9') between the service providers and the CoK on Figure 5, (b). At this level, there is neither consultation of the sectors nor the districts which evidence the lack of inclusivity of sectors and districts at planning level. The contract covers the following elements as summarized in the contract format (*In local language-Kinyarwanda*) Appendix K:

- ✚ The purpose of the contract (solid waste collection to households);
- ✚ Responsibilities of key stakeholders (sector and company);
- ✚ Duration of the contract and when it enters into force;
- ✚ User charges as approved by “Jyanama”;
- ✚ Contract revision and termination conditions and process;
- ✚ Force majeure; and
- ✚ Conflict resolution procedures.

The key responsibilities for the company are to provide a door-to-door service to all households in a sector at least once a week and to collect user charges (Relation (4) on Figure 5, (a) and (b). The key responsibilities for the sector are the public awareness and to enforce user charges collection for non-paying households (Relation (5) on Figure 5, (a) and (b).

- *Company selection process*

A harmonized selection process for all sectors has been developed to select the service providers. The selection procedures and the composition of the selection committee have been institutionalized into all sectors. This procedure recommends the selection committee to be composed of the representation of the KCC, the districts, the sector and “Jyanama” of the sector which represents citizens. The selection must pass through an open competition through the tender process. The tender process is prepared by sectors in collaboration with the KCC (relation (8') on Figure 5, (b)) and does not consider the user charges as they are determined by the sector after the company has qualified as discussed earlier. The qualification criteria are the technical and physical capabilities of the company (at least 3 owned vehicles); human capacities (operations staff); and the valid license. This has been integrally followed in sectors although some sectors have selected unknowingly companies with provisional licenses because few companies have valid licenses. But this has not been studied during this research.

- *Waste separation at household level*

Solid waste separation at source has been and is still a challenge for the City of Kigali. The first initiative of waste separation at source has been started by private operators for the sake to initiate recycling activities. These operators include P1 Company as will be discussed later. Since around 2010, the City of Kigali has initiated the enforcement of waste separation at dump site by putting fines on waste collection companies when disposed of waste is mixed. The color-coding system has also been initiated where the city encourages households to use bags with different colors. From the KCC, solid waste

must be separated into organic waste and non-organic waste referred to as “Biodegradable” and “non-biodegradable” wastes, respectively. This has been described through the KCC’s hygiene and sanitation guideline developed in 2005 and revised in 2012 and operationalised through the RURA’s guideline on solid waste collection 001/EWASTAN/SW/RURA/2014 (Both to be translated in English), and through Solid waste management strategic Plan of 2012 for Kigali.

Two main bags with different colors, i.e. “Green” for organic and “Blue” for non-organic have been recommended to households and the information have been provided through public media such as Rwanda TV and Radio. These initiatives grounded on the Organic LAW No 04/2005 about Environmental Protection in Rwanda. Its Article 56 stipulates that “...*The State is required to establish appropriate standards for treatment of waste in order to produce more productivity, with emphasis on Modern Technical knowledge, means of proper recycling, improved solid waste collection and appropriate methods of Material Recovery Facility (MRF)*”. But, these initiatives have failed as the enforcement measures targeted the final disposal.

The KCC has constantly failed to manage the huge amount of waste that the dump site receives every day which has led to the mixture of waste after disposal. This has pushed the city to do not impose fines on the service providers and since then, waste is mixed during collection. From that time, neither households nor service providers performs the waste separation. Step further, in 2012 a Solid waste management Strategic Plan has been developed proposing not only the institutionalization of the waste collection service but also the waste separation at the household level and recycling through sectors. The collection service has been institutionalized but waste separation at the household level and recycling have not. Currently, waste separation is voluntarily done by some few companies and informal collectors (scavengers) stimulated by market-based incentives.

- *Final waste disposal*

The City of Kigali provides an open communal waste disposal site where companies dispose of all collected waste (relation 9’ on Figure 5, (b)). The dump site is located at 25 Km from the city center. All disposed of waste are mixed as discussed earlier. Waste collection companies contribute to the operations costs by paying tipping fee varying from 5,000RWF to 10,000RWF per trip (approximately €6-12) for small and big vehicles, respectively. Each company signs a contract with the KCC to dispose of waste, known as “waste disposal contract” which is renewed every year. This contract is also used by KCC to control illegal waste collectors though it can also contribute to illegal disposal in surrounding areas.

4.2.2. Solid waste management mechanisms in sectors after privatization

This section discusses the mechanisms of service provision and regulation for six sectors selected in three districts (Nyarugenge, Kicukiro, and Gasabo) that compose Kigali. These sectors include Remera and Kinyinya sectors (Gasabo district), Rwezamenyo sector (Nyarugenge district) and Kicukiro, Kagarama and Kigarama sectors (Kicukiro district). For each sector, the selection discusses the general and physical characteristics of the sector, the service provision practices and regulation and the characteristics of service providers in terms of physical and human capacity. From this and characteristics of sectors and regulation key factors shaping the outcome of privatization were understood while from service provision practices social, financial and environmental outcome were understood.

1. Solid waste management in Remera sector

- *General characteristics of Remera sector*

Remera sector is one of the fifteen sectors composing the district of Gasabo. From the database of the sector, the total households are estimated to 7,448 from which 7,150 households have the contract with the service provider. From these figures, it is clear that 96% of the population has access to the service. The big part of Remera has low population density and is well planned with good roads while the small fraction knows a high population density. This part is not well planned and has bad and not accessible roads and composes (Figure 7).



In terms of income levels, Remera sector is one of the sectors where rich families live and diplomats. Though in terms of the physical settlement, the high-income families occupy a large area, in terms of population distribution the informal settlement is highly densely and counts the big fraction of the population of the sector (>60%). This has various negative effects on the development of the sector including the efficiency and effectiveness of the solid waste collection service where poor families tend to free ride on rich families and hence, affecting the cost recovery for the company.

Figure 7. The View of households and accessibility in Remera sector

Source: Photo was taken by the Author during data collection in Remera sector, Kigali (2015). 1* Informal settlement, 2** Formal settlement

Remera sector is a home for many public, administrative and business activities. It is a home for Ministry of Youth and ICT, Interpol Police office, National Amahoro Stadium, Head Office of Rwanda Development Board, more than Five Hotels and Motels (Hotel Chez Lando, Gorillas Golf Hotel, The Manor Hotel, etc.), sport parks like Gulf game ground, Telecom companies Headquarter Offices (Tigo, Airtel and MTN), StarTimes, Canal+, Rwanda University College of Education, etc. All these activities make the solid waste collection service more complex as the waste collection governance structures differ from households to business activities.

- *Service provision practices in Remera sector*

The contribution of each sector to the amount of waste generated in Kigali is not known and Remera sector is no exclusion. Though Remera sector doesn't know its contribution, it has evidenced the commitment to reduce their contribution where it is the only sector where waste is separated as evidenced by interviewed 40 households. To control waste generation, RURA has set user charges cap allowing the collection of only two waste bags of 25 kg for each household as discussed in the section on user charges. To enforce this, Remera sector charges households for the extra waste to those two bags. This enforcement combines the waste quantity and waste separation at source. The sector has adopted color-coded waste separation as defined by the KCC. The implementation of this has been facilitated by the fact that P1 Company serving Remera has been the initiator of this program in Rwanda since 2009 and since then it has initiated the plastic waste recycling factory.

P1 Company distributes waste materials to all households with a surcharge to facilitate waste storage. High-income households use single-use plastic bags which cost them between 3,500 and 4,000 RWF (approximately €4-5) in addition to the agreed monthly user charges. Two different color reusable bags

(Blue and green) are provided to poor and middle-income families which cost them around 1,000RWF (approximately €1.2) with the lifetime of 5-6 months. This has improved the sanitary conditions, especially during collection day as shown on Figure 8, but it has also incurred extra costs to poor and middle-income families.



Figure 8. Households waste storage bags in Remera sector

(a) Reusable bags distribution (source: Photo taken by the Author on filed in Remera sector) and (b) single-use bags (source: Photo from the P1 Company website, www.copedgroup.com, accessed on 19/02/2016)

The enforcement of bags distribution and waste separation is done through a joint inspection between sector local authorities and P1 Company's staff through a framework called "Smart Village Program" developed by P1 Company. This program combines the collection of security tax, distribution of waste materials and public education about waste characterization and separation. A joint inspection is organized every Thursday and the P1 Company submits the progress report to the sector every Friday. This report informs the decisions which are made during the management committee meeting of the sector taking place every Monday of the week. The company provides also the partitioned vehicles for separate waste collection and transportation.



A mixed door-to-door and communal collection (Figure 9) services are provided to the households in Remera sector. At the end, the poor families and few middle-income families living in inaccessible areas are the victims of the adopted collection method. Folz (2004) argues that the best collection modality is the one reducing the effort of the households in terms of cost, time and physical participation.

Figure 9. Waste collection modalities adopted for Remera sector

(a) A communal collection service for inaccessible households (Source: Photo was taken by the Author in Remera sector in 2015); (b) a Door-to-Door service for accessible households (Source: Photo was taken by the author in Remera sector in 2015)

The P1 Company presumes the cost recovery ranging between 50% and 100% with the average rate of 80%. The additional income to fill the gap in cost recovery is from the selling of separated waste recyclables, making and selling compost, and commercial customers subsidize households. The company provides also consulting services related to waste service experience and other environmental services such as pest control and gardening.

User charges collectors are allocated per village and paid based on the collected user charges from 10 to 15% of the collected amount, based on the fact that the agent collects user charges up to or more than the set collection targets. This pushes the agents to work hard get a high allowance percentage. Sector officials argue that there is an increase in cost recovery comparing the figures of 2014 (84%) with figures of 2015 (96%). Though there are discrepancies between figures provided by the company (80%) and that provided by the sector (96%), both figures evidence the progress. The difference may be related to the above-discussed service coverage figures provided by both company and the sector.

Both P1 Company and the sector predict the full cost recovery based on promising household's willingness to pay the service. 32 out of 40 respondents have shown that households own the responsibility to pay the service while 8 households think that the government should pay the part and household another part. Likewise, 30 households are willing to pay the current user charges and 10 households are willing to pay less than they pay. The 10 households which find the service to be not affordable is a considerable number that can affect the prediction of both company and the sector of full cost recovery. This number can also be linked to the extra costs related to the type of service, especially for inaccessible households. It is obvious that the households that receive a communal collection service and hence, involving extra costs, of hired labor to put waste on the collection point, are not happy which can have an effect on their willingness and cost recovery as well.

With the increase in waste separation at source discussed above, P1 Company presumes 30% of the collected waste to be valorised. This means that 70% of collected waste ends into the dump site. Remera sector is located at 20 Km from the communal dump site. The company uses 2 hours to and from the dump site. The road to the dump site is not improved which is the main cause of vehicles breakdowns, especially during the rain period, in addition to the worst state of the dump site as it is for other companies (Figure 10).



Figure 10. The view of the road to the dump site and that of the communal dump site in Kigali
(a) The impact of Nduba dump site on vehicles, (b) the impact of the road to dump site on vehicles (Source: Photo was taken by the Author at Kigali, 2016)

- *Solid waste collection Service regulation in Remera sector*

Since 2012, through an open competition, Remera sector has offered a 3-year franchise contract to the company Real Cleaning Services Ltd. This company failed to provide a good quality service, especially collection frequency and schedules and the sector has canceled the contract at the end of the year 2013, referring to the request of the population. Since 2014, the sector has contracted P1 Company again for 3 years until 2017 and the renewal of this contract will pass through an open competition.

As argued by Executive secretary of Remera, two main challenges related to the contract management have been evidenced: (1) the low inclusivity of the sectors at planning level and the inadequate capacity of sector officials and “Jyanama”. While [Wilson et al. \(2013\)](#) argue that the inclusive strategies allow the early contribution of all stakeholders, i.e. users (Household), providers (company) and enablers (sector), sectors are mandated to negotiate the contract with service providers using the contract exclusively developed by the city council. Many sectors have argued that this contract format hardly accommodates the sector context which may affect the performance of service providers. For this, many sectors have suggested being involved during contract development.

[Bartone et al. \(1991\)](#) argue that the inefficient contract negotiation and monitoring, related to the weak capacity of the public sector, associated with the unclear regulatory framework to avoid preventable burdens on private service providers, are among the key challenges faced in solid waste collection service for many developing countries. This is the case for Remera sector where the executive secretary

argues that “...we negotiate user charges with the service providers while we don't have adequate and enough capacity, in addition to the lack of accurate information on operations costs, which can be translated into inadequate user charges.” This evidence the inadequate capacity of the public sector and “Jyanama” as discussed in previous sections.

For Remera sector, the user charges caps set by RURA are 5,500, 3,400 and 1,700RWF (approximately €6, €4 and €2) for high, middle and Low-income households, respectively. After the discussion with the P1 Company, the sector “Jyanama” has approved 5,000, 3,000 and 1,500RWF (approximately €6, €3.5 and €2) per households per month for high, middle and low-income, respectively. But, the households could also discuss the final user charges with the company as shown on Figure6. It is in this regards that there are around 50 households in the whole sector exempted from paying the service and receive a free service. In practice, the user charges for Remera vary from Zero RWF (exempted) and 500RWF to more than 10,000RWF, based on the generated quantities and waste materials delivery method. This evidence the high involvement of households at all levels at the sector level. Households are firstly involved through “Jyanama” to set user charges baseline. Secondary, they are also involved in setting the final user charge defined by each household as discussed above. In addition to the involvement of households in the user charges setting process, they are also involved in the monitoring of the service quality where dissatisfaction complaints are addressed to the company or if no compromise between both parties, the complaints can be addressed to RURA or to the sector as shown by relations (5) and (10) on Figure 5, (b).

Each household sign a contract with the company (relation (4) on Figure 5, (a) and (b) as a way to legalize compromise between the service provider and the households. In addition, both households and service provider are informed by the sector about any change that can affect the provision of the service. This has been confirmed by all interviewed households (40 households) that they have been informed about the new company and about waste separation. One of the most important means of communication is “umuganda meeting”. But jointly, P1 Company and Remera sector have developed a specific information channel which is embedded in “Smart Village Program” discussed earlier.

- *Characteristics of P1 Company providing the service to Remera sector*

P1 Company has evolved in solid waste collection services since 1999 as a cooperative until 2009 where it became a company. It has contributed to the development of the solid waste collection industry in Kigali by contributing to the development of different policies, guidelines but also to the improvement of solid waste collection practices. It is the first company to initiate the waste separation at source using the color-coding system inspired by European countries such as Belgium, Germany and by some African and Asian countries such as South Africa and India, through various study tours in the above-mentioned countries as CEO of the company argued.

P1 Company is providing the service to more than 1,000 commercial activities and three different sectors including Remera sector. The company estimates its total customers to 13,500 households from three sectors (Remera, Kacyiru, and Nyarugenge). For Remera, P1 Company estimates the total number of households to 5,372 and the number of households having a contract to 4,500 (equivalent to 84%). Compared to the figures given by the sector officials we find that the service coverage figures are different (96% and 84% for sector and company, respectively). The Company explains the variations by the fact that one apartment may accommodate more than one families. For the operations purpose, the apartment is considered as one household. From this explanation, we can say that this can explain the variation in figures of households composing the sector and not the variation in service coverage. A deep analysis is needed to find why there is an inconsistency in provided figures.

In terms of physical capacity, P1 Company has on road 14 vehicles in daily operations of which it owns 10 vehicles varying in types as shown in Table 8.

Table 8. Types of collection vehicles and capacities

Vehicle type	Capacity (in Tonne)	Number
Compactor truck	10	2
Skip truck	0	0
Side loader truck	1	3
Roll-on-truck	5	5

The maintenance of the company is made both of the companies owned and others workshop through a permanent maintenance contract. The company has its owned two mechanics, i.e. one mechanics maintaining in total 5 vehicles though they work as a team. A regular vehicle check-up is made every Sunday of the week. Comparing the market share (around 13,500) households with the vehicles on the road (14 vehicles), P1 Company has evidenced the high physical capacity which allows the service regularity as will be discussed later. The company provides the service from Monday to Saturday with half-day service on Thursday for the cleanliness of vehicles and waste collectors and Remera is serviced on Monday and Tuesday.

In terms of human capacity, currently, P1 Company has in total 147 permanent employees. Their education level varies from secondary school to Tertiary level with the tertiary level having a big fraction. The company's salaries range from 50,000 to 1,000,000 RWF (approximately €63-€1,270) per month. Comparing the company's market share (13,500 households) and the number of supervisors (30 supervisors), the company has evidenced the need to improve the supervision capacity. This can partly explain the evidenced no full cost recovery situation faced by P1 Company as it will also be discussed later. P1 Company prepares always vehicle route plan and collection schedules which are done by the Operations Director.

With the spirit of specialization and to close the cycle of waste, the company has reframed its structure in 2009 where it has given birth to five other independent companies and one cooperative. Those companies are ECO-PLASTIC Ltd that recycles film plastics, GreenShop Ltd that distributes waste materials to customers, ECOMAKE Ltd that makes Briquettes from dry organic waste and compost from wet organic waste, Clean The City Network Ltd providing the capacity development and research and development studies and TERIMBERE Cooperative providing and managing waste collection crews. Though this framework can lead to high performance as the company narrows its scope of intervention, it can also lead to unfolding transaction costs which can increase the operations costs. But a deep analysis is recommended to verify this assumption.

2. Solid waste management in Rwezamenyo sector

- *General characteristics of the sector*

Rwezamenyo sector is one of the 10 sectors composing the district of Nyarugenge and is the smallest sector of the district. The total household estimate is 3,486 households each one having a contract with the service provider, i.e. 100% service coverage. Rwezamenyo is a highly densely area with a big fraction of the population living the informal settlement. In general, the sector is not planned and lack adequate roads. It is among the first resided areas of Kigali. Many people coming from rural areas settled informally in that area. This has contributed to unplanned infrastructure settlement including roads which limit the accessibility of many households.

In terms of income level, Rwezamenyo sector 90% of the population are generally classified in middle-income level as argued by Executive secretary. This income level has been a challenge to the sector for the development activities of the population are not able to financially contribute. Rwezamenyo is

home for many people living an everyday lifestyle like motorcycle taxi drivers, public transport drivers and other small businesses as it is among the closest areas of the city center (1-2Km from city center). This makes the management of the households difficult as their availability is limited in addition to their survival income level. It is also a home for the second stadium of Kigali City (Mumena Stadium) which contribute to the high of street sweeping costs and related transaction costs paid by the sector.

- *Service provision practices in Rwezamenyo sector*

It is the responsibility of the household to find waste materials for storage. For this, various waste materials are used namely, the color-coded single use bags (few high-income families), and not color coded reusable bags, the broken buckets, the reusable plastics bags, colligated cardboards (low & middle-income families). The performance of waste separation at source is zero. P2 Company argues waste is mixed during collection because at the dump site it is not a requirement. Hence, involving the costs related to the separation of waste would be a waste of money.

A door-to-door waste collection service is provided to all households. P2 Company's collection crews enter into each household and pick waste from the storage point. This has increased the number of collection crews (500 workers) which is the second big cost of the company after the fuel cost. The company doesn't prepare always the vehicle route plans. This is explained by low human capacity as discussed later. The supervisors are allocated per vehicles and they have the responsibility to manage the vehicles during collection.

The Driver's performance is evaluated based on the number of trips made per day, especially rented vehicles. The vehicle performance and efficiency are evaluated on numbers of trips. It is then understandable that the loser when the vehicle counts the breakdown is the user and the vehicle renting agent (vehicle owner). This can partly justify why the company doesn't what to have many vehicles which reduce their management and maintenance costs. In most cases the drivers of vehicles are also the vehicle owners. It is then clear that vehicles are overused by drivers to optimize their income by increasing the number of trips. This increases the number of breakdowns (16 breakdowns per month as evidenced by the company) and the non-respect of frequency and collection schedules as evidenced by 26 out of 39 respondents.

As far as costs recovery is concerned, P2 Company presumes the full cost recovery (100%) using user charges. One of the keys to success is to set the same user charges to everyone which easier the user charges collection monitoring. The user charges collectors, known as "Percepteurs", are allocated per village and paid 10% of the total user charges collected in a village. The second key to success is a joint inspection, organized with the sector officials once a week, which focus on the user charges collection. Thirdly, a competition between villages is also organized where the company awards the local authority from the first three villages. With this approach cost recovery has increased from 95% in 2014 to 96% in 2015 as the sector secretary has argued. .

Though the company records full cost recovery, many households find the service not affordable because only 20 out 39 respondents are willing to pay the current use charges while the 19 households are willing to pay less than they pay. This can be explained by the approach of the sector of fixing the same user charge to all households and hence, creating the burden to the poor to pay high user charges. From this, it is clear that other factors than the same user charge are influencing the rate of cost recovery. These factors may include the strong collaboration between the sector and company and incentives that the village representatives are getting from the above-mentioned competition organized by P1 Company. The other factor is the reduction of vehicle management, maintenance, and fuel costs by reducing owned vehicle and increasing rented vehicles though this approach is not sustainable as discussed later.

The contribution of Rwezamenyo to the amount of waste generated in Kigali is not known but the total waste collected in Rwezamenyo ends into Nduba dump site, i.e. 100% contribution. Rwezamenyo is located in 27Km from the communal dump site and each vehicle needs 2 hours to and from the dump site. The roads to dump site and the state of the dump site are also not improved as raised by P1 Company.

As an initiative to reduce their contribution to Nduba dump site, in 2015, the Company has signed the Memorandum of Understanding with Rentec, a Belgian company which turns waste into energy as cited in Rwanda Focus newspaper (November 2015). With this MoU, the P2 Company expects to get a machine that will not require the sorting at source as the Machine has the capacity to separate organic and non-organic waste as argued by the President of the P2 Company and as it is mentioned in Focus Rwanda Newspaper (2015). The company also predicts the production of the power of 12 Megawatts from waste. But, this MoU doesn't define when this project will start and detailed feasibility analysis findings. Meanwhile, the final destination of all collected wastes is the communal dump site (Nduba).

- *Solid waste collection Service regulation in Rwezamenyo sector*

Since 2012, through an open competition, Rwezamenyo sector has offered a 3-year franchise contract to P2 Company following the above-discussed selection process. The selection based mainly on the fact that the P2 Company has three owned vehicles and a valid license.

The Executive secretary argues that the main challenge in the management of the contract has been the income level of the population which is low and which has pushed the sector to fix one user charge to all households. Two reasons have pushed the sector to set uniform user charge for all households. Firstly, almost all households are classified in the category of middle-income level as discussed in the section on general characteristics of the sector. Secondary, this change was a way to compensate the weak capacity of both the sector and "Jyanama" in contract negotiation and the lack of information about the cross-subsidy as presumed by sector officials. With the above user charges solution, it is clear that rich families are more favored than poor families and hence, creating the unfair cost distribution while it is the objective of the privatization of solid waste collection service. This evidences again the fact raised by Remera sector about the challenge of decision power given to "Jyanama" which is then translated into inadequate user charges and unfair costs distribution among users (households).

Normally, the user charges caps set by RURA are 5,400, 3,400, and 1,700RWF (approximately €6, €4 and €2) for high, middle and low-income, respectively. Currently, the approved user charges are 2,000RWF per month (approximately €2.5) per each household, i.e. for low, middle and high-income households. It is then clear that middle and high income are more advantaged while low income is paying more than the one set by RURA.

Like for other sectors, households are involved in paying the user charges and in the monitoring of the service quality. The sector reinforces the user-provider relationship (Relation (4) on Figure 5, (a) and (b)), than household-sector relation (relation (5) on Figure 5, (a) and (b)) and in this way playing the role of mediator (contract witness). This attitude may result in the information asymmetry where the company is the most heard by the sector officials than households. There is no particular information channel for Rwezamenyo sector where the most used information channel is "Umuganda meeting" as discussed above.

- *Characteristics of P2 Company providing service in Rwezamenyo sector*

P2 Company is a multidisciplinary company. Not only it provides a waste collection service but also Agriculture and livestock farming, Gardening and Pest control services, the collection of various types of tax for the local government and providing transport facilities. P2 Company was registered since 2003

with the main focus in agriculture activities and tax collection through “Agrovet Belgrade” which changed into P2 Company. The P2 Company is providing the service to households from 13 different sectors including Rwezamenyo sector. The company estimates its total customers to around 45,000 households. For Rwezamenyo, P2 Company estimates the total number of households to 3,486 and all having contract, i.e. 100% service coverage. The same figures of the service coverage have been provided by the sector officials.

In terms of physical capacity, P2 Company has 12 vehicles on the road among which it owns only 4 vehicles and others are rented. The maintenance of the vehicles is made through the company’s owned workshop. The company has its owned two mechanics, i.e. one mechanics maintaining in total 2 vehicles. The company works all days of the week to meet the collection frequency requirement (once a week for each household). Comparing the market share of the P2 Company (around 45,000 households) with the number of vehicles on the road, P2 Company has evidenced weak physical capacity which explains the poor service quality that the sector is experiencing as also will be discussed later.

In terms of human capacity, currently, P2 Company has in total 547 permanent employees with the collection crews totalizing a high fraction (500 collection crews). Their education level varies from primary (collection crews) to Tertiary level (Top-Management). The company’s salaries range from 30,000RWF to 500,000 RWF Per month (approximately €38-634). The company has in total 13 supervisors. Following the same analysis process as for vehicles, the company has evidenced the weak supervisory capacity as also will be discussed later. This explains why route plans are not always developed giving room to drivers to choose their route. This also reduces the probability of the company to respond to all households’ complaints.

3. Solid waste management in Kicukiro sector

- *General characteristics of the sector*

Kicukiro sector is one of the 10 sectors composing the district of Kicukiro. The total households estimate is 4,100 from which 4,050 households have a contract with the service provider, i.e. about 99% service coverage. Kicukiro is a highly densely area. In general, the sector is well planned but many of its roads are not paved as shown on Figure11.



Figure 11. Non-paved roads in Kicukiro sector

Source: Photo was taken by the Author on field in Kicukiro Sector (2015)

This affects the service provision especially during rain seasons where vehicles hardly reach some areas and in most cases the vehicles are damaged. Kicukiro is a mixed sector in terms of the income level of households but with a big fraction of households classified in high income.

- *Service provision practices in Kicukiro sector*

It is the responsibility of the household to find the waste materials for storage. Households use various waste materials to store their waste such as color coded single-use bag (very few high-income families),

not color-coded reusable bags, broken buckets, reusable plastics bags, colligated cardboards (low & middle-income families) as shown on Figure12.



Figure 12. Various waste materials used by households and transit sites in Kicukiro Sector

Source: Photo was taken by the author in Kigali (2015)

Like Rwezamenyo sector, the performance of waste separation at the household level is zero. The sector experience also the mixed waste collection. Likewise, involving the costs related to the separation of waste would be a waste of money for P3 Company. For this, the vehicles of the company do not allow the separation. A door-to-door waste collection service is provided to all households. For inaccessible households, transit sites are created by collection crews before waste is loaded into vehicles as shown on Figure13.

The P3 Company doesn't prepare always the vehicle route plans and doesn't even know what the route plan is. The whole sector is serviced in two days a week (Friday and Thursday) and all vehicles are allocated there where they are allocated by cells and managed by operations supervisors. Allocating 10 vehicles in one cell shows inefficient vehicle utilization which evidences the weak planning and management capacity of P3 Company which is translated into unnecessary operations costs and low-cost recovery as discussed later.

P3 Company presumes that at the end of the month only 70% of the total costs is recovered using user charges. The company has negotiated the bank credit line to manage the delay in user charged collection. But, this is may not solve the problem as it incurs other transaction costs such as bank interest. User charges collectors are allocated per village and paid 10% of the total amount collected. Cells' supervisors are responsible for reporting all payments to the company office. 24 out of 38 respondents have evidenced the willingness to pay the current user charges. But, there is also a big fraction of households which find the service expensive as shown by 14 households which are willing to pay less than the current user charges. This can be a drawback to the optimization of cost recovery. It is important that the sector and company revisit the current user charges to consider this fraction wishing the discount on current user charges.

All collected waste in Kicukiro ends into the dump site as there is no any initiative promoting waste separation at household and recycling. In addition, collection vehicles are a disincentive to households to separate waste as they don't allow separate collection. Kicukiro is located in 30Km from the communal dump site and each vehicle needs at least 1.5 hours to and from the dump site.

- *Waste collection Service regulation in Kicukiro sector*

Since 2012, P3 Company has been awarded a 3-year franchise contract through an open competition and the renewal will pass again through open competition. Like for other companies, the selection of the company has passed through the tender process and the selection committee has been formed following integrally the KCC's guideline discussed in the previous section. The population perception and attitude which delays the payments, contract conditions which are not customized to the sector context and the lack of technical skills that can help the sector decision-making team to evaluate the service providers, have been presumed by the executive secretary as the main challenges related to the management of the current service contract. This evidences again the low inclusivity of sectors at planning level discussed for other sectors.

Other technical challenges are the day-to-day lifestyle of most households of the sector which makes the management of their contracts difficult. Most of the households are tenants. While having the user charges arrears, they move to other places. This affects the cost recovery because they move while they have received the service. As a preventive measure, households are requested to pay the service before delivery (pre-payment method). But, the effectiveness is hindered by the low accountability of the company due to the bad experience that the households have experienced before privatization as argued by the Executive secretary of Kicukiro. This affects the willingness to pay and the cost recovery as well.

The End-user charges caps set by RURA for Kicukiro are 5,500, 3,500 and 1,800RWF per each household, per month (approximately €6.5, €5 and €2) for high, middle and low-income households, respectively. The same user charges have been approved by “Jyanama” except for poor families where 1,500RWF has been approved.

Like Rwezamenyo sector, households are involved in paying the service and in the monitoring of the service quality. The complaints of households are directly addressed to the P3 Company through a hotline call, supervisors and/or households come to the company’s office. The complaints are responded in different ways. Either the company calls back, they are managed at the company office or on the field through a joint inspection of the company and the sector which takes place every Thursday. Though sector officials are motivated and willing to cooperate, the company argues that their availability is limited because they are required in many sectors’ hygiene activities such as greening, and health inspections. In addition to the day-to-day intervention of the sector, “umuganda meeting” and the information and communication team of the sector are key information channels as it is the case for other sectors.

- *Characteristics of P3 Company providing the service in Kicukiro sector*

P3 Company is a young but rapidly growing company in solid waste collection service. The company has been registered to start operations in 2011. It records a rapid growth not only in terms of physical capacity but also in terms of market share. In terms of physical capacity, while the company uses 10 vehicles in daily operations, it owns 8 vehicles as shown in Table 9. It is the second company to import compactor trucks after P1 Company which shows that the company plans to stay longer in the waste collection business. The maintenance of the vehicles is made through the company’s owned workshop. The company has its owned 3 mechanics working as a team.

Table 9. Types of collection vehicles and capacities

Vehicle type	Capacity (in Tonne)	Number
Compactor truck	5	2
Skip truck	-	0
Side loader truck	-	0
Roll-on-truck	4	6

Though P3 Company is growing the physical capacity, the comparison of this capacity with the current market share (16,000 households) has evidenced that the physical capacity needs to be improved as it is discussed later.

In terms of human capacity, the P3 Company has in total 147 permanent employees with the field staff team totalizing a high fraction of the workers. This includes waste and user charges collectors (50 and 60 workers), respectively, 10 drivers and 15 supervisors. This means that the office staff is only composed of 12 workers which explain why the company doesn’t prepare always the vehicle route plan and hence, translated into unnecessary operations costs (fuel costs). The workers’ education level varies from primary to Tertiary level with the secondary level having a high fraction. The company’s salaries range from 30,000-170,000 RWF (approximately €38-215) per month. Compared to the salary

ranges for the public jobs and lifestyle of Kigali, the Company's salary range is low which can explain the low education level of its staff.

4. Solid waste management in Kinyinya sector

- *General characteristics of the sector*

Kinyinya sector is one of the 15 sectors composing the district of Gasabo. Kinyinya sector is also a newly rapidly urbanizing area where many people live in the estates as shown in Figure 13, (a). The sector records the medium population density, especially the new urbanizing area with the big part well planned but most roads are under development and are not paved as also shown in Figure 13, (a) which affects the service provision during rain seasons. As a sector is located outside the city center, it was occupied by informal settlements, a home for the population from other cities of Rwanda. This makes the sector a mixed place of high and low-income families with a big fraction of high income. A small fraction of rural part remains which is also gradually getting urbanized in a planned way (Figure 13, (b)).



Figure 13. Urbanization process of Kinyinya sector

(a) Urukumbuzi village at Kinyinya sector. Source: Photo from Bahoneza website (2016); (b) Kinyinya before and during urbanization. Source: CentryRwanda website (2016)

Due to this progressive urbanization process, the total number of households is not known as P4 Company argues. But the company assumes that all households living in urbanized part are estimated to 2,891 households and get serviced. This evidences what have been discussed about the inconsistency in “urban area” definition in Rwanda and for other developing countries. The result may be the exclusion of urban poor community by considering them as rural or peri-urban households which do not need some of the public services including solid waste collection service.

- *Service provision practices in Kinyinya sector*

It is the responsibility of the households to find the waste materials for storage but some rich families request the company to distribute to them color-coded single-use bags with extra costs. Other households use non-color-coded reusable bags. The company argues also that there is no need to separate waste while it is again mixed on the dump site. Zero waste source separation is then experienced in Kinyinya sector and waste is mixed during collection.

A door-to-door waste collection service is provided to all households regardless their location and income. On the day of collection, the company's collection crews enter each household and pick waste at the storage points. Three owned Roll-on-vehicles are used to collect and transport waste to the Nduba dump site. To prevent air pollution and other health hazards related to waste transportation, vehicles are covered with sheeting as per defined in hygiene and sanitation guidelines of the City of Kigali mentioned above. Collection schedules and vehicle route plan are developed by the Managing Director per cell and the sector is composed of 4 cells. Generally, the cell is supposedly serviced in one day where all 3 vehicles are allocated there. The collection day may change due to vehicles breakdown or rain but the population is informed of the change.

P4 Company presumes the full cost recovery (100%). This may be explained by the fact that population lives in the estates which make user charges collection easy. It is also supported by the high willingness of the households to pay current user charges (33 out of 40 respondents) though an important fraction of households (7 households) find the service expensive. The company also presumes that jointly with the sector the public awareness campaigns are organized, especially for urban poor families who don't have access to TV and the company presumes their effectiveness.

The User charges collectors are allocated per village and paid 10% of the total amount collected. The user charges collectors report all payments to cells' supervisors and the latter report to the company office. In addition, the joint evaluation of the KCC and Rwanda National Police, evaluating hygiene and security is argued by the company to play an important role in the improvement of cost recovery and service provision in general. There is no particular initiative to reduce waste ending into the dump site. All collected waste is disposed of in Nduba dump site. The company doesn't know the distance between their operational zone and the dump site, but they argue the use of 40 minutes to and from the dump site. Kinyinya is among the sectors that are closer to the dump site which reduce their fuel costs and hence contributing to the full cost recovery recorded in this sector.

- *Solid waste collection Service regulation in Kinyinya sector*

Since 2012, Kinyinya sector has offered a 3-year franchise contract to P4 Company through an open competition and the renewal will pass again through an open competition as it is for the above companies.

The cross-subsidy for urban poor communities has been easily implemented in Kinyinya sector as the population living in the estates are rich families and hence, classified in the same income category. There is no laid-back influence of household to another as all pay almost the same amount and have the ability to pay. The baseline user charges approved by "Jyanama" are 2,000, 3,000 and 5,000RWF per month per each household (Approximately €2, €4 and €6) for low, middle and high-income households, respectively.

Households are not only involved in paying the service but also in the monitoring of the service quality as it is the case for other sectors. The service quality control is monitored through households' complaints. Like Kicukiro sector, the complaints of households are directly addressed to the company through a hotline call, supervisors and/or households come to the company's office. The complaints are responded in different ways such as calls, at the office or on the field through a joint inspection of the company and the sector. If households are not satisfied with the provided response they call the sector which is the witness of their relationship. The willingness of the sector officials to help the company has been evidenced but they are required in many activities which reduce their availability.

- *Characteristics of P4 Company providing the service in Kinyinya sector*

P4 Company has been registered in 2009 as a cooperative and became the company in 2015. As argued by the Managing Director, the change into the company was mainly triggered by the weak and complex management of cooperatives. She argued that *"...in cooperatives there is the lack of responsibility ownership while this business is so demanding, ...requires quick decisions and prompt changes in different settings while cooperative management structures are not flexible"*.

In terms of physical capacity, the company possesses 3 owned vehicles. Comparing the number of vehicles (3 vehicles) and the market share (2,891 households), P4 Company has evidenced high physical capacity as discussed later. This capacity explains the good service quality experienced in Kinyinya sector. The good quality service is evidenced by the big number of households (29 out of 40 respondents) that have presumed that the company respects collection frequency and schedules. It is

also evidenced by a small number of vehicle breakdowns (5 breakdowns per month) experienced by the company. Though the number of vehicle breakdowns is small, but P4 Company argues that their vehicles are affected by the state of the dump site during tipping and inadequate roads inside the sector as previously discussed for other companies. The company argues that these factors affect the collection schedule but not the frequency because the company has the Saturday as a reserve day. The change in the collection is evidenced by the dissatisfaction of 11 out of 40 respondents.

In terms of human capacity, the company has provided jobs to 33 permanent employees and their education levels range from primary to secondary level with the primary level being a dominant fraction. The company's salaries range from 30,000-140,000RWF per month (approximately €38-177) per month which is low and explaining the low education level of its staff as cheap labor are the most attracted. Comparing the market share of the company (2,891 households) and the number of supervisors (4 supervisors), the P4 Company has evidenced low human capacity. This low human capacity and low salary range can explain the current full cost recovery of the company. The company tries to reduce the cost by reducing the number of workers and by paying small salaries though the strategy is not sustainable.

5. Solid waste management in Kigarama sector

- *General characteristics of Kigarama sector*

Kigarama sector is also one of the 10 sectors composing the district of Kicukiro. The sector knows the big part with rural characteristics. Generally, Kigarama sector is not well planned because it is one of the aged areas of Kigali like Rwezamenyo sector. It also lacks improved roads which affect the performance of the company during the service delivery. In terms of income, Kigarama is a mixed sector of high and low income with low-income households occupying the big fraction. In total, the company has licensed 5,250 households and has a contract with 3,500 households, i.e. 67% service coverage. Kigarama is the sector with the lowest service coverage in Kigali. This can partly be explained by the whole cell (Nyarurama) which is totally rural and for which households practice home-composting and they don't want neither to sign a contract with the company nor pay the service fee as will be discussed later.

- *Service provision practices in Kigarama sector*

Like for many other sectors, it is the responsibility of the household to find the waste materials for storage. Various types of storage materials are used including color-coded single use bags (few high income families), not color coded reusable bags (low & middle-income families). Like Kicukiro, Rwezamenyo, and Kinyinya, P5 Company argues that there is no need to separate waste while it is mixed on the dump site. Zero waste source separation is experienced in Kigarama sector and waste is mixed during collection.

A door-to-door waste collection service is provided to all households. For inaccessible areas, the transit sites are created before waste is loaded into the vehicles. Three owned old Roll-on-vehicles are used to transport waste to the dump site. The Collection schedules are developed by the Managing Director and the vehicles are allocated per cell. Kigarama sector is composed of 4 cells but one of them is rural (Nyarurama) which means that few of their households get serviced. The service is provided from Monday to Friday. The vehicle driver is responsible for collection supervision. Due to old vehicles, the collection frequency and schedules are not always respected which affect the willingness to pay for households and cost recovery as well.

The P5 Company presumes the cost recovery of 60%. More than half of the respondents (25 out 39 respondents) have evidenced their willingness to pay the current user charges. But the fraction of

respondents that find the service expensive is also not negligible (14 respondents) which can explain partly the low-cost recovery through the use of user charges. The User charges collectors are allocated per village and paid 10% of the total amount collected. The user charges collectors report directly to the company office. This evidences the weak follow-up of the company on user charges collection as one person is charged to receive the payment collection reports at the company office which also explains the low-cost recovery (60%).

There is no particular initiative to reduce waste ending into the dump site. Therefore, all collected waste is disposed of in Nduba dump site. The company presumes that the distance to the dump site is unknown, but that each vehicle needs 2 hours to and from the dump site per trip.

- *Solid waste service regulation in Kigarama sector*

Since 2012, P5 Company has been awarded a 3-year franchise contract to provide the service in Kigarama sector. The contract has been offered through an open competition. The renewal of the contract will be automatic based on the company performance and it is the only sector which has the automatic renewal.

Generally, the automatic renewal would lead the company to work hard to maintain the contract but the company argues that all owned vehicles are old which contribute to the high rate of breakdowns (about 4 breakdowns a week) and hence, affecting the service quality and increasing the operations cost. The long term solution is to buy the new vehicles. As discussed in previous sections, the company recovers only 60% of the costs using the user charges and few commercial customers. This means that it is hard to buy new vehicles using user charges. The other way would be to use the bank loan. But the company argues that with the short-term contract, associated with truncated financial status, it is not easy to get the loan. From this, there is a high probability that P5 Company will be competed out by big companies or small organized companies like P4 company that have evidenced to provide good quality service.

The user charges caps set by RURA for Kigarama sector are 1,800, 3,500 and 5,500RWF per month per each household (Approximately €2, €4 and €6.5) for low, middle and high income households, respectively. The same user charges caps have been approved as end-user charges by “Jyanama”. In practices, various user charges are paid from zero (for exempted households) to 5,500RWF based on the income realities of households. This evidences the involvement households at all levels at the sector level.

Not only households are involved in paying the service and setting user charges but also in the monitoring of the service quality. The service quality control is done through households' complaints. The complaints of households are directly addressed to the company through a hotline call, supervisors and/or households come to the company's office. The complaints are responded at the office or on the field through a joint inspection of the company and the sector. They can also call directly to the sector if they are not satisfied with the provided answer. The sector officials are willing to help the company but they are required in many activities which reduce their availability as also have been discussed previously.

- *Characteristics of P4 Company providing the service in Kigarama sector*

P5 Company has been registered in 2010 as a waste collection Company. Since this time, the company has been and is providing the service in Kigarama sector.

In terms of physical capacity, the company possesses 3 owned old vehicles. The comparison of the number of vehicles and market share has evidenced the low physical capacity where it shows that the company needs 6 days a week to provide the service to all households. This would work but the

company owns old vehicles which increase the number of breakdowns up to 4 breakdowns a week. It is then hard for the company to meet the collection frequency and schedules as also evidenced by 30 out of 39 presuming that the company doesn't respect collection frequency and schedules.

In terms of human capacity, the company has provided jobs to 56 permanent employees and their education levels range from primary to secondary level with the primary level being a predominant level. The company's salaries range from 30,000-200,000RWF per month (approximately €38-€253) per month. It is clear that the salaries range is low which can explain the low education level of its staff. Comparing the market share of the company (3,500 households) and the number of supervisors (4 supervisors) the P5 Company also has evidenced the low human capacity which can also explain the low-cost recovery and service coverage as discussed later.

6. Solid waste management in Kagarama sector

- *General characteristics of the sector*

Kagarama sector is also one of the 10 sectors composing the district of Kicukiro. It is a newly urbanizing sector where the big part of the sector has the rural characteristics (Figure 14, (a)). The total households of the sector are not known because there are many new growing households. But the total households is estimated to 2,045 with 1,454 households (71%) having a contract. For the Company, the service coverage is estimated to 97% because other areas are rural. Like Kicukiro sector, many roads inside the sector are not paved (Figure 14, (b)) which affects the collection service during the rain period. The growth follows the current Master Plan of Kigali as a new urbanizing area which makes the sector a well-planned area. Kagarama is a sector with a low population density. In terms of the income level of households, it is a low and high income sector but with a big fraction classified in high income.



Figure 14. Rural Character of Kagarama sector with non-paved roads

(a) *Rural Character of Kagarama sector (Source: Photo was taken by the Author in Kagarama Sector, 2015);* (b) *Non-paved roads (source: Photo taken by the Author in Kagarama sector)*

- *Service provision practices in Kagarama sector*

Like for other companies, both sector officials and P6 Company don't know the quantity of waste generated by households residing in Kagarama sector. The generated waste is not separated at the household level and it is the responsibility of the household to find the waste materials for storage. For this, households use various waste materials to store their waste. Mainly households use not color-coded reusable bags from their daily life.

A door-to-door waste collection service is provided to every household. Before P6 involvement in Kagarama sector, households used to put waste on their gates on the day of collection and waste could pass there long hour's period before collection. This attracted more street children to scavenge on waste. As a solution, the company knocks on each door on the day of collection when the vehicle arrives. This is possible because P5 Company owns three Roll-on-vehicles (Figure 15) and their market share is small (1 sector). But it costs them time which leads the company to provide the service every day from Monday to Friday and related operations costs. The Vehicles are allocated per village and the sector

has 3 Cells. Some irregularities occur due to high rate breakdowns because vehicles are old but in general collection frequency and schedules are respected.



Only 50% of the total costs are recovered using the user charges. The highest cost recovery reaches 70% and this why it is not easy for the company to renew vehicles. Few commercial customers subsidize the service waiting for the delaying payments.

User charges collectors are allocated per village and paid 10% of the total amount collected. The user charges collectors report payments directly to the company office.

Figure 15. Service provision in Kagarama sector using Roll-on-vehicle

Source: Photo was taken by the Author in Kagarama sector (2015)

But the Managing Director acknowledge the weakness of this user charges collection framework which doesn't ensure strong follow-up on payment collectors. But since the last year of 2015, the company argues to have developed a new organizational structure giving the Cells' supervisors the responsibility on user charges collection as a way to increase the house-to-house follow-up. But the effectiveness of this reform is not yet evidenced.

There are discrepancies between cost recovery figures from the sector (70% in 2014 and 95% in 2015) and figures provided by the company (from 50% to 70%). Though both figures evidence the improvement in cost recovery but it is important to know why this difference between these figures. Partly, it is explained by the above mentioned rural character of the sector. While the target of the company is to reach every household, the sector considers only the registered households. The list of registered households may not be updated for the sector while the company has recorded the new growing settlement though not registered as a household that composes the sector. As the company regularly passes through the whole sector during the service provision and payment collection, the sector should sit with the company to update the list and harmonize their figures.

About willingness to pay, 24 households out of 39 respondents are willing to pay the current user charges while the remaining fraction is willing to pay less. This means that they find the service expensive which is a disincentive to cost recovery. Like Kicukiro Sector, the revision of the current user charges is needed by involving the households in large and put a particular emphasis on the fraction of households that are willing to pay less. Otherwise, the full cost recovery will not be achieved.

As discussed above, all collected waste are mixed during collection and ends with the communal dump site of Nduba. The company plan to combine the issue of low-cost recovery and waste sorting but the project is not yet developed. The concept aims to develop some waste separation facilities in different areas of the sector where households can drop their waste and get paid. This can not only help them to get money to pay the company but also, the company can get money to fill the cost recovery gap. In long, this can reduce waste to dump. The main challenge to implementing this project is the lack of human capacity as the company presumed which also reduce the probability to be implemented. Furthermore, the implementation requires heavy investment to install necessary waste drop-off facilities while the P6 Company knows the low-cost recovery and financial capacity in general.

Kagarama is located in 40Km from the communal dump site and each collection vehicle needs at least 2 hours to and from the dump site. This evidence high fuel costs. The roads to dump site are also not

improved which is among the main causes of vehicles breakdowns in addition to the worst state of the dump site. These factors and the fact owned vehicles are old increase the maintenance costs and the stumpy cost recovery.

- *Solid waste collection Service regulation in Kagarama sector*

Since 2012, Kagarama sector has offered a 3-year franchise contract to P6 Company through an open competition which the renewal will follow the same process.

As discussed earlier, the sector is a newly urbanizing area which means that a big fraction of households has rural characteristics having the free space where they bury their waste. The poor and middle-income families do not easily adhere to the system under the pretext to have free space to bury their waste and others burn the non-biodegradable waste. Together with the company, the sector is working on the public awareness to change this attitude which is affecting the cost recovery.

The same process as for other sectors has been followed to set end-user charges in Kagarama sector and income levels have been considered. The user charges caps set by RURA are 1,800, 3,700 and 5,700RWF per each household per month (approximately €2, €4.5 and €7) for low, middle and high income, respectively. The baseline user charges approved by “Jyanama” are 1,500, 3,500 and 5,500RWF (approximately €2, €4 and €6.5) per month per each household for low, middle and high income households, respectively.

Like for Kinyinya and other sectors, households are involved in paying the service and in the monitoring of the service quality. There is no much control of the sector officials on private operators. The quality control is mostly made through households’ complaints. Kagarama sector encourages the good relation between the service provider and the households. The complaints of households are directly addressed to P6 Company through a hotline call, supervisors and/or households come to the company’s office. The complaints are responded calling back, they are managed at the company office or on the field through a joint inspection of the company and the sector.

- *Characteristics of P6 Company providing the service in Kagarama sector*

P6 Company is a young company which has been registered in 2011 as a waste collection company. The privatization starts when the company has only 1 year of experience. Compared to its twin company P3 which they were registered in the same year, P6 Company is not growing, both in terms of physical and human capacity and in terms of market share.

Currently, P6 Company owns 3 old Roll-on-vehicles with the capacity of 5 tons each while P3 owns 8 vehicles as discussed earlier. In terms of market share, the company started providing the service in 2 sectors including Kagarama sector. But it has been competed out in 2013 by P3 Company in Niboye sector. The Managing Director argues that the failure to provide the service in Niboye was related to financial limitation and to the lack of experience. Though the company is getting experienced it still suffers the financial limitation which is evidenced earlier with low-cost recovery. It is also clear that if the company does not find other strong strategies to raise the financial capacities, there is a high probability to be competed out by big companies as has been the case when it has lost Niboye sector.

From the above number of vehicles (3 vehicles) and the market share (1,415 households), the company has evidenced the physical capacity matching with the current market share as discussed later. The company counts about 4 breakdowns a week but still meets the frequency. The company records the changes in collection schedules but households are informed about the changes. This explains the high satisfaction level of households as evidenced by 29 out of 38 respondents presuming that the company respects the collection frequency and schedules.

In terms of human capacity, P6 Company has in total 23 permanent employees. The education level varies from primary to tertiary level with the primary level having a big fraction (13 workers). The company's salaries range from 30,000-150,000 RWF (approximately €38-190) per month which is low and explaining the low education level of its staff. The vehicle route plan and collection schedules are prepared by the supervisors. P6 Company Managing Director argues that they do not always make a vehicle route plan. This can be explained by a small number of supervisors (2 supervisors) compared to the company's market share.

4.3. A comparative analysis of solid waste collection mechanisms and outcome for six sectors in Kigali

As discussed in Chapter 3 of this report, to explain the variations in the outcome of the Private sector involvement in solid waste collection service for different operational zones (sectors) in Kigali, a conceptual framework (Figure 2), combining the elements of sustainability for solid waste management and the determinants of the sustainability has been used. For the determinants of sustainability, the framework considers the four concepts discussed in the previous section: the capacity (physical and human) of service providers, the involvement of households, physical and general characteristics of the operational zone (sector) and service provision regulation by the public sector. For the elements of sustainability, the framework considers three concepts: Environmental sustainability, financial sustainability, and social sustainability referring to [Van de Klundert and Anschütz \(2001\)](#) framework. This section discusses the findings for each element of the sustainability and factors that are shaping their outcome by comparing the management of solid waste collection service in the above-selected sectors.

The sustainability of solid waste collection service is achieved when it delivers an appropriate and equitable service in terms of quality and affordability over a long period of time without having a negative effect on the environment and the system should consider the local context as argued by [Van de Klundert and Anchutz \(2001\)](#). The following sections discuss the findings for each element of sustainability and the factors that are influencing the outcome.

4.3.1. Environmental outcome of Private sector involvement in Solid waste collection service in Kigali

The indicators for environmental sustainability seek to assess the environmental hazards related to solid waste collection services such as the collection rate and level of waste separation at source and recycling rate which all determine the amount of waste ending into dump site and related environmental degradation effects. Table 3 summarizes the outcome of privatization of solid waste collection service on the environmental aspect in Kigali using six sectors (Remera, Rwezamenyo, Kicukiro, Kinyinya, Kigarama, and Kagarama) as a case study as mentioned above. For each sector, 40 households were targeted for the interview.

Waste generated in Kigali, as well as the contribution of each sector, are not known. Various studies ([Kaseva and Mbuligwe, 2005](#); [Scheinberg, 2011](#); [Oberlin, 2011](#); [Kassim, 2006](#); [Okot-Okumu, 2008](#)) have evidenced that households are the main contributors of generated waste in East African Community (EAC) country members and Kigali is no exception as more than 90% of disposed of waste is from households. Though the generation rate is not known, Table 10 shows that all collected waste ends into the communal dump site, except for Remera sector which disposes of 70% of the collected waste. It has also been presumed by the KCC that the quantity of waste disposed of has more than doubled from 180 tons/day (2012) to 300 tons/day (2015). This increase is also explained by the low performance of waste separation at the household level as shown in Table 10.

For all sectors, the performance of waste separation at source is zero percent, except Remera sector where all interviewed households have presumed to separate waste. This is also the case for many developing countries and particularly African countries such as Uganda, Tanzania, and Kenya, where there is no sorting at the household level as argued by [Okot-Okumu \(2008\)](#) even though informal waste pickers are playing an important role to reduce waste ending into the dump site.

Table 10. Solid waste collection privatization Outcome on environmental aspect in Kigali

Sector	Company	Sample size	Performance in waste separation at household level	Fraction of waste disposed of (%)	Sanitary conditions and waste overflow	
					Very good	Good
Remera	P1	40	100%	70%	18	21
Rwezamenyo	P2	39	0%	100%	0	25
Kicukiro	P3	38	0%	100%	0	36
Kinyinya	P4	40	0%	100%	0	39
Kigarama	P5	39	0%	100%	0	34
Kagarama	P6	38	0%	100%	0	35

From this, it is evident that the performance of waste separation at source is low but not zero as households separate waste that they consider having value for them. These include food waste to feed animals and home composting and some non-biodegradable waste such as plastic bottles, metal cans, cardboard boxes, etc., which are reused at domestic level. Likewise, for Kigali, scavengers collect, and sometimes buy, plastic/glass/metal bottles and discarded buckets and sell them to recycling companies or for local reuse purposes.

Some households living sectors with rural characteristics make small agricultural activities and need organic waste for composting. This is the case for Kigarama, Kagarama and Kinyinya sectors. For Remera sector, waste separation is enforced because P1 Company has initiated recycling activities of film plastics and sell other types of recyclables to Uganda recycling actors. [Okot-Okumu \(2008\)](#) presumes that for some EAC, waste separation is done at transfer stations, collection vehicles and at the dump sites. This is the case for Kigali where collection crews find waste scavenging as an additional source of income because their salaries are very low ranging from 30,000 to 50,000RwF (approximately €38-62 per month). For this, almost all waste collectors from different companies separate waste during vehicle loading and at the dump site as shown on Figure16 and sell them to recycling companies and street buyers.



[Wilson et al. \(2013\)](#) argue that many cities of developing and transitional countries have dynamic informal actors in waste recycling and reuse which are driven by the market value of discarded materials. For [Scheinberg et al. \(2010a, 2011\)](#), these informal actors save about 20% or more of the budget that would be allocated to solid waste management activities. This is the case for Kigali as discussed earlier. Formally, as also shown in Table 10, there is a simplistic assumption that waste separation, reuse and recycling performance is zero while the above discussed informal waste separation and scavenging evidence the important contribution of the informal private sector in reducing waste to dump. The main challenge is the conflict of interest between the informal waste pickers and contracted companies to provide collection service as also it has been evidenced for many developing countries ([Wilson, 2013](#)).

Figure 16. Waste separation at Nduba Dump site by companies' waste collectors

Source: Photo was taken by the Author at Nduba dump site, Kigali (2016).

On one hand these informal practices have a negative effect on the cost recovery as households request the reduction of user charges after selling or reusing waste in various sectors with rural characteristics including Kigarama and Kagarama. On the other hand, some companies such as P1 in Remera, use the recyclables and recycled products to fill the gap in cost recovery.

Different authors ([Wilson, 2013](#); [Velis et al., 2012](#); [Scheinberg et al., 2011](#)) have suggested the integration and institutionalization of this informal recycling actors as a solution to the above-mentioned conflict of interest although this can also generate new governance-related problems such as the displacement of existing recycling initiatives such as in Remera sector. Different reasons may explain the current households' waste separation including the high cost of waste storage materials which will be discussed later.

At the household level, waste storage is determined by the household income level as it is the responsibility of the household to find the storage materials, except for Remera sector where P1 Company distributes them to households with surcharge. Therefore, various materials are used to store waste as it has been evidenced for many developing countries ([Kassim, 2006](#); [Oduro-Kwarteng, 2011](#); [Scheinberg, 2011](#); [Kaseva and Mbuligwe, 2005](#)). These materials include color-coded plastics bags (high income households), reusable plastics which is the most used (middle and poor families) and cut jerry cans, broken buckets, cardboard boxes, etc. (low-income households).

In general, waste is collected directly from households to dump site, except for Remera sector. A door-to-door waste collection service is provided to all households regardless their level of income. But for Remera sector both door-to-door and communal waste collection services are provided based on the accessibility of the households. Practically, for all sectors the creation of transit sites is required especially for poor families living in inaccessible areas where collection vehicles cannot reach though it is discouraged by the KCC. For Remera sector, households living those areas compulsorily bring waste on collection sites which incur extra cost to middle and poor families to pay labor to put waste on collection points.

Like for other developing country cities ([Okot-Okumu, 2008](#); [Scheinberg et al., 2011](#); [Kassim, 2006](#); [Oduro-Kwarteng et al., 2006](#)), the transportation of waste in Kigali is done using second-hand vehicles imported from foreign countries. The dominant waste collection vehicles type is Roll-on-Vehicles except two companies (P1 and P2) which have imported 4 compactor trucks. To prevent street littering and air pollution alongside waste collection and transportation, companies are requested to build their vehicles and cover them with metallic materials or sheeting as per defined in Kigali hygiene and sanitation guideline (2012). This practice is enforced by the traffic police applying the sanctions defined by this guideline going up to 500,000RwF, (approximately, €633), for indiscriminate disposal. This has limited the number of the incidents of street scavengers who want to pick valuable waste during transportation although companies record more such incidents (P1 recorded 3 incidents in 2014). Vehicles are loaded by collection crews making the high operation costs in terms of time and financial aspects as they are loaded manually for all companies as it is also the case for many African countries ([Okot-Okumu and Nyenje, 2011](#); [Kaseva and Mbuligwe, 2005](#); [Kassim, 2006](#)). The number of loading workers varies from 7 to 10 per vehicle.

While many researchers have presumed that collection rate in low-income countries ranges from 35-68% ([Vidanaarachchi et al., 2006](#); [Palcznki, 2002](#); [Scheinberg, 2011](#)) and [Wilson \(2013\)](#) presuming that the least performing low-income city among the six reference cities recorded collection rate ranging from 45-60%, Kigali records the collection rate of 90%. This shows that there is a tremendous improvement in collection coverage with the involvement of private sector as it was estimated to 44% in 2012 before the privatization. This improvement is also evidenced by the improvement of sanitary conditions and waste overflow at the household level and in sectors before and during service provision where for all sectors more than half of the interviewed households has ranked the sanitation conditions with "Good"

score as shown in Table 10. But, as the collection rate is not 100%, this shows that there is a portion of waste which remains uncollected as it has been evidenced for other East African urban centers (Okot-Okumu, 2008).

While Wilson et al. (2012) and Scheinberg et al. (2010b) argue that there is an improvement for low-income countries in final disposal where around 50% of collected waste is disposed of in controlled dumpsite, for Kigali, 90% of collected waste ends into an open communal dump site (Nduba). The capacity of this dump site is very limited and the dump site is almost full causing various environmental hazards and water pollution through leachate and health hazards for scavengers as shown in Figure17.

Johannessen and Boyer (1999) argues that many disposal sites for developing countries are located in environmentally sensitive areas such as wetlands, forests, near water bodies and on top of hills which is the case for Kigali communal dump site. The author argues also that they are often mismanaged where they do not have fences, liners to collect leachates, soil covers, and compactors to reduce the volume occupied by dumped waste and Kigali is no exclusion as shown in Figure17.



Figure 17. The Current view of Nduba disposal site

(a) The view of the site and leachate from the dump site (source: Photo taken by the Author in Kigali, 2016); (b) Health problems of scavengers in Nduba dump site (Source: Photo taken by the author in Kigali, 2016)

Various researchers such as Kavazanjian and Merry (2005) in Philippine and Koelsch et al. (2005) in Indonesia, have also evidenced the incidents related to the mismanagement of landfills and the inappropriate locations of waste sites. To respond to citizens' complaints related to the dumping sites hazards, some megacities, like Delhi and Mumbai are closing existing disposal sites (Wilson et al., 2013). Likewise, in 2012 KCC has closed the former dump site located at Nyanza in Kicukiro district, and shifted at Nduba sector in Gasabo District. Not only this change has not contributed to solving the environment hazards related to the mismanagement of waste disposal as shown on Figure17, but also, it has contributed to the increase of waste transportation costs such as fuel costs, to service providers. The former dump site was located at 10Km from the city center while the distance to Nduba dump site has more than doubled (25Km).

In fact, based on the composition of waste generated in Kigali, and based on the fact that the main economic activity of Rwanda is agriculture, solid waste would not be a problem. Like for other waste generated in East African cities such as in Uganda (Okot-Okumu, 2008), 70% of waste generated in Kigali is organic as summarized in Table 11. This means that the composting can importantly reduce the effect of solid waste disposal on the environment as the technical viability has been evidenced in Uganda (Kumar, 2006) and in Tanzania (Oberlin and Sza'nto', 2011).

The KCC has tried various initiatives to improve the dump site infrastructures and incorporation of composting. They have commissioned a consulting firm "wat Ingenieurgesellschaft mbH" to develop the design for the improved landfill which would have a recycling component as detailed through the New Landfill Site and Recycling Centre, Kigali – Rwanda Detailed Design Report (2012). This project was funded by UNDP and implemented under the "consolidated Waste Management Project in Rwanda".

Wilson et al. (2013) argue that the main challenges for developing countries to improve disposal are related to the governance. The high capital investment and operational costs for dump sites require a strong commitment of governments which is lacking for many developing countries and Rwanda is no exception as waste competes with other development activities.

Table 11. Predicted waste generation from 2012 up to 2016 in Kigali

Type of waste	Fraction (%)	Estimated amount of waste generated per year (In tons)				
		2012	2013	2014	2015	2016
Organics	70	102,200	107,888	113,892	120,230	126,921
Plastics	5	7,300	7,653	8,022	8,410	8,816
Paper	6	8,760	9,183	9,627	10,092	10,579
Aluminium	3	4,380	4,596	4,823	5,061	5,311
Glass	1	1,460	1,534	1,611	1,692	1,777
Various	15	21,900	23,004	24,163	25,381	26,660
Total	100	148,012	155,871	164,152	172,881	182,080

Source: Edited by the author from *SWM Strategic plan for Kigali (2012)*

This has also been argued by Oberlin and Sza'nto' (2011) that the success of any initiative to improve the management of the dump site and the recycling initiatives requires the commitment of the government to support the technical viability. Wilson et al. (2013) also argue that the government commitment is not enough though imperative, but also the financial capacity is necessary.

The financial limitation is the main challenge for many developing country cities and Kigali is no exception. For this, many developing countries look for the investment capital from international aids which lead to the failure of many projects and Kigali is no exclusion. This is the case for Lusaka in Zambia where the landfill was funded by DANIDA, a Danish funding agency and Dhaka in Bangladesh, landfill funded by JICA, a Japanese funding agency as argued by Wilson et al. (2013). Likewise, the government of Rwanda has evidenced the strong commitment to improving all cities and particularly Kigali as the capital city, but the financial limitation is still the main challenge. For the above-mentioned project to improve the dump site by integrating the composting, the design of the landfill has been developed by the consultant as requested by the KCC, but the implementation failed due to the lack of the budget, wanted from the international aid.

The KCC is now trying to find a solution using available resources although their effect is small compared to the generated amount. In collaboration with some informal recycling initiatives, the KCC has installed a pre-processing facility at the dump site as illustrated by Figure12. Based on the fact that recyclables can be contaminated during collection, it is better that the city installs these facilities in places where recyclables are recuperated before disposal.



To conclude with, the involvement of private sector in solid waste collection in Kigali has not solved the problems related to solid waste management on the environment, but it has shifted the problems from households and sectors to the environment.

Table 12. Waste pre-process facility at the dumpsite in Kigali

(Source: Photo was taken by the Author at Nduba in Kigali, 2016)

On one hand, a low level of waste separation at household level has been evidenced to contribute to the environmental degradation where more than 90% of the collected waste ends into Nduba dump site. On the other hand, there is a growing involvement of informal waste pickers saving a fraction of the city's budget even though their involvement creates the conflict of interest between them and contracted waste collection companies and that their contribution has not been evidenced during this study. The evolving informal recycling is still minimal to solve the problems related to waste ending into dump site which has more than doubled from 180 tons/day in 2012 to 300 tons/day in 2015. The KCC is trying a various solution using available resources at the disposal level by installing pre-processing facilities which is also insignificant and there is a high risk of contamination of recyclables. To optimize their impact it is then better to integrate the informal recycling with waste collection service though this needs more attention as it may create new governance related challenges. This integration can be possible if companies and households are incentivised to promote source separation of waste and if companies can provide transportation means avoiding the mixture of separated waste as has been evidenced for Remera sector. Now, the question is to know why waste is not sorted at the household level. Why companies mix waste during collection? And why there are variations in sanitation conditions and waste overflows for different sectors as shown in Table 10? The following section discusses various factors that are shaping the current environmental outcomes after the private sector involvement in solid waste collection service in Kigali.

4.3.2. Factors influencing the environmental outcome for solid waste collection service in Kigali

From the above environmental outcome of Private sector involvement in solid waste collection service, as summarized in Table 10, three different groups are distinctive comparing the findings in sectors. The First group is composed of Remera sector the only sector where waste separation at source is practiced and hence, reducing waste ending into dump site and the highly improved sanitary conditions and waste overflows at household and sector levels. The second group is composed of the Rwezamenyo sector. For this sector no waste separation is performed, all collected waste ends into the dump site and sanitary conditions and waste overflows has not improved compared to other sectors. The third and last group is composed of Kicukiro, Kinyinya, Kigarama and Kagarama sectors where waste separation has not improved but the sanitary conditions and waste overflows have improved with minor variations between these sectors.

The chapter 2, section 2.6.3 has discussed the determinants of solid waste collection sustainability which include internal and external factors as also summarized by the conceptual framework (Figure 2) from which this study has evidenced three as main factors shaping the environmental outcome. Internal factors include mainly the human and physical capacities of companies which shape also the company's organizational, management and planning capabilities. The external factors include the regulatory framework and general and physical characteristics of sectors. The regulations include mainly waste separation regulations and disposal practices. Furthermore, there is interdependence between these factors. For example waste separation enforcement and institutionalization has a strong influence on physical capacities to allow separate collection of separated waste as discussed later.

Internal factors influencing environmental outcome

- *Company's physical and human capacity influence*

The involvement of private sector in urban solid waste collection aims to ameliorate the efficiency of the service provision and to benefit from private investment as it has been discussed in the previous sections. Various studies have discussed the main individual factors explaining the performance of private sector with regard to solid waste management sustainability ([Cointreau-Levine and Coad, 2000](#);

Donahue, 1989; Bartone, 1991) and the physical and human capacities of the company have been evidenced to have a great influence in developing countries.

The mixed results about the linear relation between the number of vehicles (operations scale) with regards to the households to be serviced and the performance of the company have been evidenced (Nachum, 1999). For Boyne (2003) there is no linear relationship between physical capacity and the performance because a small organization may perform well than medium or big ones or vice versa as discussed in section 2.6.3 of this report. For Stevens (1978) the improved technology, sufficient number and bigger trucks with regards to the number of customers have been evidenced to contribute to the efficiency of private firms in large cities by using smaller groups. For this study, the influence of the number of vehicles and employees has been studied by computing the vehicle and supervisor efficiencies and the results are summarized in Table 13.

The vehicle efficiency is defined by Bartone et al. (1991) as the number of households serviced by one vehicle on the day of collection. The same definition has been adopted for this study and the vehicle efficiency has been computed making the relationship between the total households having a contract with the company and the number of vehicles on road, i.e. vehicle owned by the company and vehicles rented by the company assuming each vehicle making two trips a day as summarised by Formula 1.

In addition, the use of vehicle efficiency to assess the impact of physical capacity on environmental outcome has based on the following four assumptions. Firstly, the total number of households having a contract with any company (market share) is assumed to be the same for all operational zones serviced by that company. Secondary, based on the interviews made with different service providers, one vehicle trip covers 100 households. From this, we assume that all vehicles have the same capacity and that each covers 100 households/trip. The third assumption is that each vehicle makes two trips a day to find needed days for each company to cover its market share. Finally, though the number of vehicles is strongly influenced by the number of rented vehicles which may have a strong influence on vehicle efficiency, we assume that the number of vehicles on the road is constant. As vehicle renting agents are profit oriented, this reduces the vehicle reliability which increases the company's probability to do not respect the collection frequency and schedules though this has not been evaluated during this study.

$$\text{Vehicle efficiency} = \frac{\text{Number of household with contract}}{\text{Tot. Number of Vehicles on road} * 2 \text{ trips}} \quad (1)$$

Likewise, the supervisor efficiency denotes the total number of households supervised by one supervisor per day. This has been determined by making the relationship between the total estimated number of households having a contract with the service provider and the total number of supervisors of the company as summarized by Formula 2. The same assumptions about the company's market share remain valid. The number of supervisors is assumed constant.

$$\text{Vehicle efficiency} = \frac{\text{Number of household with contract}}{\text{Tot. Number of supervisors} * 6 \text{ days}} \quad (2)$$

The use of supervisor efficiency to assess the impact of human capacity on environmental outcome seeks to explore the company's management and planning capacity where for many companies supervisors are responsible for developing collection schedules and route plans. The assumptions made base on the Rwanda Labour law N° 51/2001 of 30/12/2001 establishing the labor code of practices presuming that the private employees must work not more than 45 hours, i.e. 8 hours a day from Monday to Saturday. From this, we assume that supervisors work 6 days a week and 8 hours a day.

Though P1 and P4 have the different market share (13,500 and 2,891 households, respectively), Table 13 shows that they have the same vehicle efficiency. This vehicle efficiency is high as evidenced by the fact that both companies need 5 days a week to provide the service to all households of their operational zones as shown in Table 13.

Table 13. Number of companies' supervisor and vehicle efficiency

Company	No. of vehicles in operations	No. of supervisors	No. of households with contract	Vehicle efficiency	Supervisor efficiency	Needed service days/week
P1	14	20	13,500	482	113	5
P2	12	13	45,000	1,875	577	19
P3	10	15	16,000	810	178	8
P4	3	4	2,891	482	120	5
P5	3	4	3,500	584	146	6
P6	3	2	1,415	236	118	2

[Stevens \(1978\)](#) argues that the improved technology, sufficient number and bigger trucks with regards to the number of customers have been evidenced to contribute to the efficiency of private firms in large cities by using smaller groups. This is the case for Kinyinya sector and Remera sector. Comparing Table 10 and Table 13, there is evidence of linear relationship between company's physical capacity and the sanitary conditions and waste overflows where both companies (P1 and P4) have evidenced high efficiency (Table 13) and both sectors (Remera and Kinyinya) have evidenced higher improvement of sanitary conditions than other sectors (Table 10). For both companies, it is evident that with 5 working days there is a high probability to respect the collection frequency and schedules which explain the above improvement for Remera and Kinyinya sectors.

Though for both sectors there is an improvement, Table 10 shows that for Remera sector sanitary conditions were ranked by 18 respondents as "Very good" and as "Good" by 21 respondents while for Kinyinya there is no "Very Good" ranking but all 39 ranked it "Good". This shows that there is a higher improvement in Remera sector than in Kinyinya sector. From this, it is also evident that other factors influence the outcome.

Comparing the supervisor efficiency for both companies, P1 Company evidenced higher efficiency than P4 Company. This explains the difference in the above outcome for both sectors. Various studies ([Hansen and Wernerfelt, 1989](#) and [Boyne, 2003](#)) have evidenced the relationship between companies' performance and operational and strategic processes management. Among the management variables, the above authors mentioned strategic variables (leadership styles and management of human resources) and operational variables (planning capacity, operations supervision capacity, and improvement of operations, service design, and management of maintenance) which have been the object of this study. This is the case for Kinyinya and Remera. As discussed earlier, P1 Company has presumed to develop always route plan and collection schedules where they are developed by the Operations Director. In contrast, for Kinyinya, they are developed by supervisors. Based on the above-mentioned low supervisor efficiency which evidenced the limited availability of supervisors, there is a high probability to do not develop route plans which are translated into inefficiency. Therefore, P1 Company serving Remera sector has evidenced the higher operations planning and management capabilities than other companies including P4 serving Kinyinya which explains the above differences.

Table 10 shows that Rwezamenyo sector records bad sanitary conditions compared to other sectors (only 25 respondents ranked it "Good"). Likewise, Table 13 shows that P2 Company providing the service in that sector records the weakest vehicle efficiency (1,875 households/vehicle) as also evidenced by the days needed to cover the market share in one week as required by the KCC. While the company is required to work six days a week, the computation shows that the company needs 19 days a week which is not possible. Comparing both results (Table 10 and Table 13), it is clear that the

low improvement in sanitation conditions and waste overflows in Rwezamenyo sector is explained by the weak physical capacity of P2 Company.

As discussed earlier on, P2 Company relies on others vehicles which also is not a sustainable solution. Waste collection vehicles are built in a way that it is not easy to be used for other purposes. If the vehicle knows the breakdown it is not easy to get easily another on the renting market. This again increases the risk to lower the vehicle efficiency and their impact on the service regularity. This framework not only doesn't secure the service regularity but also, it doesn't ensure separate waste collection which was evidenced by zero waste separation and 100% contribution to waste ending into dump site experienced in Rwezamenyo sector (Table 10). The hired vehicles are paid per number of trips. Therefore, integrating waste collection with recycling would incur operations cost to ensure separate collection. In addition, vehicle owners optimize their income by increasing the number of trips. This means that the separate collection would increase the vehicle loading time and hence, reducing the income by reducing the number of trips. This again explains the influence of physical capacity to environmental sustainability aspects for waste collection service where collection vehicles are a disincentive to waste source separation.

Table 10 shows another group of sectors which include Kicukiro, Kigarama, Kinyinya and Kagarama for which record the improvement in sanitary conditions but with zero waste separation at the source which is more influenced by the regulatory framework as will be discussed later. Though all sectors record improvement, P3 Company serving Kicukiro sector has the low physical capacity as evidenced by the needed days in a week (8 days) to cover the whole market share. Though P3 is the second company in terms of owned vehicles (8 vehicles) after P1 (10 vehicles), it has evidenced the unbalance increase in market share (4 operational zones) with the number of vehicles as it is evidenced by the low vehicle efficiency (810 households/vehicle) as shown in Table 13.

On one hand, comparing the results about sanitary conditions for Kicukiro sector (36 good rankings) and other sectors, there is no big difference which confirms what [Boyne \(2003\)](#) has argued that there is no linear relationship between physical capacity and the performance. Based on Table 13 results evidencing the weak physical capacity of P3 Company we would expect the worse situation in Kicukiro but Table 10 shows the contrary as mentioned above. We would also expect the strong management and planning capacities which both lead to the optimization of the vehicle utilization to compensate the weak vehicle efficiency evidenced. But the supervisor efficiency is not so good (178 households/supervisor) and the company has argued to do not prepare route plan. From this, it is evident that other factors explain the outcome in Kicukiro sector which this research has not evidenced. The more deep analysis is a need for Kicukiro to know the factors that are shaping the environmental outcomes which evidence the improvement of sanitary conditions and waste overflows while the physical and human capacities are weak.

On the other hand, the weak physical capacity has a strong influence on the current waste separation at source in Kicukiro sector where the company optimizes the number of trips and the capacity of the vehicle by mixing all waste during collection. This can partly explain the above ambiguity on sanitary conditions improvement. There is the probability that each vehicle make more than two trips which are made possible by two factors as argued by the company. Firstly, the company allocates more collection crews per vehicle (10 workers) to reduce the loading time. Secondary, the company argues to have new vehicles which increase the vehicle efficiency by reducing the time to dump site. Though these strategies increase the efficiency of the company and evidence the operations efficiency in general, they generate new problems including the overexploitation of collection crews and the damage of vehicles which has been evidenced by a big number of vehicle breakdowns (4 breakdowns/week) considering that the owned vehicles are new.

For Kagarama sector, P6 Company records the highest physical capacity (236 households/vehicle) as also evidenced by the fact that the company can cover the market share in 2 days as shown in Table

13. While P5 Company needs at least 6 days to cover the market share (Kigarama sector), Table 10 shows no difference in environmental outcomes in terms of sanitary conditions where 34 and 35 respondents, have ranked the conditions good for Kigarama and Kagarama sectors, respectively. This evidence the weak planning and management capacity for P6 Company to optimize the efficiency of vehicles. For both sectors, the main factor influencing the outcome is the state of vehicles. For both, they use owned vehicles and they are old which increases the number of breakdowns. Again, both evidence the linear relationship between physical capacity and company performance. Despite their small size in terms of market share, their high physical capacity has evidenced the high improvement compared to big companies such as P2 Company in Rwezamenyo owning the highest market share but with the lowest vehicle efficiency. For all companies, except P1 Company (30% waste separation performance), the state of the vehicle does not allow separate collection which contributes to the laid-back attitude of households to separate waste (zero waste separation performance) though the ultimate reasons are external factors including the regulatory framework as discussed later.

External factors influencing environmental outcome

- *Solid waste collection Regulatory framework*

As discussed in the previous section, waste separation performance at the household level is almost zero though informal practices of the street and informal waste pickers are evolving in all sectors and Remera sector which is supported by the sector local authorities. The main factors that are shaping the current no waste separation situation are summarized by Figure 18 and the fact that companies mix waste during collection has been evidenced to be the main factor as also discussed earlier.

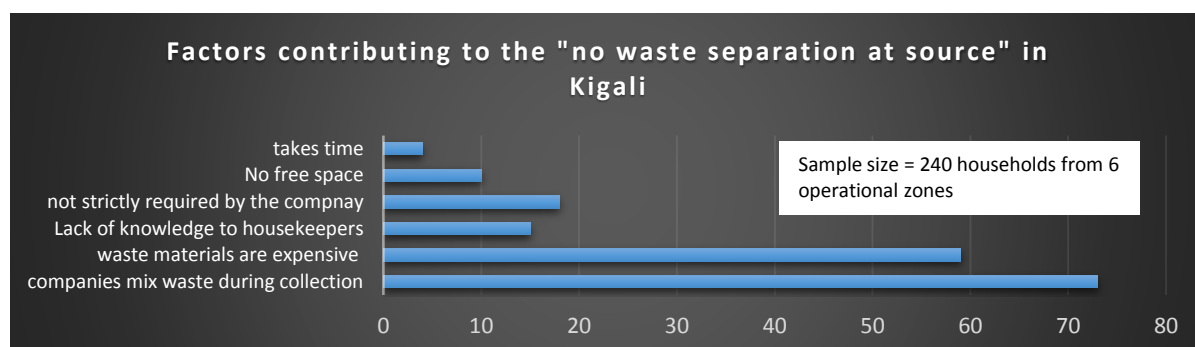


Figure 18. Chart showing the factors pushing households to do not separate waste in Kigali

There is a simplistic attitude to attribute the “no waste sorting at source” to the insufficient and inadequate physical capacity of companies and the lack of willingness of the population to separate waste as it is shown in Figure18. But for the case of Kigali, as it is for many developing countries ([W. Leal Filho et al., 2016](#), [Tello Espinoza et al., 2010](#)), the ultimate factor influencing the current waste separation performance is related to the lack of adequate corresponding institutions and weak enforcement associated with the lack or weak institutionalization of existing waste separation regulations. The fact that companies mix waste during collection and the fact that households are not separating waste, are more influenced by the lack of institutionalization and enforcement of waste separation program as per defined in the Solid waste management strategic Plan for Kigali developed in 2012.

The blame should not be addressed to the companies, but to the KCC as there is no fine for the company when waste is mixed during collection. Except P1 Company, which is motivated by the market-based interest, i.e. income from waste, the dump site is not designed in a way allowing the separate waste disposal. For this, all companies, except P1, find that there is no need to involve the costs related to separate waste collection while it is again mixed at the disposal site. It is evident that this

mismanagement of the dump site and the lack of institutionalization of waste separation in sectors, as it has been done for collection service, is a disincentive to households to separation was and to companies to provide adequate collection vehicles allowing separate collection. In addition, currently, there is no specific solid waste management Policy and waste recycling policy in Rwanda but waste management is ruled by the Water and Sanitation sector Strategic Plan 2013/14 - 2017/18 (MININFRA, 2013) ignoring practice-based challenges related to waste collection service provision and their consequence on the environment.

Though among the indicators that RURA use to evaluate the performance of companies include the separation of waste at the household level, sectors lack the capacity to evaluate this as also it has been evidenced for the Latin American cities (W. Leal Filho et al., 2016). Furthermore, households do not separate waste because the city does not provide civic amenities allowing separation. In contrast, for the sake of the general cleanliness of Kigali city, the transfer stations and other sites allowing separation and recycling are prohibited.

The companies have also raised the problem of short-term contracts and license which increase the investment risk. For this, companies do not want to invest in new vehicles as they do not believe in market security. This is the case for P2 Company providing the service in Rwezamenyo which prefers to hire vehicles while the company has the biggest market share (13 operational zones). All in all, the lack of appropriate legislations for waste separation is a disincentive to households and companies to involve costs related to waste separation and separate collection practices and hence, increasing waste ending into dump site and related environmental problems.

Various researchers (Kaseva and Mbuligwe, 2005; Wilson, 2013; Oberlin, 2011; Rotich et al., 2006) have evidenced the influence of the market-based factors on environmental sustainability through the improvement of waste separation practices. This has also been evidenced in Kigali where Remera sector all interviewed households perform waste separation and that 30% of the collected waste is recycled reducing waste to dump up to 70% as shown in Table 10. Though there are weak enforcement and lack of institutionalization of waste separation practice, the joint effort of Remera sector officials and P1 Company is a good sign that the legal framework can contribute to the improvement of the current practices through a market-based model. This has also been evidenced by the perception of households of what can motivate them to separate waste where many are motivated firstly if companies can by sorted recyclables and secondary if they can get a discount on the current user charges as shown in Figure19. The figure shows also that other incentives to sorting are also market-based such as free service, cheap waste materials, etc.

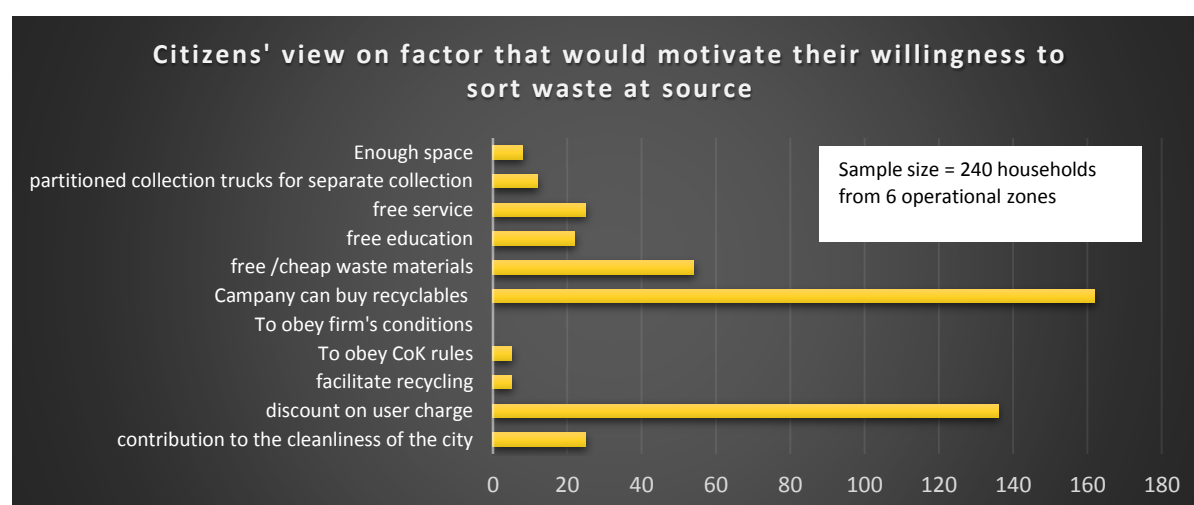


Figure 19. Chart showing factors that would motivate households to separate waste

Furthermore, this perception has been evidenced by the growing informal waste pickers and their joint initiative of solid waste recycling with the KCC at the disposal site as discussed previously. From this perspectives, there is a need for the public sector to explore these opportunities for the 3Rs and that of compost making, as 70% of waste is organic, to reduce waste ending into dump site as also has been suggested for other East African community countries ([Okot-Okumu, 2008](#)).

To conclude with, this section has discussed the impact of Private sector involvement on environmental aspect and has evidenced the improvement in some aspects such as collection coverage, sanitary conditions at household and sector levels. But the environmental sustainability has not been achieved as all collected waste ends into the communal dump site where it is causing environmental degradation in different ways including leachate. The section has also discussed key factors that are shaping the environmental outcome where physical and human capacities and regulatory framework play the important role.

4.3.3. Financial outcome of Private sector involvement in Solid waste collection service in Kigali

Though the big fraction of waste is collected from households, the sustainability of solid waste collection is achieved if the received service is affordable on the side of users (households), at the same time ensuring the cost recovery on the side of service providers. This two-dimensional interest balance is crucial as companies need to meet the users' (households) expectations by providing good quality service, but also to financially survive using user charges, which is imperative to increase their physical capacities. Therefore, the indicators of financial sustainability seek to explore the financial viability of the service providers requiring the full cost recovery using user charges based on the choice of the KCC.

This study has proposed three indicators namely, full cost recovery using user charges, reduction of transaction costs (on the side of the public sector) and Zero subsidies, to assess the financial sustainability of solid waste collection service provision after the involvement of private sector as summarised by the Research Conceptual Framework (Figure 2). The first indicator has been assessed through the interview with six private companies and the two remaining have been assessed through interviews with sector executive secretaries and KCC and Table 14 summarizes the findings.

1. Cost recovery using user charges

[Oduro-Kwarteng et al. \(2006\)](#) argue that the low-cost recovery, associated with a limited fund or subsidy from the central government, is common in many developing country cities and Kigali is no exception. Table 14 shows that only two sectors (Rwezamenyo and Kinyinya) report the full cost recovery using user charges. For other sectors, such as Remera, and Kicukiro, there is a delay in user charges collection but they presume the full cost recovery using other sources of income before all user charges are collected while Kigarama and Kagarama sectors presume no full cost recovery at all.

Even though a combination of user fees and local taxes may be required for the functionality of waste collection system, [Wilson et al. \(2013\)](#) and [Schubeler \(1999\)](#) argue that a certain level of cross-subsidy and/or financial support from the government is necessary to ensure the financial sustainability and equitable service access. For Kigali, the cross-subsidy for the urban poor community has been institutionalized and operationalized by classifying households into three categories, i.e. high, middle and low-income, where rich families subsidize poor families as will be discussed later. Therefore, the implementation of cross-subsidy is not ensuring the financial viability as evidenced by the low level of cost recovery for many sectors (Table 14) which can explain the need for the financial support from the government to service providers.

While [Hoorweg et al. \(2005\)](#) argue that it is important to have full information of the total costs involved in the provision of the solid waste collection before taking any decision, neither the KCC nor companies, know the current costs involved in the service provision. Whether current user charges caps set by RURA help companies to recover their costs it is not clear. This unclear situation, in terms of costs involved, makes the KCC reluctant to intervene to fill the gaps. Furthermore, as also argued by various authors ([Hanrahan et al., 2006](#); [Zurbrugg et al., 2007](#); [Parthan et al., 2012](#); [Lohri et al., 2014](#)), the limited, and even the complete lack of financial monitoring and evaluation capacities is the main challenge for many service providers and the public sectors in developing countries and Kigali is no exception. This is the case for many companies which are not able to evaluate their profit as they don't have full control on all recurrent costs. Likewise, the sector officials are not able to assess the financial viability of companies providing the service to households residing in their sectors.

Though the gaps in cost recovery are not evidenced, companies are using various sources of income to cover the presumed gaps. On one hand, Table 14 shows that P1 Company (Remera) covers the gap by selling recycled products such as Briquettes fuel and compost, selling recyclables such as plastic bottles, glass bottles, and papers and by using money collected from commercial customers and consultancy works. P3 Company (Kicukiro), in addition to commercial customers, uses also the bank credit line though this option is not sustainable as it generates additional transaction costs. On the other hand, Table 14 shows that Kigarama and Kagarama sectors, both record low-cost recover (60 and 50%, respectively) and the commercial customers are not enough to cover the total costs involved to provide the service.

Table 14. Cost recovery level and other sources of income in waste collection service for Kigali

Sector	Company	Cost recovery using user charges (%)	Other sources of income to fill the gap	Comment
Remera	P1	50-100	Sell Recyclable products (Briquettes fuel, compost), Sell recyclables (glass bottles, plastics bottles, papers, etc.), Commercial customers subsidize households, Consultancy workers	<ul style="list-style-type: none"> • Market share: 3 sectors • Delay in user charges collection but cross-subsidy of companies activities lead to full cost recovery
Rwezamenyo	P2	100%	Multidisciplinary company (agricultural and livestock farming, tax collection in different markets, public transport	<ul style="list-style-type: none"> • Market share: 13 sectors • Full cost recovery
Kicukiro	P3	70%	Bank credit line Commercial customers	<ul style="list-style-type: none"> • Market share: 4 sectors • Full cost recovery but this means of filling gaps incurs transaction costs such bank's interest
Kinyinya	P4	100%	Commercial customers	<ul style="list-style-type: none"> • Market share: 1 sector • Full cost recovery
Kigarama	P5	60%	commercial customers	<ul style="list-style-type: none"> • Market share: 1 sector • Few commercial customer, hence no full cost recovery
Kagarama	P6	50%	Commercial customers	<ul style="list-style-type: none"> • Market share: 1 sector • Few commercial customer, hence no full cost recovery

2. Transaction costs and subsidy from the public sector

The same situation of the lack of financial information has been evidenced for the public sector. The KCC presumes that the reduction of transactions remains undefined, as the city has not yet compiled all relevant transaction costs. Though undefined, the KCC argues also that, with the decentralization of the provision and management of public services, the transaction costs has reduced. But the non-paying households and small street businesses throw waste in public places. This requires the intervention of the local authority at the sector level and then making the transaction costs not equal to zero and varying

from one sector to another. These transaction costs are very small as street sweeping companies are outsourced to clean and collect waste generated by their activities. Furthermore, for commercial activities, everyone pays the hygiene tax collected by the municipality which is used for general activities of greening and to pay sweeping companies. The same commercial activities are required to have a contract with a private service provider to collect the waste generated inside their business.

However, for some small businesses, it is hard to pay the hygiene tax and waste collection user charges. For the sake to reduce their waste bill, they throw waste into drainage systems or put it on the roads. The cost to collection waste generated in this way is covered by the normal budget of sectors. These unfold transaction costs is the main challenge for many sectors. The minimum budget is allocated to sectors from the mother districts to facilitate the monitoring and follow-up activities of companies servicing households. If it is then used for other purposes, this may reduce the involvement of sectors in the enforcement of different mechanisms helping companies to optimize their performance including cost recovery. From this, it is then clear that the “zero subsidies” option, is not performed as sectors are subsidizing the service provision through unfolding transactions. Whether the transaction costs have reduced or not it is not known as discussed earlier and it was hard to verify this as there is no information about the transaction costs before and after privatization.

4.3.4. Factors influencing the cost recovery and financial viability of service providers

Table 14 shows the variations in cost recovery for different sectors. This section discusses key internal and external factors explaining these variations. Various factors may explain the current level of cost recovery and companies’ financial viability in general. But human capacity of companies and their organization have been evidenced as internal factors and general characteristics of sectors which influence the willingness to pay and regulatory framework such as low inclusivity of sectors and households at planning level during user charges setting, the capacity and motivation of sector officials and sectors financial autonomy to easier the enforcement, low capacity of “Jyanama” associated with lack of information while they are charged to approve baseline user charges (Figure 6), have been identified as external factors shaping the current cost recovery outcome for different sectors.

Internal factors influencing financial outcome

- *Companies’ human capacity*

In terms of human capacity, the low supervisor efficiency (number of households per supervisor) has been evidenced for Kigarama and Kagarama sector while supervisors are responsible for payment collection. For both sectors, the weak organization has also been evidenced by the fact that user charges collectors report directly to the company office which means that only one person is responsible for monitoring and managing user charges collection. On the other hand, Kinyinya is one of the sectors which record the full cost recovery. One of the strategies used to recover all costs is to reduce labor cost by employing cheap labor. This strategy is not sustainable as the company would save more operations costs by optimizing fuel costs through the development of efficient and effective vehicle route plans and schedules as this has been evidenced by various researchers ([Hansen and Wernerfelt, 1989](#) and [Boyne, 2003](#)). Furthermore, [Cointreau-Levine and Coad \(2000\)](#) and [Oduro-Kwarteng et al. \(2006\)](#) argue that the weak planning of companies is translated into unnecessary operational costs. This is the case for P4 and P6 companies. Due to the low-skilled workers, P4 company provides the service the whole week while it could work 5 or less than 5 days a week and hence, creating unnecessary operational costs. Likewise, for Kagarama sector based on P6 Company high physical capacity (Table 13), it could provide the service only in two days a week. But, due to the weak organizational and planning capacity related to the weak human capacity, it provides the service every day though there is also the contribution of the state of vehicles which are old.

While the productive efficiency, by pushing service providers to reduce the operational costs during the price cap period, is among the key reasons for price cap regulation (Ballance and Taylor, 2005), the weak capacities of companies have evidenced the weak productive efficiency for many companies in Kigali. There is a need for KCC and RURA to make a deep analysis on this issue as there is an assumption that user charges are not covering the total cost involved in service provision while on the other hand the willingness of the households to pay current user charges shows that the service is expensive as discussed in the following section.

External factors influencing financial outcome

- *General characteristics of sectors and willingness to pay*

The influence of general characteristics has been evidenced to have a strong influence on the financial viability of companies where it influence the households' willingness to pay for the current user charges and to the cost recovery as well. This is the case for Remera, Kagarama, Kinyinya and Kigarama with opposing influence for Kinyinya sector. For Kinyinya sector, though the sector is newly urbanizing, households are grouped in estates which make the collection of user charges easy and is dominated by rich families. This is also evidenced by the high willingness of the households as shown in Table 15. Generally, Table 15 shows that the service is still expensive for many as evidenced by the considerable fraction of the respondents (31%) which is willing to pay less than the current user charges. As discussed further, there are various factors explaining this, but the general characteristics and level of urbanization of the sectors have been evidenced as the main factors.

Table 15. Households' perception of options for cost recovery and willingness-to-pay

Citizens' perception of options for cost recovery								%
Cost recovery option	Sample size	Sectors						
		Remera	Rwezamenyo	Kicukiro	Kinyinya	Kigarama	Kagarama	
Household	240	32	30	31	28	31	27	76
household & government	240	9	5	6	9	5	9	18
Government	240	0	4	1	3	3	2	6
Citizens' willingness to pay the user charges								
Willingness to pay current user charges	240	30	20	24	33	25	24	67
willingness to pay more	240	0	0	0	0	0	0	0
willingness to pay less	240	10	14	13	7	14	15	31

Sectors with big part having rural characteristics have been evidenced to have a high fraction of households willing to pay less. This is the case for Kigarama and Kagarama (Table 15). In contrast, Remera sector is among well-organised sectors but rich families occupy the big space while they are small in numbers compared to poor families. In addition, Remera is home for many commercial, hotels and administrative head offices which make the collection challenging as poor families lay behind this commercial activity and rich families to do not pay the service. While Remera is experiencing the good quality service (Table 10) the fraction of households willing to pay less is high (10 out of 40 respondents) as shown in Table 15 which is explained by the above characteristics. For Kagarama sector, the sector is among well planned newly urbanizing areas but, rich families occupy the big surface area and the sector still have the big part with rural characteristics. Poor and middle-income families do not pay the service because they have free space where to bury waste. For some households, organic waste is used in their farms and non-biodegradable waste is burnt while the company is still engaging various permanent costs such as office renting, salaries and waste collection to few households with a contract in the same area. Likewise, Kigarama sector counts a big part with rural characteristics (the whole cell of Nyarurama) and few households in that area get the service.

- *Service regulatory framework*

Wilson (2013) argues that the involvement of private sector in the solid waste collection is not a simple privatization as the municipality remains the responsibility to oversee the service cost-effectiveness and social equitability. This is the case for Kigali where the private sector is contracted to provide the collection service but the overall effectiveness is overseen by the municipality represented by sectors. He also argues that this requires some changes calling the customer-oriented attitude of municipalities where the private sector is considered as the “client”. However, for many developing countries this attitude is very low as municipalities limit their intervention on service quality and equitable access and little effort is given to cost recovery. This is the case for Kigali where cost recovery is totally ignored for many sectors and considered as the business of private sector while the franchise contract gives the responsibility to sectors to enforce user charges, especially on non-paying households, to ensure full cost recovery.

Scheinberg et al. (2010b) argue that clear budget is crucial for the efficiency and cost-effectiveness of organizations and any installed system. He then argues that for many developing countries, solid waste management is given little priorities and no clear budget is given to the institutionalized structures which affect the effectiveness and efficiency of service providers. This is the case for Kigali. While sectors are mandated to manage franchise contract and to control the performance of service providers they rely on the budget of districts. In addition, there is no specific budget for solid waste collection service enforcement where one sector officer is in charge of other domains of hygiene and cleanliness of the sector. Because, the sectors have in mind that solid waste collection service is paid by households, little budget, even none, is consecrated to solid waste collection service which limits the involvement of sectors in enforcing the payment. This is the case for Kigarama, Kagarama and Kicukiro sectors as evidenced by the low-cost recovery (Table 14). Other sectors, such as Rwezamenyo, user charges collection is among the priorities not because the sector owns the responsibility but it has been evidenced that village representatives are motivated by the incentives provided by the company through regular competitions organized by P2 Company among villages.

On one hand, while Wilson (2013) argues that the early inclusivity of all stakeholders is crucial to ensure the success of solid waste management system, the low inclusivity of sectors and households at planning level during user charges setting has been presumed by the six sectors. This is translated into inadequate user charges as sectors and households have adequate information that reflects the real conditions of the sectors and that can inform RURA to set appropriate user charges. This generally explains the results on the willingness of households to pay less than the current user charges (31%) as summarized in Table 15. This is a considerable number showing that the service is expensive for many households reflecting the influence of low inclusivity of users and sectors at the planning level.

On the other hand, various researchers (Rodic et al., 2010; Scheinberg et al. (2010b); Wilson, 2013) have discussed the good practices for user involvement, including the institutionalization of inclusivity of users through a “solid waste platform”. These examples include Bamako (Mali) and Bengaluru (India). This platform can be compared to the End-user charge setting process for Kigali as discussed in the previous section and as summarized in Figure 6. There is a goodwill for the government of Rwanda to involve households in setting user charges though its effectiveness is affected by the weak capacity of “Jyanama” of sectors while they are mandated to approve user charges used by the service providers to negotiate with each household. This weak capacity, associated with lack of cost recovery information on the side of both private and public sector, is translated into inadequate user charges and hence, affecting the level of cost recovery of companies. There is the need to build the capacity of “Jyanama” and sector officials as they play a crucial role in the financial viability of companies in setting user charges.

To conclude with, Table 14 shows that there is a low-cost recovery for all companies (big or small) except two companies P2 and P4. But these two companies do not ensure the financial sustainability for two reasons. Both companies have been evidenced to adopt unsustainable strategies to reduce their cost. For P2, the strategy has been to reduce vehicle investment capital and related operation costs as discussed previously. This strategy has been evidenced to have negative effects on collection frequency and schedules and the service quality in general as evidenced by the low vehicle efficiency of P2 Company. Likewise, Kinyinya sector (P4), cost reduction strategy has been to reduce human resources cost by employing cheap and non-skilled labor resulting in unnecessary operational costs.

Various factors have been evidenced to influence the current level of cost recovery and companies' financial viability in general. But, human capacity of companies and their organization; general characteristics of sectors which influence the willingness to pay; and the service regulatory framework such as low inclusivity of sectors and households at planning level during user charges setting, the capacity and motivation of sector officials and sectors financial autonomy, low capacity of "Jyanama" associated with lack of information, have been discussed as main factors. All in all, it is evident that the privatization of solid waste collection is not leading to the financial sustainability of the service provision to households for three main reasons. Firstly, the level of cost recovery for service providers is low. Secondary, the implementation of the cross-subsidy for the urban poor community is not contributing to the full cost recovery though it responds to fairness in cost distribution. Finally, the service provision strongly depends on other sources of income, mainly the commercial activities, to financially survive.

4.3.5. Social outcome of Private Sector Involvement in Solid waste collection service in Kigali

The social sustainability is achieved when each household has access to the regular service regardless their ability to pay for it. The indicators of social sustainability seek to inquire the quality of the current service and social equity in regards to the service quality and affordability, especially for the urban poor community. This study has proposed the following indicators to evaluate the social outcome of private sector involvement in solid waste collection service in Kigali and how the involvement is contributing to the social sustainability: (1) Fairness of cost distribution considering income levels, (1) extra costs to citizens, (3) service affordability, (4) service coverage, (5) company's responsiveness to complaints of households and (6) Service quality. The objectives of the KCC to privatize the service include job creation and this has also been added to the indicators to be assessed and the indicators results are summarized in Table 16.

The involvement of private sector in the solid waste collection has created more jobs than what was expected for the KCC. Table 16 shows that about 1,000 permanent jobs have been created from 6 interviewed companies while the city was predicting the creation of 63 jobs from the private sector and 23 jobs from the public sector varying from waste collection to office work. The types of created jobs are dominated by field related jobs such as waste pickers counting a big fraction followed by user charges collectors and supervisors, respectively and office jobs (officers and top management) counting the smallest fraction. Even though many jobs have been created, the study has evidenced that there are opportunities for improvement such as the increase of salary ranges (currently ranging between 30,000-500,000RWF, approximately €38-586, per month), enforcement of safety measures and reduction of working hours as per defined by Rwanda Labor Law, especially working hours.

For many developing countries, a wide range of disparity in the households' ability to pay the user charges for waste collection has been evidenced by [W. Leal Filho et al. \(2016\)](#). This disparity is explained by the big fraction of urban population living in peri-urban areas while they don't have the ability to pay. This is the case for many sectors such as Remera, Kigarama, Kagarama and Kinyinya where the general characteristics of these sectors have evidenced the co-habitation of rich and poor families. Associated with the insufficient resource allocation from the municipality taxes, this results in

chronically limited funds and user charges (Coffey and Coad, 2010, Zurbrügg, 2003) and weak financial capacities of service providers. In long, this results in the truncated service quality such as unreliable service in terms of collection frequency and schedules as companies are not able to rehabilitate or increase their physical capacities and Kigali is no exception.

For Kigarama sector the service is not reliable (Table 16) and this is explained by the peri-urban characteristics where the sector is composed of four cells and one of them is totally rural and few of the population get serviced. This contributes to the truncated cost recovery and hence, affecting the physical capacity of P5 Company providing the service to this sector. P5 Company owns very old vehicles and knows at least 4 breakdowns every week. The long term solution is to buy new vehicles and this is not easy for many reasons including low-cost recovery level as discussed later. Table 15 shows also that Rwezamenyo sector experience unreliable service while the sector would expect good quality service as the P2 Company providing the service to this sector records the full cost recovery. But the previous sections have evidenced the weak physical capacity of this company as it is also discussed later.

Table 16. Social outcome of privatization of solid waste collection service in Kigali

Sector	Company	Created job	Sample size	Responsiveness to complaint	Fairness of cost distribution	Service affordability	Extra cost to citizens	Service reliability	Service coverage (%)
Remera	P1	192	40	Good	X	Fair	X	Reliable	96
Rwezamenyo	P2	547	39	Fair		Expensive		Not reliable	100
Kicukiro	P3	147	38	Good	X	Fair		Reliable	99
Kinyinya	P4	33	40	Good	X	Cheap		Reliable	100
Kigarama	P5	56	39	Fair	X	Fair		Not reliable	67
Kagarama	P6	23	38	Fair	X	Expensive		Reliable	97
Explanations <ul style="list-style-type: none"> • <i>Fairness of cost distribution:</i> X – cross-subsidy has been implemented in that sector • <i>Extra cost:</i> X – Households involve Extra cost in that sector • <i>Service affordability</i> <ul style="list-style-type: none"> ○ <i>Expensive:</i> $\geq \frac{1}{2}$ of the respondents score “High” the current user charges ○ <i>Fair:</i> (≥ 10 households of the respondents score “Fair” the current user charges) ○ <i>Cheap</i> (≤ 10 households of respondents score “affordable” the current user charges) • <i>Service reliability:</i> ≥ 25 households of the respondents score “Good” the reliability of received service 									

Various authors (Wilson et al., 2013; Schubeler, 1999) argue that the cross-subsidy and/or financial support from the government is necessary to ensure the financial sustainability and equitable service access. Table 16 shows that all sectors have implemented the cross-subsidy for the urban poor community by classifying households into three categories, i.e. high, middle and low-income, except Rwezamenyo sector. This explains the high service coverage (more than 90%) for all sectors, except Kigarama (Table 16). The low service coverage for Kigarama sector is also explained by the peri-urban characteristics of the sector as discussed in later section.

For Rwezamenyo, the main motif to do not implement cross-subsidy by fixing one user charge to all was that almost all households in Rwezamenyo sector are classified in middle-income category. This approach does not lead to the fairness in cost distribution. It is evident that the poor families are the victims of this approach as shown in Table 16 where Rwezamenyo is among sectors where households presumed that the service is expensive. This has also been evidenced by the user charges caps set by RURA which are 5,400, 3,400, and 1,700RWF (approximately €6, €4 and €2) for high, middle and low-income, respectively. Currently, the approved user charge is 2,000RWF per month (approximately €2.5) per each household, i.e. for low, middle and high-income households. It is then clear that middle and high income are more advantaged while low income is paying more than the one set by RURA. Likewise, more than half of the respondents in Kagarama sector presumes that the service is expensive. This is

linked with the general characteristics of this sector as a newly urbanizing sector and still have important rural characteristics as will be discussed in the following section.

Table 16 shows another category of sectors for which the service is considered to be fair in terms of affordability. These sectors include Kigarama, Remera, and Kicukiro. This “Fair” ranking does not mean that the service is affordable but this category groups all sectors where less than half of the respondents up to 10 respondents find the current service affordable as will be discussed later discussing factors influencing the social outcome.

4.3.6. Factors shaping social outcome of solid waste collection privatization in Kigali

Three factors have been evidenced as the main factors explaining social outcome: the physical capacity of companies as an internal factor; physical and general characteristics of sectors; and solid waste collection service regulation as external factors.

Internal factors influencing social outcome

- *Company’s physical capacity*

The level to which companies respect the collection frequency and schedules was the main indicator of service reliability for many households. It has been evidenced that many companies do not respect the collection frequency due to low physical capacity (vehicles) as it has been discussed in the previous section. This is the case for Rwezamenyo and Kigarama sectors serviced by P2 and P5 Companies, respectively. While P2 Company is the biggest in terms of market share (13 sectors) it owned only four old vehicles like almost other companies with 1 sector such as P4, P5, and P6. P2 relies on few hired vehicles and counts at least 4 breakdowns a week. This approach of renting vehicles has been evidenced to be not sustainable because when the vehicle counts a breakdown it is not easy to find the other vehicle as they are built in a particular way to comply with the city’s requirements. Likewise, for Kigarama, the P5 Company owns three old vehicles with regular breakdowns (at least 4 breakdowns a week). This is the main cause of the low level of compliance to waste collection frequency and schedules. For both companies, there is a high probability to do not respect the collection frequency and schedules which influence the perception of household on service reliability. The increase in job creation has been influenced by the extension of the service coverage to new sectors and to the decentralization enforcement where companies are requested to provide more channels to respond to households’ complaints and hence, creating new jobs in companies. The number of created jobs has also been influenced in this way by the capacity of companies, and market share and collection modalities where a door-to-door collection modality has been evidenced by many companies to create more collection and supervision jobs than a communal collection. The influence of the market share on job creation has been evidenced in Table 16 where companies with the big market share (P2, P3, and P1, respectively) count more jobs. This gain evidence the big fraction of waste and user charges collection team.

External factors influencing social outcome

- *Physical and general characteristics of sectors*

The newly urbanizing areas of Kigali record a big fraction of urban population living informal settlement with limited ability to pay the service as it is the case for other East African community countries (Okot-Okumu, 2008). The households in peri-urban areas perform household composting and this is an informal practice is difficult to control which can lead to the environmental hazards such as illegal dumping or open burning (Simon, 2007; Okot-Okumu and Nyenje, 2011). This is the case for Kigarama sector where poor and middle-income families have big free spaces where they bury the organic waste

which affects the cost recovery as discussed in the section about factors influencing the financial outcomes. The quantity of waste to collect per household (2 bags of 25 kg) is among the determinants of user charges that a household has to pay although its enforcement remains a challenge in Kigali. The above discussed informal waste management practices for peri-urban areas is one way for households to reduce the quantity of waste to pay for. Therefore, this is the main challenge for Kagarama sector as households request the discount on the user charges after burning or burying their waste. It also influences their perception on user charges, and service affordability, where they find the service expensive (Table 16).

Table 16 shows another group of sectors for which households find the service fairly affordable as discussed earlier. These sectors include Kigarama, Remera, and Kicukiro. For Kigarama, on one hand, this is explained by the bad quality service, especially the collection frequency and schedules as discussed earlier. On the other hand, it is explained by the fact that a big part of the sector is rural and resided by poor families. As they have free space where to bury their waste, it is evident that they want to get a discount on the current user charges as the waste quantity to collect has reduced. The physical characteristics of the sector have also been evidenced to influence the service coverage. Table 16 shows that sectors with large areas having rural characteristics know low service coverage. This is the case for Kigarama and Kagarama sectors.

For Remera sector, various factors may explain the fair service affordability but the physical characteristics is important as it determines accessibility of the households and the mode of collection. P1 is the only company which provides two types of service, i.e. door –to- door and communal collection services. A door-to-door service is provided to rich families as they have the ability to build in the accessible areas and poor and some middle-income families get a communal collection service as they live in inaccessible areas. This results in social inequality in terms of service accessibility and extra costs for urban poor families on the day of collection as shown in Table 16. It is clear that poor and middle-income families are willing to pay less than the current user charges to compensate involved extra costs.

- *Solid waste collection Service regulation*

Service regulation influences the social outcome of private sector involvement in solid waste collection in different ways for different sectors. But, the joint evaluation of hygiene and security organized by Rwanda National Police jointly with the City of Kigali is the most important common factor influencing the social outcome, particularly the service coverage and service quality (reliability). This evaluation takes place every six months for all sectors composing Kigali. The service coverage and collection rate are among the key indicators evaluated. After each evaluation, the first three companies and sectors are awarded by the Rwanda National Police. This has put sectors into a competition to get the best award. However, if all sectors are in competition, what can then explain the differences in service coverage figures? This shows that the outcome is not only shaped by the regulation but also other factors.

These factors include the motivation, availability of sector officials which had been difficult to assess during this study for social outcomes. But the availability and the capacity of sector officials have been evidenced to influence other sustainability aspects, especially financial viability of companies. Though not evidenced, These two factors likely influence the service coverage as it requires the enforcement on the side of public sector for resistant households. The weak regulation capacity has also been evidenced for “Jyanama” of sectors by approving user charges which do not match with the income level of the households. This is the case for Kicukiro, Kagarama and Remera sectors, where the service is fairly affordable (Table 16). This has been evidenced by the considerable number of households (from 10 to 15 households) which are willing to pay less than the current user charges as shown in Table 15. It is then the government responsibility to adjust the baseline user charges accordingly and to build the capacity of “Jyanama” which plays the main role of approving the baseline user charges.

To conclude with, on one hand the involvement of private sector has improved the social equity where the ability of households to pay has been the base of private involvement in solid waste collection. The inclusivity of urban poor communities was among the KCC's objectives of privatization of solid waste collection. This has been achieved by implementing cross-subsidy of households where user charges are set following "Ubudehe" classification. This has been respected in all sectors except in Rwezamenyo sector. There is also the high involvement of households in end-user charge setting which has reduced unfair cost distribution. In addition, the involvement of private sector has increased the service coverage where 90% of the households have access to the service. Likewise, the service quality has improved through the increase of level to which companies respect collection frequency and schedules compared to last 3 and 4 years though this needs improvement. On the other hand, the social sustainability is still a problem as the physical capacity of companies is limited associated with the low level of cost recovery. Furthermore, the service in households is strongly relying on other developmental sectors such as commercial activities to survive in terms of financial aspects. The same factors influencing the outcome of other sustainability aspects of private sector involvement have been evidenced to influence the social outcome. These factors include the companies' physical capacity affecting the service quality, general characteristics of sectors, especially peri-urban characteristics affecting the willingness to pay and service regulatory framework affecting the effectiveness of user charges settings (inadequate user charges).

CHAPTER 5

Conclusions and implications of findings on Theory

5.1. Introduction

This thesis focused on understanding the mechanisms of solid waste collection in Kigali after the privatization and analysis of factors shaping the variations in outcome for different sectors while the same regulatory framework is applied. There is a gap in the literature about the effectiveness and efficiency of private sector involvement in solid waste collection service in developing countries where the service is fully provided by the private sector and where the service bill is submitted directly to households and this is the case for Kigali. There is also a gap in the literature about local and general factors influencing and creating the variations of the outcome of private sector involvement in solid waste collection in developing countries.

There is a belief that private sector can lead to the efficiency and service quality improvement provided adequate regulatory framework is ensured by the public sector. It is then imperative for the public sector to understand factors that can influence the effectiveness and efficiency of private sector involvement. On one hand, when factors are understood it is possible to shape the service provision by preparing settings allowing the efficiency and effectiveness of private sector and hence, optimizing the intended outcome (Cointreau-Levine and Coad, 2000). On the other hand, the efficiency of the private sector requires the effort of companies to improve the physical and human capacity along with the development of the management and planning capacities (Cointreau-Levine and Coad, 2000).

Literature on service efficiency and quality has evidenced that private sector gain over public sector service provision (Post et al., 2003; Bel and Warner, 2008; Kassimu, 2006; Oduro-Kwarterg, 2011) and few has explored the factors shaping the outcome in developing countries such as Kassimu (2006) in Tanzania and Oduro-Kwarterg (2011) in Ghana who have evidenced the influence of companies' physical and human capacities, involvement of households and regulatory framework on the performance of private sector. There is a gap in the literature about the influence of physical and general characteristics of operational zones such as infrastructural development, income disparities, and peri-urban characteristics, on private sector involvement outcome which has been analyzed during this study.

As discussed earlier, the theory predicts the efficiency, increase in service coverage, financial viability and service quality improvement with the involvement of the private sector. The main objective of this study was to explore the mechanisms of solid waste collection service in Kigali after privatization. The main research question for this thesis is: *How does the provision of solid waste collection service work in Kigali after privatization?* The sub-questions to respond the main question are: (1) *What reasons do explain the privatization of solid waste collection service in Kigali?* (2) *What is the impact of privatization of solid waste collection on service coverage, service quality, and financial viability of service providers in Kigali?* (3) *What individual and environmental factors explaining variations in results of privatization of solid waste collection services for different monopoly zones while the same regulatory framework is applied to the whole City of Kigali?* (4) *What can be improved based on the dysfunctionality of the whole system? And how to improve it?*

To explore the outcome of privatization of solid waste collection and to explain variations in the outcome for different operational zones (sectors) in Kigali, a framework combining the elements of sustainability for solid waste management and the determinants of the sustainability is used. For the determinants of sustainability, the study has focussed on four concepts: (1) the capacity (physical and human) of service providers where vehicle and supervisor efficiencies have been computed to compare the companies' performance combined with operational planning (vehicle route plan); (2) the involvement of households

in user charges setting and service quality monitoring combined with willingness to pay; (3) physical and general characteristics of the operational zone (sector) such as infrastructural development, peri-urban characteristics and income disparities; and (4) service provision regulation by the public sector such as contracting mechanisms, licensing processes, contract format development, local authority inclusivity at planning level. For the elements of sustainability, the study focused on the three concepts: (1) Environmental sustainability (waste collection coverage, waste separation performance at household level and recycling, the portion of collected waste ending into dump site); (2) financial sustainability (full cost recovery using user charges, zero subsidy from the public sector and reduction of transaction costs); and (3) social sustainability (job creation, equity in cost distribution through cross-subsidy for urban poor community, service coverage, service quality and extra cost to households). For environmental sustainability, the study failed to evidence the status of recycling in Kigali as no data has been found neither from the KCC nor from private companies. For the financial sustainability, the study remains inconclusive on zero subsidies and reduction of transaction costs as it fails to find the data before and after privatization.

The data for this study have been collected from six private companies, four sectors (operational zones), hygiene and sanitation (KCC) and water and sanitation (RURA) departments where solid waste collection service falls, the author's field observation, the secondary data from published and unpublished reports, guidelines and solid waste strategic plan (2012), and the discussion groups with companies' user charges collectors and households. Forty (40) households were selected from each sector, 240 households for six sectors and a total sample size of 256 respondents was the target of this study for which the results are presented in chapter 4 of this report.

This chapter presents the conclusions of this study summarizing the main findings on reasons behind privatization and how the private sector has evolved in solid waste collection service in Kigali, the impact of private sector involvement for environmental, financial and social sustainability aspects and key factors shaping the observed outcome, and implication of findings on various theories which defines the area for improvement. The chapter is then divided into 4 sections. Section 1 introduces the chapter, Section 2 presents the conclusions, Section 3 presents the implication of findings on theory and Section 4 presents key recommendations.

5.2. Conclusions

From the findings presented in chapter 4 of this study, seven main conclusions have been drawn summarizing the main findings on reasons behind privatization and how the private sector has evolved in solid waste collection service in Kigali, the impact of private sector involvement and key factors shaping the observed outcome.

Firstly, this study has evidenced that the privatization has evolved from the shortcomings of KCC to provide the service alone and has been implemented by creating monopoly zones and involving RURA as an independent regulator

This study has evidenced that the privatization has evolved from the shortcomings of KCC to provide the service alone where it owned only three vehicles to serve the whole city dwellers. While it was not expecting to get other sources of income to improve the situation the service quality continued to deteriorate which opened doors to the private sector since 1999. This involvement has slightly improved the service quality at the same time increasing the exclusivity of urban poor community where the access to the service was determined by the ability to pay. This resulted into illegal dumping and uncleanness of Kigali while it is considered as a "Satellite city" of the country and KCC continued to lose control over households and service providers. As a long-term solution, the KCC has initiated the monopoly privatization since 2012 to increase the control on service providers at the same time ensuring service affordability and service quality. This study has evidenced that the privatization had five main objectives

which are: to increase service coverage, to improve the service quality, create more jobs, and inclusivity of urban poor community. The private sector has been involved in the solid waste collection by creating the monopoly zones following administrative structure where a sector is considered as a minimum monopoly zone and by involving RURA as an independent regulator to ensure the profitability of the supplier (private service providers) and the interest of customers (households).

Secondary, this study has evidenced the difference between the approach adopted to create the monopoly zones in Kigali – following the administrative boundaries, and the approach adopted by many developing countries including Tanzania, Kenya, and Ghana – which doesn't follow the administrative boundaries; and it has been effective compared to these countries in terms of increased control of public sector on service providers.

For other cities, the creation of monopoly zones has not followed the administrative structure and boundaries where one city could be divided into multiple operational zones. In contrast, for Kigali, the creation of monopoly zones has followed the administrative structure. Normally, the country is divided into provinces (five provinces including Kigali having the status of a province), province into districts and districts into sectors. Kigali is divided into three districts (Nyarugenge, Kicukiro, and Gasabo) and it counts 35 sectors. For the implementation of privatization as mentioned above, a sector is considered as a monopoly zone and the company competes to provide the service to the whole sector. Three assumptions have been made to choose a sector as a monopoly zone. Firstly, although the capacity of local operators is weak the KCC assumes that each private operator can, at least, provide the good service to one sector. Secondary, aiming the equity in cost distribution at the same time ensuring the financial viability, the KCC assumes that a sector records high disparities – in terms of income of households, which can help companies to recover involved costs even when a cross-subsidy for the urban poor community is applied. Finally, admitting the weak monitoring and management capacity for the public sector, the KCC assumes that this capacity is enough to manage the contract and control the service quality and performance of private operators in general at the sector level.

Thirdly, this study has evidenced three limitations challenging the above-made assumptions to create monopoly zones: weak capacities of companies – not responding even to the expectations of one sector; weak capacity and availability of the public sector – not responding to the companies expectations in terms of enforcement on user charges collection; and unbalance financial disparities of households – responding to the fair costs distribution to households and not to the financial viability of companies.

This study has evidenced three limitations for some sectors challenging the above-discussed assumptions. Firstly, some companies have evidenced the weak physical and human capacity that cannot respond even to the needs of one sector. This is the case for P5 Company providing the service to only one sector (Kigarama) but the sector is experiencing unreliable service due to old owned vehicles. Secondly, all sectors have evidenced the weak capacity and availability to respond to companies expectations in terms of enforcement on user charges collection and in terms of capacity to set adequate user charges. This has been evidenced by the big fraction of households (31%) willing to pay less than the current user charges. Thirdly, while the cross-subsidy has increased the inclusivity (social equity) of the urban poor community, the study has evidenced that it is a challenge to private operators as it is not contributing to the full cost recovery. The companies are compulsorily required to provide the service to every household regardless their income where some households even receive the service free of charge (exempted). As discussed above, the consideration of a sector as a monopoly zone assumes the income disparities that could help companies to recover their costs. However, for sectors with unbalance of income disparities such as Kigarama, there is an assumption that the companies are not making a profit even when all user charges are collected as the amount collected is thought to be less than the involved costs. But this study failed to evidence this because companies were not able, and others were reluctant to provide information on user charges collection. From the

above assumptions, it is clear that this may affect the financial capacity of companies leading them to the failure in providing the service even to the households able to pay the service based on the current low-cost recovery. In long, this may result in social conflicts between poor and rich families and public sector (local authority) may risk losing the households accountability, especially rich families. Other sectors – such as Rwezamenyo, know quite the same middle-income category households. This has pushed the public sector to bypass the regulatory framework on cross-subsidy by fixing the same user charge to all households. This results in social inequality where poor families are the victims paying more than they are willing to pay and more than the user charge set by the competent authority (RURA and “Jyanama”) which has also been explained by the weak capacity of the public sector.

Fourthly, this study has evidenced a clear regulatory framework which has succeeded to shape the market boundaries and conduct of the service providers – by developing various settings supporting companies and sectors during implementation, but its effectiveness and consistency are into question.

On one hand, KCC has developed and implemented various settings which include, but not limited, Solid Waste Strategic Plan (2012) for Kigali defining solid waste management mechanisms and key actors; a franchise contract format which is used for all sectors and signed between companies and sectors; solid waste disposal contract signed between the KCC and companies and the process for end-user charge setting – involving households through “Jyanama” up to the negotiation between households and companies. On the side of RURA, a five-year license is provided to companies and specific requirements including a license fee of 2,500,000RWF (approximately, €2,934/5years), an application fee of 100,000RWF (Approximately, €117 once) and three owned vehicles are in place.

On the other hand, although the regulatory and regulatory tools are in place, this study has evidenced that their effectiveness is affected by the lack of experience and human and financial capacities in sectors – while they are implementing agents of public sector institutions in relation to waste management, and the weak capacity of companies. The key responsibilities of sectors, as defined in the franchise contract format, include the enforcement of user charges. However, many sectors have evidenced the low availability of local authority associated with an unclear and low budget allocated to sectors from districts which affect the effectiveness of user charges collection enforcement. Normally, due to financial limitations one sanitation and hygiene officer is allocated at the sector level. The latter not only is responsible for monitoring of the mechanisms of waste collection service and to evaluate the performance of service providers but also, he/she is required in many hygienes and health inspections, greening and cleaning activities such as street sweeping. Their overloaded workload reduces their availability which affects the enforcement of the sector on user charges and on the performance of private sector actors as it results in a low-cost recovery for many companies. For this, many companies such as P5 and P6, there is a low probability of increasing the physical capacities and hence, affecting the service quality.

Fifthly, this study has evidenced that the weak capacity of both service providers and sector local authority is resulting in a re-centralization of solid waste collection – KCC tending to control the whole system, which leads to a lax attitude of existing actors such as sectors, and in weak performance of companies.

While privatization aimed to accommodate the weak capacity of the public sector by the decentralization of the service through sectors – monopoly zones, this study has evidenced that the KCC is breaking administrative structure which is resulting into a re-centralization of solid waste management where the KCC is tending to control the whole system jointly with newly evolved actors, namely RNP and “Jyanama”. It has been evidenced that KCC is breaking the administrative structures to fill the above-discussed gaps of local authorities in monitoring and evaluation of companies performance although it is ultimately created by KCC and districts which are the cause of the lack of financial autonomy as evidenced earlier. The breaking of the administrative structure has been evidenced by the creation of

new direct relationship evolving between KCC and sectors and/or companies while the structure supposes that the relationship between sectors and KCC should pass through districts. The change in regulation has also been evidenced by the intervention of new actors such as RNP to enforce the service quality and performance of companies as discussed previously. Currently, a joint inspection combining the security and hygiene is organized by RNP and KCC every six months where the first three companies and sectors are awarded by the national police. This evaluation has put sectors and companies into a competition to win the best award. For solid waste collection, the collection coverage, service coverage and general cleanliness of sectors compose the evaluation indicators.

Although the above initiatives have evidenced to shape the outcome positively as discussed later, this re-centralization is resulting in a lax attitude of sectors affecting the service quality monitoring and enforcement of bylaws such as sanctions to defaulters (households and companies). The lax attitude has been evidenced by the fact that there are no sanctions for companies that provide poor quality service while they record full cost recovery such as P2 Company. This results also in alteration of service standards as defined by the franchise contract format and hence, the KCC will lose the control over the service providers and not able to evaluate their performance which was the case, before privatization. The change in contract conditions has been evidenced by P1 company which is providing both door-to-door services in collaboration with the sector while the contract requires companies to provide a door-to-door service which creates extra costs to households, especially poor families living in inaccessible areas. There is also an assumption that sectors and companies manipulate some figures of service coverage and collection coverage to win the competition. This may be translated in inadequate decisions for further improvement of the system although this study has remained inconclusive about this issue due to the lack of evidence.

Sixthly, mixed results about the outcome of private sector involvement in solid waste collection in Kigali have been evidenced. But in generally, it has been evidenced that privatization has more contributed to the improvement of social aspects while it is not leading to environmental sustainability and financial viability of companies.

- *In terms of environmental sustainability, although the improvement has been recorded for some environmental aspects – such as collection coverage (more than 90%), this study has evidenced that the involvement of private sector in solid waste collection in Kigali is not leading to the environmental sustainability. Rather it is shifted the problem from households and sectors to the environment by increasing collection coverage – from 44% (2012) to more than 90% (2015) alongside poor waste separation performance at household level, which is increasing waste ending into the dumpsite – more than 90% of collected waste.*

This study has evidenced the improvement in areas such as sanitary conditions and waste overflows, waste collection rate – from 44% in 2012 to more than 90% in 2015; and the general cleanliness of sectors before and during service delivery as evidenced by households (more than 34 out of 40 households, except one sector). In contrast, the study has evidenced that the level of waste separation at the household level is very low, even quite zero, which leads to the fact that more than 90% of collected waste ends into an open dump site. The study has also evidenced that only one sector (Remera) – driven by the market benefit of P1 Company, has initiated the promotion of recycling by enforcing waste separation at source and improving waste storage materials. This study has also evidenced a growing involvement of informal waste separation and recycling actors, even though this uncontrolled practice conflicts with the interest of contracted waste collection companies. Likewise, the KCC has initiated the pre-processing unit at the disposal level. The impact of these waste separation and recycling initiatives is still very low to ensure environmental sustainability, associated with the risk of contamination of recovered materials although this study has failed to evidence this as neither KCC nor companies do not have information on recycling.

Furthermore, the dump site is among the main vectors of environmental degradation related to the location of the dumpsite in a sensitive area – on the top of the hill surrounded by valleys making wetlands for urban agriculture and water bodies; and health problems such as poor occupational health and safety of dump site workers and families surrounding the dump site. The current mismanagement of the dumpsite has been also evidenced as a hazard to collection vehicles which can lead to the illegal dumping of collected waste in surrounding valleys and hence, affect the urban agriculture. This study has also evidenced unwise land use where each three years a new land may be used for the dumpsite. This has been evidenced by the fact that the current dumpsite was open in 2012 after the closure of Nyanza dumpsite and now is almost full while the City of Kigali records a rapid extension in the surface. The increasing hazards on collection vehicles has been evidenced to exacerbate the problem of weak physical capacity of companies by increasing the rate of vehicle breakdowns (at least 4 a week) which alongside the recorded truncated cost recovery, can lead to the worse service quality in households and hence, lead to an uncleanness of the city while it is the ultimate purpose of privatization: "Making Kigali a clean and attractive city".

“While many factors can influence the environmental outcome, the study suggests the regulatory factors as the ultimate factor influencing the environmental outcome.

The fact that privatization objectives were dominated by social aspects (service coverage, improving the service quality, job creation, and inclusivity of urban poor community), this has resulted in the lack of institutionalization of waste separation at source and recycling and hence, increasing waste ending into dumpsite and related environmental and health hazards. Currently, there is no any level of the government which has a clear mandate to promote and enforce waste separation at the household level like it has been done for waste collection. Likewise, the current dump site does not allow separate disposal which leads to the laid-back attitude of companies in improving the collection capacities (Vehicles) allowing separate collection and households to separate waste. This inadequate regulation includes also the short-term contract and license (3 and 5 years, respectively) which both increase the investment risk pushing the companies to do not invest in new collection vehicles as they do not have a long-term market guarantee.

- *In terms of financial aspect, the privatization of solid waste collection is not leading to the financial sustainability. While the choice of the government is that the cost incurred by the service provision must be covered using user charges collected from service recipients (households), this study has evidenced a low-cost recovery – ranging between 50-100%; alongside a big fraction of households willing to pay less than the current user charges; involvement of unfolding transaction costs – to pay indiscriminately disposed of waste; and the system strongly depends on other developmental sectors – mainly money collected from the waste service provided to commercial activities, to survive.*

This study has evidenced that all companies, except P2 and P4, do not recover all involved costs using user charges. Even the two companies which record full cost recovery, there is no insurance of sustainability as they have adopted unsustainable strategies to reduce their operational costs. The adopted strategies are the reduction of vehicle investment capital and vehicle operations related costs by reducing owned vehicles and increasing rented vehicles (P2); and the reduction of labor costs by employing cheap workers (P4). Other companies, such as P3, use the bank credit line to fill the gap. This strategy is also not a sustainable solution as it incurs unnecessary transaction costs, such as bank interests. Furthermore, this study has evidenced that companies use various sources of income to fill the gaps in cost recovery. All companies provide the waste collection service to commercial activities in addition to households and this is the main contributory factor to the survival of the service provision in households. Other companies such as P1 have initiated recycling activities and sell recycled products such as briquettes fuel to bakeries, compost to gardening companies and households and recovered recyclables to Ugandan recycling actors. The P1 company provides also consultancy services sharing its gained experience (more than 15 years) in the waste collection – as the first company evolved in

waste collection service (1999). Both P2 and P1 companies provide gardening and pest control services. Finally, P2 Company provides public transport facilities, agricultural services and various tax collection service in public markets. However, although the cost recovery using user charges is low, the study has evidenced that only small companies such as P5 and P6, are not able to fill the gap in cost recovery due to their low physical and weak management capacities which do not allow them to compete for commercial customers. Moreover, the study has evidenced that for many households the service is still expensive as evidenced by a considerable number of households (31% of the respondents) willing to pay less than the current user charges. This is more influenced by the physical characteristics of sectors where sectors with peri-urban characteristics such as Kigarama and Kagarama have evidenced the low willingness to pay as explained in the following section.

While the choice of the government of Rwanda was a “Zero subsidies” option for solid waste collection, the study has evidenced that the principle of zero subsidies has not been respected. This has been evidenced by the fact that sectors engage unfolding transaction costs to pay the bill of indiscriminately disposed of waste by non-paying households and small street businesses. Normally, all commercial activities are required to pay the hygiene tax (10,000RWF, approximately €12 per month) which is collected by the districts – used for greening activities and to pay sweeping companies, and to have a contract with a private service provider to collect the waste generated inside their businesses. However, it has been evidenced that for some small businesses, it is hard to pay the hygiene tax and waste collection user charges. For the sake to reduce their waste bill, they throw waste into drainage systems or put it on the roads. The cost to collection waste generated in this way is covered by the normal budget of sectors. From this, it is then clear that the “Zero subsidies” option has not been performed as sectors are subsidizing the service provision through unfolding transactions. But this study has failed to evidence the decrease of transaction costs before and after privatization as KCC does not have full information on involved transactions from sectors.

“Though various factors have been evidenced to influence the financial outcome, the study finds that the financial viability is more influenced by three factors: (1) the general physical characteristics; (2) companies’ human capacities (supervisor efficiency) along with their level of organization; and (3) service regulatory framework, especially user charge setting process involving “Jyanama” and sector officials.

On one hand, it has been evidenced that all sectors in Kigali are recording a progressive urbanization process from areas with peri-urban characteristics – mixture of agricultural and small economic activities. For this, many sectors are generally characterized by populations living an everyday lifestyle; the co-existence of formal and informal actors such as waste pickers and dealers; and large financial differences between households. This mixture affects the performance of solid waste collection service providers where poor families tend to rely on rich families (free riding); poor roads damaging the physical capacities of companies and increasing the maintenance costs; and poor families living of the agricultural activities making home-composting and burying non-biodegradable waste in their free spaces and hence, affecting their willingness to pay. This is the case for Remera, and Kagarama sectors, while recording a high fraction of rich families poor families free ride on rich families (Remera) and poor families make home-composting for organic waste and burn other types of waste (Kagarama). This informal practice leads households to do not want to pay for the service. On the other hand, while the creation of monopoly zones assumes that sectors have the financial disparities that can help companies to recover the costs through the implementation of cross-subsidy for the urban poor community, some sectors such as Kigarama have evidenced unbalance income disparities due to a big fraction of poor families and this affect the cost recovery.

The influence of regulatory framework on cost recovery, especial inadequate user charges setting has been evidenced by the weak capacity of sector executive secretaries and “Jyanama” while they play a

crucial role in setting user charges. Their weak capacity along with incomplete information on costs involved in the service provision is translated into inadequate user charges.

The study has also evidenced the influence of companies' supervisory capacity where companies such as P6 and P5 have evidenced low follow-up on user charges collection. This has been evidenced by the assignment of one staff at the company level to monitor all payments. There is no regular and constant follow-up which explained the lowest cost recovery for both companies. All companies have evidenced the weak supervisory capacity (low supervisor efficiency – many households supervised by one supervisor) while supervisors are also responsible for user charges collection which has also been suggested by this study to explain the low-cost recovery.

- *In terms of social sustainability, the fact that the objectives of privatization were dominated by social priorities – inclusivity of poor families as a way to increase the service coverage; the creation of more jobs; and the improvement of the service quality, has resulted in a tremendous improvement of social aspects although the social sustainability is not guaranteed as it depends on the above-discussed sustainability elements – financial and environmental elements.*

The inclusivity of poor families (social equity) has been achieved by implementing the cross-subsidy of households where user charges are set following “Ubudehe” classification that classifies households in three categories (High, middle and low income). The average user charge for each category is 5,000, 3,000 and 1,500RWF (approximately €2, 4, and 6) per month, respectively. Moreover, the involvement of private sector has increased the service coverage where more than 90% of households have access to the service (2015) from 50% (2012), regardless their income. This study has also evidenced that the service quality has improved. The main indicator of service quality improvement for many households was the level to which companies respect collection frequency and schedules. However, the service quality evaluation results have been influenced by the bad experience in service provision for many households which could bias the reality in service quality and the author could not go beyond this reality. For many households, the service quality was compared to the last 3 and 4 years and this could not reflect if the company respects the service standards as specified in the contract signed between the company and households or not. This has also been evidenced for sector officials arguing the service improvement comparing the current improvement with the last 3 to 4 years. However, as the service quality reflects the satisfaction of users' expectations, this allow this study to conclude the improvement of the service quality as the findings have evidenced the service reliability in 4 out of 6 sectors, except Rwezamenyo and Kigarama sectors where the service has been evidenced as unreliable. Concerning job creation, this study has evidenced that the involvement of private sector in the solid waste collection has created more jobs than what was expected by the KCC. About 1,000 permanent jobs have been created while the city was predicting the creation of 63 jobs from the private sector and 23 jobs from the public sector.

“Although multiple and interconnected factors have been evidenced to influence the social outcome, this study suggests the implementation of cross-subsidy along with increasing market orientation for companies – due to created monopoly zones, to influence service coverage, affordability, increase of urban poor inclusivity, and job creation and companies' physical capacity – number and state of vehicles along with planning capabilities, to influence the service quality.

Before privatization the service provision was mainly guided by the market incentives – companies provided the service to the households that are able to pay the service, which led to the exclusivity of poor families and hence, to low service coverage. In contrast, with the involvement of private sector and the creation of monopoly zones, the service is more shaped by social equity through the implementation of cross-subsidy where rich families subsidize poor families which have increased the inclusivity of urban poor communities and this leads to the increase of service coverage. The service coverage has also

been increased by the fact that companies driven by profit purpose are more customer-oriented where each household is considered as a potential customer. As the economy of scale suggests, companies expect more profit with market extension outside and inside the operational zone. The study has evidenced that all companies have tried to extend the market through the above two options. The market extension inside the operational zone has been evidenced by the progressive increase in service coverage while the extension outside the operational zone has been evidenced by commercial customers serviced by each company which is now the main source of income for all companies to compensate the cost recovery gaps.

This study has also evidenced that the service quality and the level to which companies respect the collection frequency and schedules, in particular, was influenced by the physical capacity (number and state of vehicles) of companies. On one hand, it has been evidenced that companies with high physical capacity in terms of the number of vehicles (P1, P4, and P6), provide good quality service while those with low capacity (P2) provide unreliable service. This is the case for Remera, Kinyinya and Kagarama sectors where a reliable service has been evidenced while Rwezamenyo experiencing unreliable service, respectively. On the other hand, this study has evidenced the influence of other factors on the efficiency of vehicles which include mainly the level of planning and organization of the company and the state of vehicles. The influence of the state of the vehicle (old or new) has been evidenced by companies which have three owned vehicle as a minimum requirement to serve one sector but that are providing bad service. This is the case for P5 company for which the findings evidenced that the physical capacity of this company in terms of the number of vehicles (3 owned vehicle) would fit the market share (1 sector, Kigarama). But all owned vehicles are old which increases the number of vehicle breakdowns (at least 4 breakdowns a week) and hence, leading to unreliable service. The influence of the planning capacity has been evidenced in Remera, Kagarama and Kicukiro sectors. For Remera, while P1 company needs 5 days to service the sector, the findings on physical capacity has evidenced the high planning capacity where the service is provided in 2 days. For Kicukiro sector, while the findings on physical capacity have evidenced that the company needs 8 days a week, which is not possible, the company has evidenced the optimization of the vehicle utilization by increasing the number of trips and meet the frequency requirement. In contrast, for Kagarama sector, while physical capacity findings have evidenced that the company needs only 2 days a week to serve the sector, the weak planning and organization capacity lead the company to provide the service the whole week (6 days). All in all, not only the number of vehicles matters but also their states associated with planning and organization capacity of companies.

The increase in job creation was influenced by the extension of the service coverage to new sectors and to the decentralization enforcement where companies are requested to provide more channels to respond to households' complaints and hence, creating new jobs in companies. The types of created jobs are dominated by field related jobs such as waste pickers counting a big fraction followed by user charges collectors and supervisors, respectively and office jobs (officers and top management) counting the smallest fraction. Even though many jobs have been created, the study has evidenced that there are opportunities for improvement such as the increase of salary ranges (currently ranging between 30,000-500,000RWF, approximately €38-586, per month), enforcement of safety measures and reduction of working hours as defined by Rwanda Labor Law, especially working hours.

Seventhly, the study finds that there is no linear relationship between the cost recovery and service quality due to the factors such as profit purpose and physical capacity of companies that influence the behavior of service providers and hence, their performance although a prolonged unbalance between both variables may lead to truncated service quality

This study has evidenced that companies such as P2 record full cost recovery while the service in Rwezamenyo where the company provides the service is not reliable. The study has evidenced that the company has reduced the operation costs by reducing the number of owned vehicles while increasing

rented vehicles to make a profit which affects the service quality. In contrast, the service in sectors such as Remera, Kagarama, and Kicukiro have been evidenced to be reliable while they record partial cost recovery due to the high physical capacity that matches with the market share in terms of the number of households in the operational area.

Though there is no direct linear relation between cost recovery and service quality a prolonged unbalance between both variables may lead to two possible future scenarios. On one hand, for Rwezamenyo, a prolonged unreliable service may decrease the household's willingness to pay the service which will affect the cost recovery of the company and hence, exacerbate the current truncated service quality. On the other hand, for sectors that receive regular service while recording a truncated cost recovery, there is a high probability that the physical capacity will decrease as companies are not able to renew collection vehicles due to low-cost recovery which can lead again to the bad service quality. At the end, there is a relation between both variables as one can affect another in the long term. It is then imperative for both public sector and private companies to work on this issue as a way to sustain the service provision.

5.3. The implications of findings on theory

This section presents the implications of the findings of this study to the previous research and theories on the privatization of solid waste collection services, particularly in developing countries. As discussed earlier, this study aims to explore the mechanisms of solid waste collection service in Kigali after privatization and to understand how it works and key factors that are shaping the outcome. To explore the outcome of privatization of solid waste collection and explaining factors for variations in the outcome for different operational zones (sectors) in Kigali, a framework combining the elements of sustainability for solid waste management and the determinants of the sustainability was used which also grounded on the literature on elements and determinants of solid waste management sustainability presented in chapter 2 of this study. The presentation of the implications of the findings of this study also based on these concepts.

For the determinants of sustainability, the study has focussed on four concepts: (1) the capacity (physical and human) of service providers where vehicle and supervisor efficiencies have been computed to compare the companies performance combined with operational planning (vehicle route plan); (2) the involvement of households in user charges setting combined with willingness to pay and service quality monitoring; (3) physical and general characteristics of the operational zone (sector) such as infrastructural development, peri-urban characteristics and income disparities; and (4) service provision regulation by the public sector such as contracting mechanisms, licensing processes, contract format development, local authority inclusivity at planning level). For the elements of sustainability, the study focused on the three concepts: (1) Environmental sustainability (waste collection coverage, waste separation performance at household level and recycling, the portion of collected waste ending into dump site); (2) financial sustainability (full cost recovery using user charges, zero subsidy from the public sector and reduction of transaction costs); and (3) social sustainability (job creation, equity in cost distribution through cross-subsidy for urban poor community, service coverage, service quality and extra cost to households).

5.3.1. Environmental sustainability

Cointreau-Levine (2000) has presumed that low-income countries service coverage are only 10-40%, and middle and well-organized country, from 50-80%. In 2012, Wilson et al. (2013) and Scheinberg et al. (2010b) have presumed that many countries have recorded improvement where low-income countries record the service coverage ranging from 40-60% and middle-income, from 99-100%. On one hand, the findings in Kigali confirm the increase in collection coverage for low-income countries as argued by Wilson et al. (2013) and Scheinberg et al. (2010b) as the study has evidenced the increase

in service coverage up to more than 90%. On the other hand, the findings challenge the above figures as this study has evidenced the collection coverage increase of more than 90% in 2015 from 44% in 2012 while it is classified as a low-income country city. From this, it is evident that the collection coverage in Kigali ranges from 10-90% based, on the evidence of [Cointreau-Levine \(2000\)](#) or from 40-90%, based on the findings of [Wilson et al. \(2013\)](#) and [Scheinberg et al. \(2010b\)](#).

While [Van de Klundert and Anschütz \(2001\)](#) argues that environmental sustainability implies that solid waste collection and disposal should be transformed into a closed-cycle to minimize its burden on the environment and resources. This study has evidenced that solid waste privatization priorities in Kigali have been dominated by social and environmental health issues. The focus has been made on improving collection to make households free from waste rather than focusing on transforming the collection and disposal into a closed-cycle. The study has also evidenced that the main focus for Kigali which has also been evidenced to be the ultimate objective of the privatization of solid waste collection service, is the cleanliness of the city to promote tourism. To achieve this, the focus is made on the improvement of the collection which has also been evidenced for many developing countries by various authors ([Wilson et al., 2013](#)) and [Scheinberg et al., 2010b](#)).

This study confirms the findings of various authors on the improvement of sanitary conditions and waste overflows and environmental cleanliness of operational zones before and during service provision and waste related burden-free as a result of the focus made on improving the cleanliness of the cities which have been evidenced for many municipalities in developing countries during the privatization of solid waste collection. These include cities of countries located in the same area with Kigali, such as [Karanja \(2003\)](#) in Kenya; [Kassim et al. \(2006\)](#) in Tanzania; and cities of other developing countries such as [Obirih-Opareh \(2002\)](#) and [Awortwi \(2003\)](#) in Ghana; and [Post et al., \(2003\)](#) in India. This also confirms the findings of [Wilson et al. \(2013\)](#) that the first priority for many developing countries is to protect health of city dwellers which results in the improvement of collection coverage and improvement of sanitary conditions.

Though there is an improvement in the above aspects, this study finds that the involvement of private sector does not lead to the environmental sustainability as it has been evidenced that more than 90% of collected waste ends into an open dumpsite (Nduba dumpsite) where it is among the key environmental degradation drivers in Kigali. This fraction of waste ending into dumpsite (90%) is far beyond the range evidenced by [Wilson et al. \(2013\)](#) arguing that in cities of low-income countries about 50% ends in controlled dumpsite. Not only the mismanagement of the dumpsite has been evidenced but also it has been evidenced that the dumpsite is a hazard to collection vehicles and to the environment and health based on its sensitive location. It is located at the top of the hill surrounded by wetlands occupied by agricultural activities. The same findings have been identified by various studies for developing countries in general ([Cointreau-Levine, 2000](#)), Asian countries ([Johannessen and Boyer, 1999](#)) and for countries with the close characteristics to Kigali (East African Community country members) such as Uganda and Tanzania ([Okut-Okumu, 2008](#); [Kaseva and Mbuligwe, 2005](#); [Okot-Okumu and Nyenje, 2011](#)).

While it is argued by various studies ([Van de Klundert and Anschütz, 2001](#); [Cointreau-Levine, 1994](#); [Oberlin, 2011](#)) that a closed-cycle for waste management requires the implementation and enforcement of waste separation at the source and to increase the recycling rate which reduces waste ending into the dump sites, this study has evidenced low, even quite zero waste separation at household level due to low enforcement and weak institutionalization of waste separation. The same findings have been evidenced for many developing country cities in the same region with Kigali such as Kampala (Uganda), Dar es Salaam (Tanzania) and Nairobi (Kenya) as evidenced by [Okot-Okumu \(2008\)](#); [Oberlin \(2011\)](#); [Karanja \(2003\)](#) and [Kaseva and Mbuligwe \(2011\)](#). The market-based incentives have been evidenced to shape the current waste separation and recycling informal practices where increasing informal actors have been evidenced in all sectors. This is done by street scavengers, companies (such as P1) – to fill

the gap in cost recovery; and companies' collection crews – as a way to increase their small income. The same findings have been evidenced for East African countries (Okot-Okumu, 2008; Oberlin, 2011 and Karanja, 2003) and in other developing countries (Odoro-Kwarteng, 2011; Cointreau-Levine and Coad, 2000; Wilson et al., 2013).

Various authors including, but not limited, Wilson et al. (2013); Scheinberg et al.(2010a, 2011) and Cointreau-Levine (1994) argue that informal recycling contribute to the reduction of waste ending into the dump site for many developing countries and hence, saving 20-25% of the budget of municipalities allocated to the management of the dumpsites. Though this study has evidenced the growing involvement of informal separation and recycling actors in Kigali it remains inconclusive about their contribution to the reduction of the budget of the KCC allocated to the management of the dumpsite as neither the KCC nor companies had no data on recycled and recovery amount. This confirms the findings of Odoro-Kwarteng (2011) in Ghana; Kassim et al., (2006) in Tanzania; and Okot-Okumu and Nyanje (2011) in Uganda arguing that the contribution of informal actors in recycling is ignored in those countries, which is the case for many developing countries as also argued by Wilson et al. (2013)

This study has also evidenced the conflicts of interest between collection companies and informal recycling actors where households living in an informal settlement and in sectors with peri-urban characteristics do not pay the collection companies as they make home-composting for organic waste and sell recyclables to scavengers. This has also been evidenced by Okot-Okumu and Nyanje (2011) for other East African Community country cities. The same conflict of interest has also been evidenced by Wilson et al. (2013) for developed upper-middle income and developing countries. Furthermore, this study confirms the findings on waste composition for many developing countries where organic waste make a big fraction and 70% of the waste disposed of in Kigali is organic. This has been evidenced by Odoro-Kwarteng et al. (2006) in Ghana, Kaseva and Mbuligwe (2005) in Uganda, Oberlin (2011) in Tanzania and by Cointreau-Levine (1994) for developing countries in general.

5.3.2. Financial sustainability

Various studies (Kassim, 2006; Cointreau-Levine, 1994; Odoro-Kwarteng, 2011) argue that relieving the public sector from the financial burden is among the main reasons for privatization of solid waste collection for many developing countries. It is then believed that the financial sustainability is achieved if cost recovery is sustained through user charges without relying on subsidies from the government and other sources of income. Other authors argue that waste management service should be provided by the government based on the fact that it endorses externalities and lack of possibility of market exclusivity, especially in developing countries (Cointreau-Levine, 1999; Roth, 1987; Gidman et al., 1999).

This study has evidenced that Kigali is the same scholar with Cointreau-Levine (1994) arguing that waste collection can be privatized as it involves private costs such as transport and door-to-door collection costs. This has pushed the City of Kigali to adopt a full privatization where the service is only provided by the private sector and the bill submitted to households and this is unique for Kigali. To ensure equitable cost distribution the KCC has also required companies to provide a door-to-door service to all households though the study has evidenced that few companies have bypassed this regulation. On one hand, this study has evidenced that based on the choice of the KCC the costs involved in the provision of the waste collection service is officially covered using user charges from households where the government has adopted a “Zero subsidy” option. But, it has been evidenced that only two companies record full cost recovery using user charges and that all companies use the money collected from the waste service provided to commercial activities to fill the gap in cost recovery. This confirms what is argued by Odoro-Kwarteng et al. (2006); Cointreau-Levine (1994); Kassim (2006) that the low-cost recovery associated with a limited fund or zero subsidies from the government is common in many developing country cities.

With the creation of a monopoly, there is an assumption that sectors have financial disparities that can help companies to recover the costs while implementing cross-subsidy for the urban poor community. But this study has evidenced that some sectors such as Kigarama have evidenced unbalance income disparities recording a big fraction of poor families which affect the cost recovery.

Various authors ([Wilson et al., 2013](#) and [Schubeler \(1999\)](#)) have argued that even though a combination of user fees and local taxes is required for the functionality of waste collection system, that a certain level of cross-subsidy and/or financial support from the government to ensure the financial sustainability and equitable service access is necessary. The findings of this study challenge the contribution of the cross-subsidy for the urban poor community to the financial sustainability as the study has evidenced the low-cost recovery while the effective implementation of cross-subsidy has been evidenced – implemented in all sectors, except one (Rwezamenyo). Rather, this has contributed to the social equity by allowing poor families to have access to the service. Based on the fact that the service provided to households strongly depends on other developmental sectors in Kigali, mainly on money collected from waste service to commercial activities while cross-subsidy has been implemented, this study suggests a compulsory support from the central government or the promotion of a cross-sectoral subsidy such as a “Household-Commercial activities cross-subsidy” to ensure financial sustainability for Kigali but also for other developing countries. The effectiveness of this cross-sectoral subsidy has been evidenced in Kigali where all six companies are filling gaps in costs using the money collected from this service provided to commercial activities.

Furthermore, this study has evidenced the lack of information on the costs involved in the private sector during the service provision which makes the KCC reluctant to intervene to fill the costs gaps. This confirms the importance of cost information to get the support from the public sector as argued by [Hoornweg et al. \(2005\)](#). The study has also evidenced this lack of financial information on the side of the public sector where sectors involve unfolding transactions to pay the bill for indiscriminate disposal but the KCC does not have figures on these costs. This has led this research to remain inconclusive about the reduction of transaction costs as information on transaction costs before and after privatization was not found.

The lack of financial management capacities on the side of companies has been evidenced where companies are not able to provide the total amount of user charges collected. From this, it is evident that all companies are not able to evaluate their profit as they don't have full control on all recurrent costs. This confirms what have been argued by various authors ([Hanrahan et al., 2006](#); [Zurbrugg et al., 2007](#); [Parthan et al., 2012](#); [Lohri et al., 2014](#)), that the limited, and even the complete lack of financial monitoring and evaluation capacities is the main challenge for many service providers and the public sector in developing countries.

This study has also evidenced that the service is still expensive for many households as evidenced by many households (31% of the respondents) willing to pay less than the current user charges. While a low-cost recovery has been recorded, this big portion of households willing to pay less does not ensure potential cost recovery. This evidenced also that there is no room to increase the current user charges cap as an alternative to fill the gap in cost recovery. It also confirms what has been argued by [GIZ \(2015\)](#) that the use of user charges only to cover the full cost related to service provision, for many developing countries, would result in a user charge which is not affordable for a considerable number of the population, especially for urban poor communities. This study suggests the integration of various sources of income including by not limited, recycling activities and waste collection service to commercial activities. This also confirms the importance of the consideration of the whole range of economic instruments which include various taxes, user charges, disposal fees, product taxes and the economic incentives. The latter include mainly the exemption of taxes for service providers on imported technologies (trucks, recycling machines, bags or bins) and on other waste collection related activities as argued by [GIZ \(2015\)](#); [Cointreau-Levine \(1994\)](#) and [Schubeler \(1996\)](#). This can reduce the operation

costs which is translated into low user charges or service affordability for citizens and urban poor communities in particular.

5.3.3. Social sustainability

This study has evidenced a wide range of disparity in the households' ability to pay the user charges for waste collection for many sectors as it is the case for many developing countries (W. Leal Filho et al., 2016 and Oldfield and Parnell, 2013). This disparity is explained by the big fraction of urban population living in peri-urban areas while they don't have the ability to pay. This has been evidenced for many sectors such as Remera, Kigarama, Kagarama and Kinyinya where the general characteristics of these sectors have evidenced the co-habitation of rich and poor families. This study has also evidenced that inability of households to pay the service, associated with the "zero subsidies" option adopted by the public sector, results in chronically limited user charges for some sectors (Kigarama and Kagarama) and weak financial capacities of service providers (P5 and P6, respectively). In long, this results in the truncated service quality such as unreliable service in terms of collection frequency and schedules as companies are not able to rehabilitate or increase their physical capacities, which is the case for many developing countries (Coffey and Coad, 2010, Zurbrugg, 2003).

Though the ability of the population to pay the service varies in developing countries, the social sustainability is achieved when all segments of the community have access to the service without considering their income. Cointreau-Levine (1994) argues that this is possible if the government establishes a financial mechanism that enables self-financing to cover service cost– such as cross-subsidy for urban poor communities, at the same time comprehending all strata of the society. Based on the above argument of Cointreau-Levine (1994), this study finds that the involvement of private sector in the solid waste collection has led to social sustainability as the service is provided to all households regardless their income level which has been made possible through cross-subsidy.

Various authors (Wilson et al., 2013; Schubeler, 1999) have also argued that the cross-subsidy is important to ensure equitable service access. This has been a success key for Kigali to increase the service coverage where 90% of the population have access to the service at the same time ensuring fairness of costs distribution. The implementation of cross-subsidy has increased the inclusivity of urban poor communities which is the problem for many developing countries such as Kenya (Karanja, 2003), Tanzania (Kassim, 2006), Ghana (Obirih-Opareh, 2002) and (Awortwi, 2003) and India (Post et al., 2003). While for these countries the access to the service and the collection modality is defined by the income level where poor families receive a communal (use of containers) and truncated service quality and rich families receive a door-to-door service, this study has evidenced that in Kigali the poor and rich families receive the same service (door-to-door service) except for one sector (Remera). This has reduced the extra costs to households on the day of collection and waste littering in drainage systems. Cross-subsidy has also ensured the service affordability in general, where user charges are set considering the households income category as defined by social classification locally known as "Ubudehe".

Furthermore, various studies (Oduro-Kwarteng et al., 2006, Cointreau-Levine and Coad, 2000; Okot-Okumu and Nyenje, 2011; and Okot-Okumu and Mbuligwe, 2005) have evidenced the lack of consistency in service quality, especially in the informal settlements. For Kigali, this study has evidenced no difference in service quality for poor and rich families. This has been evidenced to be the result of the creation of monopoly which has allowed the sector to monitor the performance of the service providers and to the full privatization allowing a uniform evaluation for the performance of all service providers. For other countries where monopoly zones have been created such as in Ghana (Oduro-Kwarteng, 2011) and in Tanzania (Kassim et al., 2006) the improvement in service quality has been evidenced in areas where live rich families able to pay the service as the collection modalities are different in low (communal service using containers) and high (door-to-door) income areas. This complicated the benchmarking for the performance of service providers. This is the case also for other

developing countries in the same area with Kigali such as Uganda ([Okot-Okumu and Nyenje, 2011](#); and [Okot-Okumu and Mbuligwe, 2005](#)) where informal settlements are provided the service by CBOs or NGOs and private companies provide the service to rich families. This study has evidenced that the privatization in Kigali has been driven by social priorities which have contributed to social sustainability, in general while the above-discussed examples evidence that privatization in many developing countries is still dominated by the market principles and financial factors where access to the service is defined by the ability to pay.

5.3.4. Private sector capacity

This study has evidenced that the involvement of private sector in solid waste collection in Kigali has improved in general the technological aspect in terms of the number of vehicles. While the KCC owned only three vehicles to provide the service to the whole Kigali, the study has evidenced more than 30 vehicles from six companies. This confirms the belief that the involvement of private sector contributes to the amelioration of the efficiency of the service provision and the public sector benefit from private investment including free improved technology ([Cointreau-Levine and Coad, 2000](#); [Donahue, 1989](#); [Bartone, 1991](#)).

The influence of the number of vehicles and employees on service quality and performance of companies has been studied by computing the vehicle efficiency (number of households/vehicle/day) and supervisor efficiency (number of households/supervisor/day) which has been developed based on [Bartone et al. \(1991\)](#) presumptions. The choice to evaluate the vehicle efficiency by computing the number of households has been influenced by the fact that the waste generated in Kigali is not known and the disposal mechanisms do not allow the determination of the weight of collected waste. While for developed countries, the use of weighing bridge at the disposal allow the municipality and companies to know their contribution on waste disposed of, many developing countries record only the number of vehicles which do not allow the determination of the contribution of each company to waste disposed of at the dumpsite and Kigali is no exception. This has pushed the author to evaluate the vehicle efficiency using the number of serviced households per vehicle. This study has evidenced its effectiveness and recommend it to other developing countries which use the same disposal mechanisms to evaluate the capacities of companies though it cannot provide information on waste quantity.

There are various scholars about the linear relation between the number of vehicles (scale of operation) and service quality. For [Boyne \(2003\)](#), there is no linear relationship between the number of vehicles and performance because a small organization may perform well than medium or big ones or vice versa. For [Stevens \(1978\)](#), there is a linear relation between service quality and physical capacity, provided improved technology, sufficient number and bigger trucks with regards to the number of customers are provided. For [Lusthaus et al. \(2002\)](#) the internal capacity – in terms of human resources and physical capacity, shapes the performance of the organization.

Though there are various scholars, this study confirms the scholar of [Lusthaus et al. \(2002\)](#) which has also been evidenced by [Wilson et al. \(2013\)](#), as it has evidenced the linear relation between the number of vehicles but also the influence of human resources which shaped the organization and planning capacities of companies to optimize the physical capacity. This study has evidenced that companies with high vehicle efficiency (small number of households serviced by one vehicle) have been evidenced to provide good quality service. This is the case for Remera sector, Kinyinya sector and Kagarama sector where the service was ranked by households as reliable. This is the case also for many developing countries as evidenced by [Oduro-Kwarteng et al. \(2006\)](#) in Ghana and [Kassim et al. \(2006\)](#) in Tanzania.

This research has also evidenced that the state of the collection vehicle (old or new vehicles) which is referred as “improved technology” by [Stevens \(1978\)](#), has a strong influence on the performance of companies and it doesn’t contrast the influence of the number of vehicles. This has been evidenced by

Kagarama sector where the P5 company could provide the service to all households only in two days but due to the state of the vehicles (old) – increasing the number of breakdowns, it provides the service the whole week (5 days). This is also the case for Kigarama sector. Furthermore, the influence of the human capacity has been evidenced by Kinyinya sector – the nearest sector with regards to the dumpsite (20 minutes to and from the dump site). While P4 company owns three vehicles in a good state and providing the service only in Kinyinya sector, the company could save the operations costs by preparing vehicle route plan, and by reducing the days of service, but it provides the service every day for the whole week. The weak human capacities have also been evidenced for all companies where it affects the follow-up on user charges collection. This is the case for Remera sector, Kicukiro, Kigarama, and Kagarama sector but a deep analysis is needed to confirm the influence of human capacities on user charges collection as companies have remained skeptical to providing this information.

Likewise, while [Hansen and Wernerfelt \(1989\)](#) and [Boyne \(2003\)](#) have evidenced the relationship between companies' performance and operational and strategic processes management (leadership styles and management of human resources) and operational variables (planning capacity, operations supervision capacity, and improvement of operations, service design, and management of maintenance), this study remains inconclusive on management strategies although it has evidenced the weak motivation of workers related to low salaries and the no compliance to Rwanda Labor Law for many companies, especially long working hours.

5.3.5. Involvement of households

This study has evidenced a high involvement of households in user charges setting, payment of the service and service quality monitoring which is the contrary for many developing countries ([Odoro-Kwarteng, 2011](#); [Kassim, 2006](#); [Wilson et al., 2013](#)). For user charges setting, households are involved in two different ways. Firstly they are involved through “Jyanama” which is an organ part of the decision-making and elected by the population. This organ is mandated by the KCC to approve the user charges baseline used by companies to discuss with each household (Figure 6). Secondary, households are involved in the negotiation of the contract which is signed between the company and each household. At this step, the households can negotiate the user charge according to the quantity of waste generated and frequency of collection which can change but not less than once a week. Thirdly, households are the “third eye” for both the public sector and companies to monitor the service quality. For companies, the performance of field workers is monitored through households' complaints related to the service provision. For this, the private sector provides a hotline for calls and install the office in sub-zones up to the village level. The public sector ensures that companies install these offices. The public sector provides also channels for information where households call the sector for the default of the company to respond to the complaints.

This study has also evidenced permanent information channels developed by the public sector which includes “Umuganda meeting”, taking place every last Saturday of the month. This meeting gathers all households of the village where different issues are discussed including waste collection services. During this meeting, companies present households having user charges arrears and complaints about service quality are addressed to the company. This information channel associated with the information and communication committee of the village have been evidenced to be effective by all interviewed households where they were aware of the company that provides the service to them.

Furthermore, the failure of companies to provide good quality service has created a new relationship between the regulator (RURA) and households. All these examples evidence the inclusivity of households and the dynamism of households which has also evidenced that they know their right to have access to good quality service. This has also evidenced the effectiveness of the public awareness made by the public sector.

5.3.6. Service provision regulation

This study has evidenced the improvement in solid waste collection comparing the situation before and after privatization as also evidenced in the above concepts. On one hand, the current regulation has strengthened the customer-oriented approach for both companies and sectors. This study has evidenced, as also illustrated by the above examples of the involvement of households, a continuous communication between sectors and households, companies and households and companies with sectors, which is not the case for many developing countries. This is filling the information asymmetry between actors which is not the case for many developing countries such as Ghana ([Oteng-Ababio, 2009](#)); Uganda ([Okot-Okumu, 2008](#)); and Tanzania ([Kassim et al., 2006](#)).

On the other hand, the study has evidenced the inability of some sector officials associated with their low availability to respond to the expectations of companies. While the privatization has been initiated to decentralize the service and hence, to enhance the regulatory capacity of the public sector through sectors, the study has evidenced the intervention of the KCC in all mechanisms breaking the administrative structures. This attitude has been evidenced to create a re-centralization of regulation of the service. This results in the lax attitude of sectors and affecting the service quality monitoring and enforcement of bylaws such as sanctions to defaulters (households and companies). This has been evidenced by the fact that there are no sanctions for companies that provide poor quality service while they record full cost recovery such as P2 Company.

[Schuberler \(1996\)](#) argues that the public sector in developing countries faces the lack of experience in dealing with private sector operators associated with weak capacities. While the above examples have illustrated the good inclusivity of households through “Jyanama”, this study has evidenced the lack of experience and capacity of this organ and the sector executive secretaries while they play a key role in the management of the franchise contract and user charges setting. This is translated into the lack of guidelines providing practical guidance to service providers and households; inadequate user charges; inadequate contract conditions and tender documents; inefficient conditions to promote fair competition between service providers and inefficient and ineffective quality control and performance evaluation of companies as it is the case for many developing countries ([Schuberler, 1996](#)).

Furthermore, the lack of experience and capacity of the public sector has also been evidenced by the asymmetric privatization objectives formulation where the environmental and financial sustainability have not been considered. Rather they have been dominated by social sustainability priorities such as job creation, equitable access to the service, affordability, service quality and other social aspects. This has resulted in the lack of institutionalization of the waste separation at source and recycling and hence, increasing waste ending into the dumpsite and related environmental and health hazards as discussed in previous sections.

5.3.7. Physical and general characteristics of the operational zone

Various studies ([Watson, 2014](#); [Satterthwaite, 2014](#); and [Brenner et al., 2012](#)) have concentrated more effort to explore the effect of weak planning and the adoption of northern planning concepts on southern cities and related consequences including the urban poor exclusion or deprivation on public services such as water supply and sanitation services where solid waste collection falls. But little effort has been made to understand the impact of the adoption and implementation of northern planning concepts on solid waste collection services in developing countries. This has pushed the author to explore the influence of the infrastructural reform of Kigali on solid waste collection service provision and sustainability elements where it is creating income level blocks between poor and rich families. This study has evidenced the important impact of this factor on various aspect of solid waste collection service by influencing the effectiveness of companies and particularly the behavior and attitude of households to participate in solid waste provision. The influence of the general characteristics on the

outcome of privatization of solid waste collection is observed in different ways as discussed in the following paragraphs.

Watson (2014) argues that the planning effort made by many developing countries is creating new socio-economic and governance problems which include the exclusion of urban poor communities living in slums and in “so-called informal settlements”. This has been evidenced in Kigali which records a tremendous infrastructural development but poor families are left to the inaccessible areas having little access to improved roads. This affects the provision of public services such as public transport and waste collection services in those areas. This is also the case for many developing country cities where they are recognized by their dominant informality, diversity in urbanization levels, high demographic internal inflows, inequalities in opportunities in terms of infrastructures and public services (Oldfield and Parnell, 2013),

This study has evidenced severe disparities between the rich and urban poor creating socio-cultural tendencies such as free riding, and low willingness to pay the public services including solid waste collection services and indiscriminate waste disposal. This is the case for Kigarama, Remera and Kagarama sectors where poor families tend to free-ride on rich families and burn waste at the household level, respectively. These informal practices affect the willingness of households to pay the service.

Like for other developing countries (Oldfield and Parnell, 2013), all sectors in Kigali are recording a progressive urbanization process from areas with peri-urban characteristics, i.e. a mixture of agricultural and small economic activities. For this, many sectors are generally characterized by populations living an everyday lifestyle; the co-existence of formal and informal actors such as waste pickers and dealers; and large Socio-economic differences. This mixture affects the performance of solid waste collection service providers where poor families tend to rely on rich families, poor roads damaging the physical capacities of companies, and poor families living off the agricultural activities making home-composting and burying non-biodegradable waste in their free spaces and they do not want to pay for the service. It is then important to understand the above divergent characteristics of operational zones and how they influence the performance of service providers and the level of households’ participation.

While Van de Klundert and Anschütz (2001) encourage the consideration of local context of cities, this study has evidenced that it is also important to the policy- and decision-makers to consider the variations in contextual factors within the operational zone, especially physical and socio-economic characteristics, to optimize the effectiveness of the involvement of private sector in the solid waste collection. This can result in the development of adequate settings such as contracts’ conditions, regulations allowing various options for collection practices and user charges which accommodate these variations. This has failed for Kigali where one franchise contract format, i.e. uniform performance benchmarking, has been developed for all sectors. This has been evidenced as the cause of the failure in terms of cost recovery (Remera, Kagarama and Kigarama) and in terms of equitable service provision (in Remera) where the household accessibility defines the collection modality, i.e. a door-to-door and communal service for accessible (generally, rich families) and inaccessible (generally, poor families) households, respectively.

5.4. Recommendations

From the above findings, it is clear that in terms of environmental aspect there is a need to improve the final disposal to prevent environmental hazards related to mismanagement of the dump site but also to the low capacity of the dump site to receive all collected waste. For this, two options have been suggested to the KCC to ensure the environmental sustainability as discussed in the following sections.

“To reduce waste ending into the dump site by increasing the performance of waste separation at household level

To achieve this, the integration of recycling and informal waste pickers into waste collection service associated with a new regulatory framework that gives sectors the mandate for waste separation at the household level, and public awareness program to households and companies has been recommended. Furthermore, as it has been evidenced by Remera sector, to increase waste recovery from domestic waste requires incentives to households, collection companies, and recycling companies. This has also been evidenced by households by suggesting the incentives that can motivate them to separate waste. For this, the following incentives are recommended:

Incentives to Households:

- Public sector to develop civic amenities allowing waste separation;
- Public sector to require companies to buy separated recyclables;
- Companies to provide free education about waste separation to housekeepers as they are responsible for waste management (generation, storage, and collection) for many households;
- Companies to provide partitioned vehicles allowing separate waste collection.

Incentives to recycling companies to increase the use of recyclables recovered from waste:

- New regulation on imports of pure raw materials by increasing taxes on import;
- Tax exemption on recycled products to make them affordable to end users at the same time making them able to compete with imported products; and
- Tax exemptions on machines used in recycling to increase the number of recycling enterprises at the same time to make finish products affordable to end users.

Incentives to collection companies:

- Public sector to develop civic amenities allowing separation;
- New regulatory framework to prevent conflict of interest related to the integration of informal waste pickers and recycling with collection service;
- Exemption on imported waste materials for storage (bins and bags) to make them affordable to households;
- Tax exemption on imported collection vehicles to increase companies physical capacities and hence, allowing separate collection.

“To promote composting at household level (for sectors with peri-urban characteristics) and at final disposal level by developing cross-sectoral and /or ministerial partnerships

It has been evidenced that more than 70% of collected waste in Kigali is organic. There is an opportunity for the KCC to motivate the cross-sectoral and/or cross-ministerial partnership to alleviate the financial limitation which has been evidenced to hamper the implementation of composting initiatives.

On one hand, the Ministry of Agriculture (MINAGRI) is subsidizing farmers by providing to them the chemical fertilizers to increase the crops. But, this is also among the vectors of environmental and ecosystem degradation including wetlands and water bodies. On the other hand, the Ministry of Infrastructure (MINIFRA) where sanitation services fall, including solid waste management, is contributing to environmental degradation by increasing waste ending into the dump site. As both ministries are drivers of environmental degradation, there is an opportunity to improve the environment for both by partnering to make composting. This can help MINAGRI to reduce the fertilizers and related

environmental hazards and to achieve its objective of crop production using the compost at the same time helping MINIFRA to achieve its objective of reducing environmental hazards related to waste final disposal in collaboration with KCC. With this partnership, both ministries will have new responsibilities and benefits as summarized in Appendix L. A deep analysis is needed to examine the feasibility and other challenges that can be linked to this partnership before any action is taken.

In terms of financial aspect, it has been evidenced that it is imperative to improve the financial viability of companies by working to increase the cost recovery. But the improvement of the financial aspect requires also the companies to take actions to improve their management and to reduce their costs although the public sector needs to undertake some actions to ensure income of companies.

Public sector:

- To the KCC to ensure the inclusivity of sectors and “Jyanama” at planning level which will help RURA to set adequate user charges reflecting the realities of sectors along with organization of capacity building programs for “Jyanama” and sector official to ensure adequate user charges baseline used by companies to discuss with households;
- To the KCC and RURA to extend the monopoly by integrating solid waste collection service of commercial activities with households as commercial activities have been evidenced by all service providers to subsidize households;
- To the KCC and MINIFRA to develop a policy specific to waste management fostering the integration of environmental, financial and social aspects on which can ground all necessary reforms including new regulatory framework that can accommodate the integration of commercial and households waste collection services;
- Integration of waste collection user charges with other public utilities such as water and/or electricity. For this option, to add waste collection bill to the electricity bill can be the best option as not everyone has access to piped water while with the electricity bundles supply system almost everyone in urban areas has access to the electricity network. Though this can increase the rate of user charges collection and reduce the free riding of poor families on rich families, a deep analysis is required to evaluate its feasibility and new challenges related to this option.

Waste collection companies:

- To develop adequate customer database and cost accounting systems allowing them to provide accurate and complete information on costs incurred during service provision which is translated into adequate user charges;
- To find other strategies to deal with the delay in user charges collection as bank loans create unnecessary transaction costs which can have further consequences on company's financial sustainability. These strategies include exploration of 4Rs as discussed above;
- To organize capacity building programs for user charges collection team and develop the capacity in user charges follow-up to optimize the payments collection; and
- To revise the salary ranges to attract skilled and capable labor and build the capacity of existing workers in operations planning and management capacities. This will reduce or prevent unnecessary operations costs by developing route plans which optimize the vehicles utilization.

In terms of social sustainability, the study has evidenced improvement but some aspects need to be improved which are linked to the above aspects. The following summarize regulation- and practice-based recommendations to ensure social sustainability.

- The KCC and RURA should revisit contract and license conditions, especially extension of the contract duration at least up to 10 years, to reduce investment risks. This can not only attract the private operators with high financial capacities to invest in solid waste service but also, it can provide opportunities to existing small and medium organized companies to have access to bank loans to grow their physical and human capacities;
- KCC and RURA should find strategies to increase the competition by revisiting licensing conditions such as the reduction of the license fee to prevent provisional license category. This will allow companies that have provisional license to have valid license and that having valid license feel the fair competition;
- KCC should consider the general characteristics of sectors and develop various franchise contract accommodating these characteristics;
- The KCC should improve the state of the roads and the dump site to reduce the hazards on collection vehicles which will reduce the rate of vehicle breakdowns and hence, ensuring the compliance with collection frequency and schedules;
- Companies should increase the number of vehicles and supervisors to ensure the compliance with collection frequency and schedules and to respect the Rwanda Labour Law, especially working hours for private employees;
- Companies should provide and enforce protective gears to collection crews and to other categories of field staff alongside training on occupational health and safety.

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Appendices

Appendix A List of all licensed operators with valid licenses

Private operator	Province	Operational area	Contact person	License expiration date
ISUKU KINYINYA	CoK	Kinyinya (Gasabo)	Mukeshimana Liberate 0788567963	16/06/2018
Real Environmental Protectors	CoK	Kagarama (Kicukiro)	Kananura Christophe 0788747099	06/08/2018
KOIBO	Western Province	Rubavu	Tugirumwami Deo 0788531642 tugideo@gmail.com	20/08/2018
Umurimo Mwiza Ltd	CoK	AirPort, Inyange Industries, Bralirwa (Kicukiro)	Safari George 0788589186 umurimomwiza@gmail.com	09/07/2018
UBUMWE Cleaning Services	CoK	Kicukiro, Gatenga, Niboye and Gikondo (Kicukiro)	Bwate David 0788545551 ubumwe.cleaning@yahoo.com	16/04/2018
COPED	CoK	Nyarugenge, Kacyiru and Remera (Nyarugenge and Gasabo)	Buregeya Paulin 0788301975	17/12/2018
AGRUNI LTD	CoK	Nyarugunga, Kanombe, Kimihurura, Rwezamenyo, Kimironko, Nyamirambo, Gatsata, Rusororo & Jali (Gasabo, Kicukiro, & Nyarugenge)	MITALI Diogene 0788435111	28/01/2019
BAHEZA General Services	CoK	Kigarama (Kicukiro)	Uwimana Therese 0788736353 hezanew@yahoo.fr	20/01/2019
COCEN	CoK	Nyakabanda & Kimisagara (Nyarugenge)	Benimana Leon 078835440 coocenabl@yahoo.fr	12/03/2019
ACAPE	Western Province	Rubavu District	Fikili Didace 078858792	21/07/2019
M.ZI	Northern Province	Musanze District	Desange UWAMAHORO 0788886820	08/09/2014

Source: From [RURA \(2015\)](#)

Appendix B Core reasons for privatization of solid waste services in developing countries

Main reasons	Characteristics	
	Public sector	Private sector
To reduce the cost related to public service in favor of the consumer	Difficult to implement Urgent measures due to tenacious structures	High motivation of minimization of cost and maximization and or optimization of profit
To release the government from financial and administrative challenge	Incapability in meeting the demands in scale and quality; delays in service and facilities provision, resistance of citizens to tax increase	Able to put pressure on public sector, access to diverse financial arrangement such as bank loans
To reduce the demand-supply unbalance	Incapability in meeting the demands of scale and quality; less responsive to customer complaints (more priorities)	private operators are customer-orientated which makes the knowing the need of customers; high responsiveness to customer complaints
To increase the efficiency by encouraging competition	Service provision monopoly, inefficient resources use, rigid employee contract makes difficult to change defaulting staff	Strong competition which pushes them to cost counting; efficiency and performance were driven; flexibility in changing staff, staff incentive-based management
To introduce and adopt new technologies	Resistance to change; rigid financial procedures	Malleable and cost effective-oriented

Decision making	Decisions making guided by political priorities which may lead to misallocation of resources	Decision making driven by economic factors
Management of equipment	common property character of public asset reduces responsibility ownership of staff leading to stumpy maintenance level	private property character increases responsibility ownership which coupled great Economic incentive leads to high maintenance level
Service interruption	Possibility to public service cut off when the provision is ensured by the public monopoly as no alternative supply is planned.	Disputes or service cut off is quickly resolved due to robust incentive
Responsiveness to control of cost	Prominence and salaries of public sector managers are related to the number of staff and level of expenses	The performance of private sector managers is based on his/her contribution to the profitability of the firm, hence to the efficiency.

Source: Modified from [Kassim \(2006\)](#)

Appendix C Group discussion with workers of P1 Company



Source: Photo was taken by the Author in RUKIRI II cell office at Remera sector, Kigali (2015)

Appendix D P1 Company's compactor truck in Nyabisindu cell in Remera sector



Source: Photo was taken by the Author in Nyabisindu cell at Remera sector, Kigali (2015)

Appendix E P3 Company's collection vehicle providing service in Kicukiro sector



Source: Photo was taken by the Author in Kicukiro cell at Kicukiro sector, Kigali (2015)

Appendix F Transit sites created during collection in inaccessible areas in Kicukiro sector



Source: Photo was taken by the Author in Kicukiro cell at Kicukiro sector, Kigali (2015)

Appendix G P6 Company's vehicle providing the service in Kagarama sector



Source: Photo was taken by the Author in Kagarama sector, Kigali (2015)

Appendix H Road to the dumpsite and waste overflows in areas around the dumpsite in Kigali



Source: Photo was taken by the Author at Nduba dumpsite, Kigali (2016)

Appendix I Leachate from waste disposed of at Nduba dumpsite in Kigali



Source: Photo was taken by the Author at Nduba dumpsite, Kigali (2016)

Appendix J Mixed waste at the dumpsite in Kigali with big fraction of organic waste



Source: Photo was taken by the Author at Nduba dumpsite, Kigali (2016)

AMASEZERANO NO / 2012 HAGATI
Y' UMURENGE WA

NA
.....(RWIYEMEZAMIRIMO)

AJYANYE NO GUKUSANYA NO GUTWARA
IBISHINGWE BYO MU NGO AHABUGENEWE

IBISOBANURO BY'AMAGAMBO AKORESHA MURI AYA MASEZERANO

Mu rwego rwo gusesengura no gusobanura ibikubiye muri aya masezerano amagambo akurikira asobanuwe atya:
“**Akazi**” bisobanuye imirimo igomba kurangizwa na koperative/company hakurikijwe inshingano

zigaragazwa n'aya masezerano mu ngingo yayo ya 2.

“**Rwiyemezamirimo**” bisobanuye ikigo, koperative cyangwa company yahawe na RURA uruhushya rwo gukusanya no gutwara imyanda y'ibishingwe ikaba yaranatsindiye isoko ryo kubitwara mu Murenge.

“**Igiciro cyo gukusanya no gutwara ibishingwe**” bisobanura igiciro ntarengwa cyemejwe n'inama ngenzuramikorere ya RURA buri muturage agomba kwishyura kugira ngo ahabwe serivisi zo gutwarirwa ibishingwe.

“**Uruhushya**” Bisobanuye icyemezo gitangwa n'Ngenzuramikorere ya RURA mu bijyanye no gukusanya no gutwara ibishingwe biva mu ngo.

INGINGO YA 1: Intego y'amasezerano.

Aya masezerano agamije gushyiraho umurongo w'imikoranire hagati y'Akarere na Rwiyemezamirimo watsindiye isoko ryo gukusanya no gutwara imyanda y'ibishingwe biva mu ngo.

INGINGO YA 2: Inshingano za Rwiyemezamirimo

Hakurikijwe ibisabwa mu gitabo cy'amabwiriza y'isoko, Rwiyemezamirimo agomba kurangiza inshingano zikurikira:

1. Gukusanya no gutwara ibishingwe byo mu ngo zose ziri mu Murenge wa ... nibura rimwe mu Cyumweru.
2. Gutanga ibikoresho byabugenewe byo gushyiramo ibishingwe byo mu ngo ku muntu ubikeneye ariko bikishyurirwa ukwabyo.
3. Kutavanga ibishingwe bibora n'ibitabira mu gihe cyo kubitwara ahabugenewe
4. Gukuza ibishingwe mu ngo bigakorwa mu gihe imodoka yo kubitwara ihageze kandi bigakurikiranwa n'umukozi wa Rwiyemezamirimo .
5. Gusukura aho bapakiriye ibishingwe
6. Gushakira abakozi ibikoresho byabugenewe by'akazi (isarubeti, bote, uturindantoki, uturinda mazuru)
7. Gukingiza abakozi urukingo rwa Tetanusu
8. Gusukura imodoka zikoreshe mu gukusanya no gutwara imyanda y'ibishingwe
9. Kubahiriza amategeko yose n'amabwiriza arebana n'isuku n'imirungire y'ibishingwe mu gihugu cy' u Rwanda
10. Kugirana amasezerano n'umuturage agaragaza inshuro azajya amutwarira, Amafaranga yishyurwa n'igihe agomba kwishyurirwa kandi akajya ayubahiriza
11. Gutanga raporo ku Umurenge buri kwezi ikagera kopi Akarere, Umujyi wa Kigali na RURA
12. Gukora urutonde rw'abatishyura rugashyikirizwa Umurenge.
13. Gutanga raporo za buri cyumweru ku murenge zikurikira :
 - a) Umubare w' ingo zasinye contract,
 - b) Umubare w' ingo zishyuye servise
 - c) Umubare w' ingo zahawe servise
 - d) Umubare w' ingo zivangura imyanda

14. Kugaragaza abakozi bakorera (Rwiyemezamirimo) ku rwego rw' Umurenge, Akagari, Umudugudu n' ibikoresho bibaranga mu kazi.
15. Kugaragariza Umurenge gahunda ihamye yo gutwara ibishingwe muri buri umudugudu.

INGINGO YA 3: Inshingano z'Umurenge

Umurenge ufite inshingano zikurikira:

1. Gukurikirana ko Rwiyemezamirimo ashyira mu bikorwa inshingano ze.
2. Gukangurira Abaturage kwishyura ku gihe Rwiyemezamirimo ubatwarira ibishingwe .
3. Guca amande abatishyura amafaranga yo kubatwarira ibishingwe .
4. Gukurikirana ko Rwiyemezamirimo acyujije ibisabwa kugira ngo akore akazi ko gukusanya no gutwara ibishingwe (licensing obligations);
5. Gutanga raporo y'imikorere ya Rwiyemezamirimo ku Karere bakagera kopi Umujyi wa Kigali na RURA buri gihembwe.

INGINGO YA 4: Igihe aya masezerano azamara

Aya masezerano azamara imyaka ... ishobora kongerwa.

INGINGO YA 5: Ibiciro n'uburyo bishyirwaho

Igiciro cyo gutwara ibishingwe byo mu ngo nibura rimwe mu cyumweru ni amafaranga y'u Rwanda atarenze frw ingo zikenye; atarenze ... frw ingo zifashije; atarenze ... frw ingo zikize. Ukeneye ko bamutwarira inshuro zirenze imwe mu cyumweru cgangwa udufuka turenze 2 mu cyumweru yumvikana na Rwiyemezamirimo.

INGINGO YA 6: Uburyo bw'imyishyurize

Amafaranga yo gutwara ibishingwe yishyurwa na nyiri rugururwa ibishingwe akishyurwa mbere kandi bitarenze itariki ya 7 za buri kwezi gukurikira ukwishyurizwa, akishyura bijyanye n' inshuro yahawe servise.

INGINGO YA 7: Aho imirimo izakorerwa

Imirimo izakorerwa n' Umurenge wa ...

INGINGO YA 8: Ivugururwa ry'aya masezerano

Byumvikanyeho n'impande zombi ko aya masezerano ashobora kuvugururwa igihe cyose bibaye ngombwa

INGINGO YA 9: Gusesa amasezerano

Mu gihe Rwiyemezamirimo atujuje inshingano ze Umurenge wibutsa mu nyandiko (bitarenze inshuro eshatu) ukamenyesha Akarere; mu gihe Company bigaragaye ko itisubiyeho, Umurenge wandikira Akarere usaba ko amasezerano yaseswa bityo Rwiyemezamirimo agahagarikwa burundu gutanga serivisi mu Murenge. Mu gihe amasezerano aseshwe burundu, Akarere kamenyesha ikigo ngenzuramikorere cya RURA.

INGINGO YA 10: Uburenganzira bwo guhagararirwa

Mu birebana n'ishyirwa mu bikorwa ry'aya masezerano, umwe mu bayagiranye ntiyemerewe guhagararirwa uretse igihe yaba yabimenyesheje mu nyandiko kandi bikemerwa n'urundi ruhande.

INGINGO YA 11: Irengayobora (force majeure)

Umwe mubagiranye aya masezerano ntashobora kuryozwa ibitubahirijwe muri aya masezerano bitewe n'impamvu z'irengayobora.

INGINGO YA 12: Amategeko agomba gukoreshwa

Ishyirwa mu bikorwa ry'aya masezerano ryubahiriza amategeko agenga amasezerana mu Rwanda.

INGINGO YA 13: icyemurampaka

Impaka zose zizavuka mu ishyirwa mu bikorwa ry'aya masezerano zizakemurwa ku bwumvikane bw'impande zombi nibinirirana hazitabazwa ikigo ngenzuramikorere cya RURA mbere y'uko hitabazwa urukiko nkemurampaka rwo mu Rwanda.

Aya masezerano azatangira gushyirwa mu bikorwa n' impande zombi kuva tariki ya dd/mm/yyyy.

Bikorewe i Kigali ku wa

.....
(Rwiyemezamirimo)

.....
Umunyamabanga Nshingabikorwa w'umurenge wa ...

Appendix L Responsibility and incentives of partners to promote composting

Partner	Costs	Incentives
MINIFRA	<ul style="list-style-type: none"> • Necessary facilities 	<ul style="list-style-type: none"> • Wise use of land to dump site • Reduction/prevention of environmental hazards related to waste disposal • Reduction of the budget allocated to the management of the dump site
MINAGRI	<ul style="list-style-type: none"> • Co-finance composting activities • Ensure the market for compost by mobilizing of farmers 	<ul style="list-style-type: none"> • Promote organic farming by getting compost • Promote ecosystem restoration such as aquatic ecosystem and wetlands by reducing waste in dump site
KCC	<ul style="list-style-type: none"> • Management of facilities • Management of human resources • Enforcement of waste separation, collection, and transportation • Management of compost distribution to farmers 	<ul style="list-style-type: none"> • Extension of the lifetime of the dump site • Reduction of the budget allocated to the dump site • Minimization/prevention of environmental hazards related to waste prevention • Reduction/prevention of hazards on companies' collection vehicles