

Solid Waste Management in Secondary Cities of Rwanda - Muhanga & Huye

Situation assessment and potential intervention areas



Acknowledgement

This report is an integrated result of initial assessment and study on solid waste management sector in Huye and Muhanga in Rwanda, conducted by Global Green Growth Institute (GGGI). The report was prepared under the guidance and leadership of Mr. Donovan Storey, Deputy Director and Head of Green Cities, Investment and Policy Solutions Division at GGGI. Ms. Shomi Kim (Green Cities Analyst, GGGI), author for the report, provided technical oversight and led the research, field study, analysis and writing efforts. This report is based on substantial inputs from the solid waste management consultant Mr. Pius Nishimwe. Mr. Okechukwu Daniel Ogbonnaya (Program Lead, GGGI Rwanda), Mr. Jean Pierre Munyeshyaka (Green Urbanization Senior Associate) and Ms. Inhee Chung (Country Representative, GGGI Rwanda) have contributed to field study and review of this report. The field study was benefited from contributions made by Mr. Theogene Nsengiyumva (Huye District Technical Assistant) and Ms. Diane Umukunzi Uyambaje (Muhanga District Technical Assistant). Ms. Sujeung Hong (Associate, GGGI) has contributed to designing of this report.

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Acronyms

CoK	City of Kigali
FST	Fecal Sludge Treatment
GGGI	Global Green Growth Institute
GOR	Government of Rwanda
KPIs	Key Performance Indicators
MININFRA	Ministry of Infrastructure
MoU	Memorandum of Understanding
MFI	Microfinance Institute
MSWM	Municipal Solid Waste Management
NR	The National Roadmap for Green Secondary City Development
RURA	Rwanda Utility Regulatory Agency
SWM	Solid Waste Management
SWOT	Strength, Weakness, Opportunity, Threat
ToT	Training of Trainers
tpd	Tonnes per day

Executive summary

With the rapid urbanization of secondary and emerging cities around the globe, greater attention has been paid to the sustainable management of increasing volumes of municipal solid waste. Secondary cities of Rwanda are no exception. Through the Green Secondary Cities Development Program supported by Global Green Growth Institute (GGGI), the district governments of Huye and Muhanga have identified solid waste management as their priority sector in transitioning to greener urban development.

The aim of this study was to conduct an in-depth assessment of solid waste management value chains and the policy and regulatory framework in secondary cities of Rwanda. This has been completed to inform and identify potential intervention areas to develop a sustainable waste management system in support of waste-to-resource approaches.

The assessment demonstrates that municipal solid waste management (MSWM) in Muhanga and Huye is at rudimentary levels, with collection coverage rates at less than 10%¹ (6% in urban areas of Huye, 7% in serviced areas of Muhanga), and with the limited infrastructure for waste treatment and disposal. The majority of urban residents still follow the traditional ways of handling waste, such as open dumping and burning. This traditional practice of handling waste has negative impacts on health and environment through methane and carbon emissions from burning and uncontrolled dumpsites. Both in Huye and Muhanga, municipal waste collection services are provided by private companies that are facing challenges associated with limited physical and financial capacities due to limited local demand, and low willingness-to-pay for the service. There remains a lack of awareness on municipal waste collection services while households are unlikely to use services due to unaffordability and dissatisfaction with irregularity of the services. While there is a certain degree of organic waste recovery managed at the landfill site in Huye, there is no significant municipality-led waste-to-resource initiatives evident in Muhanga. The waste collected in Muhanga is disposed of at an uncontrolled dumpsite with no opportunities for resource recovery.

The above-mentioned challenges are attributed to:

- Lack of regulatory framework or policy on solid waste management services at the district level, which hinders government enforcement and systematic approaches on mobilizing community participation;
- Limited infrastructure and facilities to adequately dispose, discharge and treat waste, especially in Muhanga;

¹ Data was gathered through a field study conducted by GGGI in 2018.

- Limited physical and financial capacity of service providers, which results in irregular service provision and low service contract rate;
- Low level of awareness and willingness to use and pay for the waste collection services;
- Lack of coordination among the local stakeholders in the waste recycling value chain;
- Small local markets and demand for recyclable materials and organic composts;
- Limited sources of revenue generation from solid waste management for municipal governments resulting in a lack of financial resources to promote a sustainable MSWM system.

To overcome these challenges, a number of potential intervention areas for promotion and improvement of the solid waste management system were considered and discussed. As an outcome of desk research and field missions to Huye and Muhanga conducted in 2018, GGGI recommends the following opportunities as highly impactful intervention areas which address the local context and most urgent needs.

Recommended intervention areas for the city of Huye are:

- Promotion of, and improvement in waste collection services and waste separation at source;
- Valorization of the waste-to-resource value chain, with specific attention to plastics and organic waste;
- Development of a viable and sustainable business model to generate income streams in waste management for the Huye district government.

Recommended intervention areas for the city of Muhanga are:

- Establishment of transit sites with decentralized waste composting facilities;
- Development of a regulatory framework for waste collection services, pricing, and disposal at the district level

The recommended intervention areas could be further discussed with the respective municipal governments and development partners in order to take these initiatives into implementation of policy adoption and mobilization or allocation of financial resources. It is recommended that project proposals will be developed by the municipalities, with the support of GGGI and other international development partners, to ensure local government ownership over the projects and policy initiatives.

Introduction

This report was produced as part of the 2nd phase of GGGI's Green Secondary Cities Development Program in Rwanda. GGGI, as a trusted advisor to the Government of Rwanda (GOR), has been pursuing mainstreaming green growth into urban planning and development in the secondary cities of Rwanda for several years. In 2016, GGGI in collaboration with Ministry of Infrastructure in Rwanda (MININFRA) officially launched "The National Roadmap for Green Secondary City Development (NR)" which lays out guidelines and action plans on green urban development for six secondary cities. With an aim to implement this NR, GGGI and MININFRA conducted a series of participatory Training of Trainers (ToT) workshops in 2017/18 to improve the capacity of local government officials, and thus to help them independently identify and implement green secondary action plans.

Following this ToT program, six green project ideas were initiated and developed into project concept notes with a focus on sustainable solid waste management for Huye, Muhanga, Musanze and Rubavu. Through consultations with the local governments, GGGI has identified Huye and Muhanga as pilot cities to conduct in-depth situation assessments in the waste sector for further policy and project development, to support sustainable solid waste management in pursuit of waste-to-resource approaches and circular economy.

The report is produced using descriptive analytics based on field observations, desk study, informant interviews, and surveys. The field mission was conducted from September 12 to 20 in 2018 by a group of thematic experts including Ms. Shomi Kim (Green Cities Analyst), Mr. Jean Pierre Munyeshyaka (Senior Associate, Rwanda), and Mr. Pius Nishimwe (Solid Waste Management Consultant). The field missions included meetings and discussions with different stakeholders involved in the solid waste sector such as district governments, waste collection companies, recycling companies, junk shop owners, and waste pickers at the district levels in Huye and Muhanga. Stakeholder meetings at the central level, such as with the Rwanda Utilities Regulatory Authorities (RURA), financial institutions and development partners, were also held to assess the regulatory framework and financial mechanisms to promote microenterprises in waste services provision.

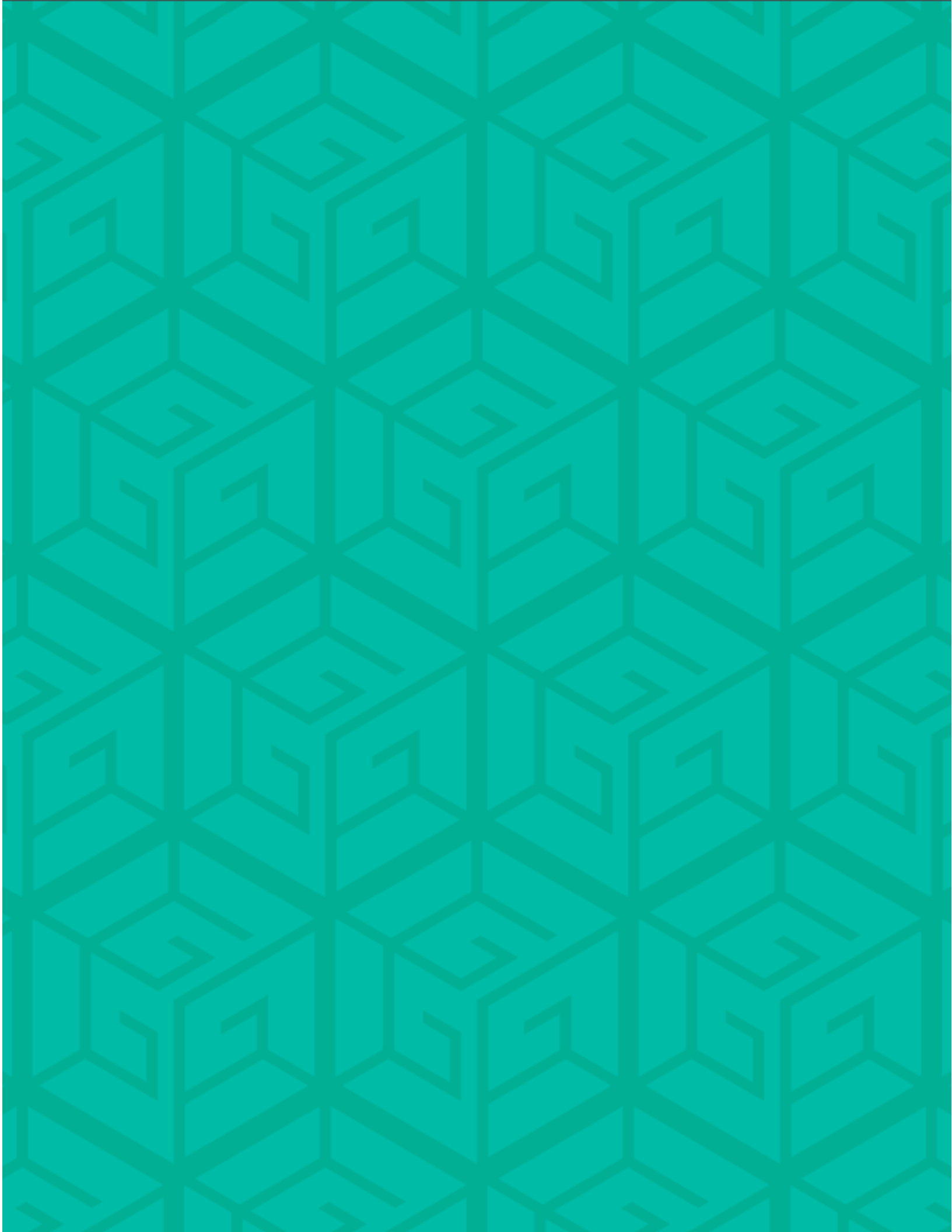
Secondary data was collected through households' survey conducted in Huye and Muhanga. A sample of 60 households was selected based on a random selection basis in each city and a total of 120 households participated in the survey.

This report aims to present the findings from the field study and to propose impactful intervention areas to achieve sustainable MSWM in Huye and Muhanga in line with the aspirations and vision of the respective municipal governments.

The report is organized into three main chapters as follows:

- **Chapter 1** lays out the situation assessment of solid waste management in Huye city. This chapter illustrates the value chain analysis of solid waste management, i.e. generation and storage, collection and transport, waste to resources and waste disposal. It also presents a policy and institutional framework that provides the waste collection fee structure and financing mechanisms in the cycle of the MSWM system.
- **Chapter 2** presents current practices of MSWM in Muhanga city and its structure follows that of Chapter 1 above.
- **Chapter 3** elaborates on the opportunities to improve the solid waste management systems in Huye and Muhanga with a focus on waste-to-resource approaches and proposes recommended interventions areas. These interventions stem from a ranking exercise of all identified potential intervention areas.

The findings of this report are expected to provide insights to district governments and international development partners on plausible options and most impactful entry points specific to local context in order to improve the MSWM system in secondary cities of Rwanda.



Chapter 1.

Solid waste management in Huye: value chain analysis and institutional framework

1.1 Waste generation and handling

According to the Sanitation Master Plan for Huye District (2015), the daily generation of waste on a per capita basis on average is 0.7kg/cap/day. As the population of the city is 65,555, it is estimated that the city generates around 50 tons of solid waste per day.

Solid waste generated in Huye is dominated by organic waste accounting for 75% of the collected waste (Figure 1). Among recyclable waste, plastics and paper accounted for the biggest share of the recyclable materials, at 8% and 6% respectively.

Composition of Waste Collected in Huye City

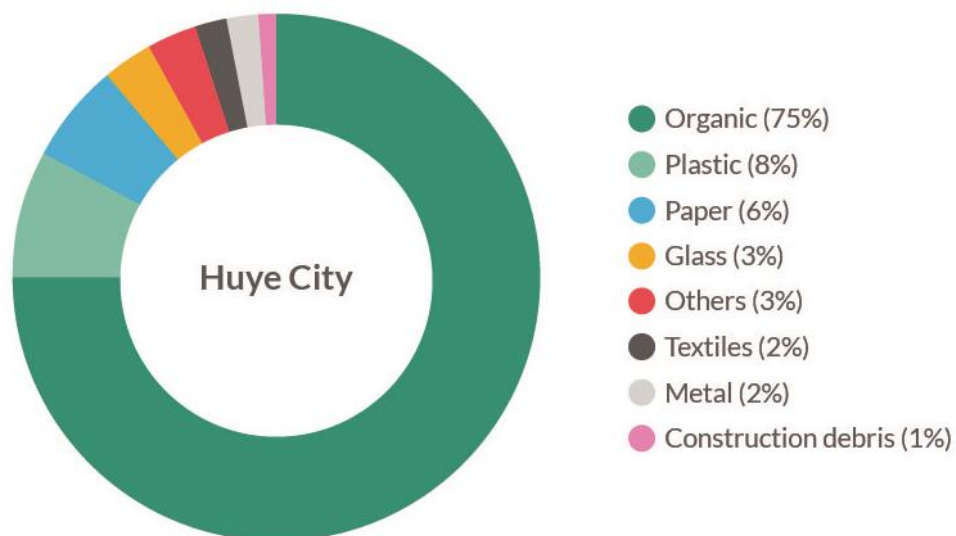


Figure 1. Composition of solid waste collected in Huye²

There is no source segregation mechanism enforced by the municipality, while some informal waste pickers scavenge recyclable waste for commercial purposes. According to the survey result, it was revealed that many households are willing to separate waste at source if households are

² Modified based on the preliminary data collection from the Huye district government.

provided with clear information and guidance on a source segregation mechanism. Households have different motivation factors to separate waste, ranging from aesthetic factors (e.g. cleanliness of the households) to market-based factors (e.g. discounted collection fees or direct cash handouts from selling recyclables). This indicates that there is a need for a mixed intervention, i.e. combining aesthetic and market-based incentives to promote waste separation at households.

In general, one storage facility is used for the storage of all types of waste generated at household level, which results in the immediate mixing of biodegradable (organic) and non-biodegradable waste. Some organic waste is buried as natural decomposition is valued for soil amendment. Different resources are used for storage of unseparated waste, which comprise mainly discarded cartons, plastic buckets and sugar and rice bags.

For business entities such as markets and shopping malls, a waste collection corner is arranged within the premise of the market. Wood dustbins are mainly used to store unseparated waste and are in general poorly managed as shown in the images below (Image 1).



Wooden dustbin used in a market



Poorly managed waste corner in a market

Image 1. Waste storage in markets in Huye

There are no public bins in the city which leads to significant and littering in public spaces and drainage systems. Installing public bins is part of the district priorities for this fiscal year 2018-2019, as reported by the Mayor of the district.

Furthermore, there is no district specific bylaw or initiative to enforce waste source separation, which undermines waste-to-resources initiatives. The waste collection companies also do not provide waste separation mechanisms i.e. separate compartments or separate vehicles during the

collection and transportation. Therefore, even if waste is separated at source, it is subsequently mixed in the course of transportation and disposal.

1.2 Waste collection and transportation

Waste collection services are provided by private operators based on door-to-door collection. Most households are located in truck accessible areas according to the planned settlement of Huye, which is an important incentive to waste collection companies. However, waste is not collected regularly which results in children, especially, scavenging on waste at disposal and collection sites. This irregular service is mostly explained by limited physical capacities of collection companies and no designation of intervention zones for each operator. Each company owns one collection truck to provide services both to household and business entities. As business entities are the main customers of the service, they are given a higher priority in the service delivery. No designation of intervention zones for each operator is a hinderance to holding them accountable for quality service delivery and monitoring, which results in low collection rates at the household level and low levels of public satisfaction with the service.

Waste is collected using specific trucks which are dominated by used roll-on-trucks owned by private operators. Collection trucks are not partitioned, which does not allow separate collection nor storage.

The district council has set user charges based on households' income categories and collection frequency for household and waste volume is included as an additional parameter for business entities. For households, the user charge set is Frw2,000 (USD2.20) for low and middle-income households and Frw3,000 (USD3.30) for high income households. For businesses, the prevailing user charge is based on the volume of waste generated, where the user charge is Frw1,500 (USD 1.70) per kg. The user charges collection fee structured for households was designed based on the experience of Kigali. Albeit with regulated prices, it was found out that a monthly user charge is often negotiated between the operator and the users based on the volume of waste generated. Although there are some zones which have a well-known price to be charged to households based on the level of its economic status, generally, there is no standardized and regulated service frequency. The frequency is driven by the need of users (e.g. household, public and private institutions). This demonstrates that there is no standardized collection system based on market segmentation such as zoning and hence, users pay differently based on the volume of waste generated and the service frequency.

It is reported by the district official and collection companies that the current waste collection coverage is at 6%. According to the household survey, it was reported that the main reason for

not using the waste collection services is an affordability issue (16%). One important note is that 13% of the respondents reported that lack of awareness on the services is the reason for not using the service. This is an indication for the need of promotional activities on the municipal waste collection services and for a more regular service. According to the survey, the level of willingness to pay for service was Frw 3,000 (USD3.30) which falls in within the current waste collection fee structure. Therefore, if there is strong enforcement or promotional activities conducted by the city government on the use of the collection service accompanied by increased service quality, it is expected to increase waste collection coverage rates in Huye.

1.3 Waste treatment and disposal

There is a sanitary landfill located in 15km away from the city center in Huye. Albeit the basic infrastructure, the landfill is seen as well managed by a private company. The organic waste component at the landfill is turned into compost, which contributes to generating income for the company through sales of organic compost. There are currently no charges (tipping fees) paid by the collection companies for disposal of waste at the landfill site.

Waste entering into the landfill is dominated by organic waste counting 75% of the collected waste, as discussed above. In addition to composting, some non-biodegradable waste, such as plastic jerry cans and polyethylene bags, are sorted and on-sold by the private company that operates the landfill.

Organic waste treatment and sales

Organic waste is processed and sorted manually through windrows made under roof (Image 2). The modality of composting relies only on natural decomposition. The main challenges faced during composting is unsorted waste arrived at the landfill. This not only affects the quality of the compost but also requires more human resources and time to sort out the organic waste from the residual waste. Financial constraints facing the company also lies on limited sales of the organic compost. The company produces 15 tons of compost per year however, only 5 tons (30%) of the organic compost is sold. In order to ensure sustainable operation of the sanitary landfill, a more solid business model shall be established through charging tipping fees to the collection companies and expanding the market and demand for organic compost. In addition, the process of composting needs to be upgraded to make compost more competitive in local and regional markets.



Image 2. Organic waste composting at the landfill site in Huye

Treatment of recycling materials

There is a local plastic recycling company operating in Huye. The company recycles two types of plastics namely low-density plastic (LDP) and high-density plastic (HDPE), to produce electrical appliances (e.g. plastic jerry cans) and plastic waste bags. Despite the existence of a local plastic recycling company, there was a clear disconnect between the plastics arriving at the landfill site and the plastics processed at the local recycling company. The company managing the landfill site was not aware of the local recycling company's operation and therefore their supply chain was instead to Uganda, while the recycling company sources raw materials from Kigali. Once the linkage between two local actors is built up, this would provide a more optimal waste-to-resource opportunity for the city, particularly for plastics.

Moreover, there are also a number of unregulated waste banks, so-called Junkshops, operating in public markets and there is no formal link between waste pickers and waste bank operators. At present, operators source waste from housekeepers, collection crews of waste collection companies, and street children scavenging on waste at the gate of households on the day of collection. The collection of recyclable materials by informal waste pickers is highly concentrated on plastics and metal, as their local commercial values are relatively higher than other recyclable materials.

1.4 Policy and institutional setting on municipal solid waste management in Huye

Household contractual framework

Two private collection companies contracted by the municipal government provide collection services to households and business entities. The district does not pay anything to these companies. While it is an obligation of the Rwanda Utility Regulatory Agency (RURA) to own a valid waste collection license to compete for waste collection service contracts, the district does not enforce it strongly, as it can be a limiting factor for local companies to kick-start their business. However, this may also lead to unfair competition and lead to poor service quality, which in turn results in a low collection coverage rate.

Public institutions and small businesses contractual framework

The district has contracted one company to clean public institutions and public spaces (e.g. district and sector offices, roads and public markets), and to collect and transport waste generated from those institutions and buildings to the sanitary landfill. The company submits the bill directly to the district and the district pays the company a fixed amount of 5 million Rwandan Francs (USD5,500) per month. Waste is not separated by the businesses entities and is therefore collected, transported and mixed in one collection truck.

District specific regulatory framework

The Huye district council elaborated and approved the district specific waste management by-law which entered into force in December 2017. This bylaw was elaborated as response to the challenge of the small proportion of waste generated entering the landfill, a concern faced by the private company managing the landfill opened in June 2017. However, there is no clear governance structure and accountability framework at scale to enforce this bylaw. Waste collection is not yet a governance performance indicator of the municipality therefore enforcement of regulation is ensured at the district level. At present, there is no involvement of local authorities such as a village authority, whereas it is this level of governance that has direct contact with households.

Moreover, waste collection companies are not accountable for service quality, as they do not report to the districts concerning their service provision, and there is no reporting framework they are required to comply with. The communication channel for households to report on services satisfactory is not evident.

1.5 Summary of findings

Table 1. Overview of MSWM in Huye

Solid waste generation	<ul style="list-style-type: none"> Waste per capita: 0.7kg/day Daily waste generation: 50 tons/day No source segregation mechanisms enforced by the municipality
Solid waste composition	<ul style="list-style-type: none"> Organic waste is estimated to account for the highest share of the total waste: 75% of waste to landfill Other recyclables: Paper (6%) and plastics (8%), especially plastic bottles
Collection and transportation	<ul style="list-style-type: none"> Collection service coverage: 6% Waste collection service is provided by private companies: Two companies servicing households and businesses entities while one company operating in public spaces and buildings. Collection trucks: three roll-on-trucks owned by private companies without partitions Service frequency: once a week Collection fee structure: The district government sets user charges from Frw2,000 (USD 2.20) to Frw3,000 (USD 3.30) per month based on the household income level. Fees are normally negotiated at the price ranging from Frw2,000-5,000 (USD 2.20 -5.50) per month. Collection modalities: Door-to-door collection
Waste-to-resources	<ul style="list-style-type: none"> Organic waste is manually sorted and composted by a private company at the sanitary landfill. Only 30% of the organic compost (5 tons out of 15 tons produced) is sold. Low composting capacity due to manual composting and no separation at source Low demand of produced compost due to non-recognition of compost from waste as a fertilizer option by the Rwanda Fertilizer Policy and weak marketing strategies of the composting company. The quality of compost is not measured or certified. Large amount of untreated plastic bottles accumulated in the warehouse at the landfill site and is only sold to Uganda periodically. A local plastic recycling company produces electrical appliances, waste bags, and baby plants tubes, sourcing the raw materials from Kigali.

	<ul style="list-style-type: none"> • There was no connection between raw materials of the local recycling companies and the company managing plastics at the landfill site.
Waste disposal	<ul style="list-style-type: none"> • A well-managed landfill located in 15 km from the city center placed near the district industrial park • Unsorted waste is disposed at the landfill and sorted manually.

To have a better understanding of the solid waste sector in Huye, the following maps out Strengths (S), Weaknesses (W), Opportunities (O) and Threats (T). Through a SWOT analysis, it aims to synthesize the critical features of the MSWM for Huye to inform potential intervention areas.

Strengths

- Established municipal waste collection services with the participation of private operators
- A regulated waste collection fee structure based on the income categories at the district level
- Existence of informal waste pickers and junk shops operating in some public markets.

Weaknesses

- Poor transportation fleet owned by waste collection service providers leading to irregular and poor service delivery which results in households' resistance to using the services resulting in a low (6%) collection rate which undermines the waste management system
- Slow composting process of organic waste due to no separation at source and limited waste recovery facilities
- Disconnect between plastic recycling companies and the collected plastics at the landfill site
- Limited sales of organic waste, in relation to what is produced
- Lack of awareness on the municipal waste collection services
- Lack of awareness and enforcement in waste segregation at the household level.

Opportunities

- Existence of local plastic recycling companies
- Existence of a well-managed landfill site which can be leveraged for promoting waste-to-resource opportunities
- Existing distributors of organic compost and potential markets for organic compost including rice plantation cooperatives
- Existing district specific bylaw for MSWM.

Threats

- Limited financial capacity of the Huye district government to respond to solid waste sector needs as the income source in MSWM for the municipality is limited
- Low level of willingness and affordability of the middle-low-income households to pay for waste collection services contributing to investment risks
- Lack of recognition of organic compost from municipal waste by the national fertilizer policy
- Lack of district specific regulatory framework supporting waste-to-resource approaches.

Chapter 02.

Solid waste management in Muhanga: value chain analysis and institutional setting

2.1 Waste generation and handling

The per capita solid waste generation rate in Muhanga, as obtained from the solid waste characterization field survey, is 0.6 kg/cap/day. According to Rwanda's 4th Population and Housing Census (2012), it is estimated that 50,608 inhabitants live in the urban area which means the daily generation of the waste in urban area of Muhanga is around 30 tons. Generated waste is dominated by organic composition (about 64% of generated waste, 19 tpd). Another key source (28% of generated waste) comprises wood ashes, as illustrated on Figure 2.

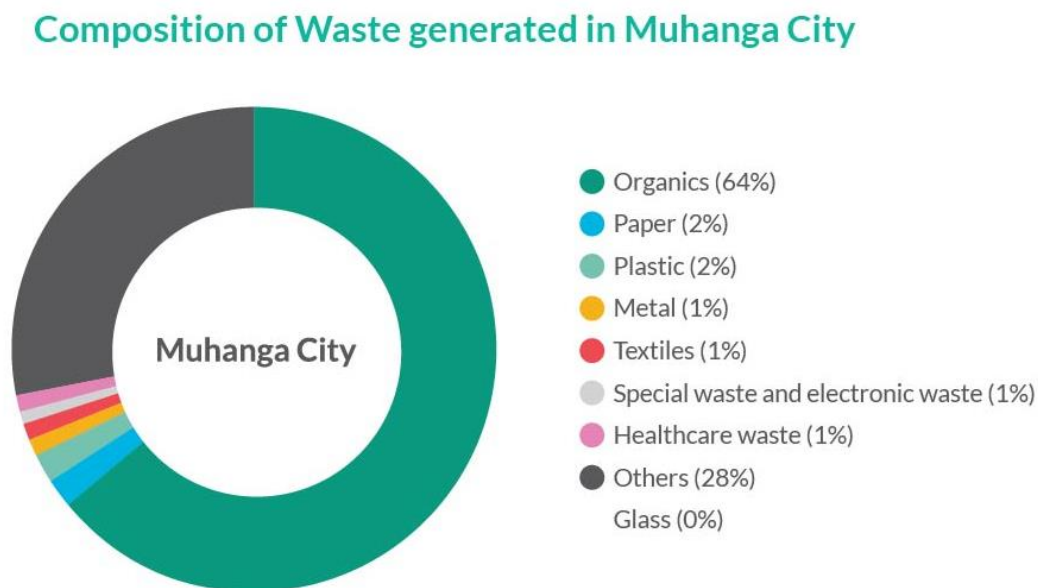


Figure 2. Composition of waste generated in Muhanga³

Waste generated from households is stored in different containers including, but not limited to, bins and bags, and placed inside of compounds for collection by the collection companies on the designated day of collection. Most households do not segregate recyclable waste in their premises. Waste generated in market and shops is stored in storage facilities before it is collected by

³ Source: Adapted by the consultant from GGGI preliminary data for Muhanga

collection companies or cooperatives.⁴

As far as health care facilities are concerned, in practice, solid waste from these facilities is divided into general and medical waste. As promulgated by the Ministry of Health, medical or infectious waste must be separated from general waste and incinerated inside the health care compounds. Health care facilities should have a contract with service providers for collection of general solid waste. In Muhanga, all facilities incinerate medical and infectious wastes inside their compound, practice waste recycling and composting of organic waste and bury non-biodegradable waste in a pit. However, burying non-biodegradable waste in the facility compound is not sustainable as the health care facilities have limited land for dumpsites, alongside being a vector of various health hazards associated with open dumpsites.

Compared to Huye, households are more aware of waste separation at source (34% of surveyed households) as they have been informed by waste collection companies concerning separation at source. It was found that business entities also segregate biodegradable waste from residual waste and use different bins for separation at source.

2.2 Waste collection and transportation

The waste collection coverage rate in serviced urban areas is 30%, as 754 households out of the estimate of 3,000 HHs in serviced areas of Muhanga district are contracted with collection companies. However, if the urban population of the Muhanga district is fully counted, the collection coverage rate is estimated at only 7.5%. There is, therefore, a huge gap between the current collection rates and the target rates set by the municipal government, which is achieving 100% service coverage by 2024.

According to the survey conducted by GGGI (2018), the main reasons for not using services were summarized as unaffordability (22%) and small quantity of waste generated (28%). Another 9% of the respondents reported that they were not aware of the existence of waste collection services.

Although 34% of households separate waste, the waste is mixed during transportation and disposal, which undermines efforts and commitment of households towards source separation. The collection company owns only one small, old and non-partitioned collection truck, which leads to poor quality service and mixed waste collection as shown in Image 3.

Moreover, households have reported that the collection company does not respect the waste collection schedules of the week, to the extent that they can skip service up to five days while

⁴ Draft Sanitation Master Plan for Muhanga District. Volume I: Main Report (REMA, 2016)

waste is placed at the collection point, as agreed during contract negotiation. Some households have also stated that the company pours collected waste in open fields after collection, though this was not validated.



Roll-on-Truck owned by the company



Non-roll-on-truck owned by the district

Image 3. Waste Collection Trucks operating in Muhanga⁵

Concerns over service quality is partially explained by weak physical capacity of the collection company. The district reports that between 3,000 and 4,000 households are residing in serviced areas of Muhanga. According to the report by the collection company, they provide a service to 67 households (each trip) and make 3 trips per day. This means that about 200 households are serviced per day. Under the assumption that all 3,000 households have a contract with the waste collection company, using one truck would require 15 days to service all households with the current capacity. Therefore, the company's capacity is short of the estimated need of at least three trucks to serve households with at least one truck to provide services to business entities i.e. markets, hospital, and restaurants, in order to provide a regular service once a week. Clearly, if the district government wants to reach its collection target, the capacities of service providers also need to increase.

Waste from public markets and other businesses is collected and transported to poorly managed transit sites, before they are on-transported to the communal uncontrolled dumpsite.

As discussed above, waste from public buildings is collected by a different private company that has a contract to clean district offices. This company does not own a collection truck and uses a

⁵ Source; Photo taken the consultant at Muhanga dumpsite, September (2018)

non-roll-on-truck owned by the district government, and transports waste to the communal uncontrolled dumpsite once a month.

2.3 Waste treatment and disposal

As noted above, there is no sanitary landfill in Muhanga. Waste is disposed at an uncontrolled dumpsite located at in Kanyinya sector, which is 12km from the city center. The dumpsite does not have a fence which allows children to scavenge on dumped waste. It also suffers from limited access, due to an unpaved road from the main road to the dumpsite.

There are several informal waste pickers operating at the landfill site who mainly segregate organic waste from the residual waste manually. They are hired by a private company managing the dumpsite however, the segregated organic waste was not recovered into resources as there are no waste-to-resource facilities in proximity to the dumpsite. The dumpsite is currently managed by a private company contracted with the Muhanga. City government officials expressed strong concerns over the uncontrolled dumpsite as it represented a health threat to residents and did not provide opportunities to sustainably manage the growing generation of the waste in the city.

As a temporary solution to this problem, the district has initiated an MoU to use the landfill site in Ruhango. However, The MOU was not materialized due to a change of the district executive committee and resistance from the collection companies. This is due to the long distance to the Ruhango landfill, located in 30km from Muhanga.

In Muhanga, waste-to-resource initiatives are very limited. Only a few scrap shops are located in the public markets selling various discarded materials such as glass bottles. There are informal waste pickers picking recyclable materials such as glass bottles and metal. It was reported by informal waste pickers that metals are the most valuable recyclables in the city.

2.4 Policy and institutional setting on solid waste management in Huye

Waste collection service contractual framework

In Muhanga, waste collection services are provided by private companies. Two companies are contracted by the district government; one providing collection services to households and business entities, and road sweeping activities; with the other company cleaning and collecting

waste from district and sector offices. The company contracted to clean commercial areas and roads has also a contract with each sector in urban areas to provide service to households.

For cleaning services and management of uncontrolled dumpsite, the district pays RW2,544,000/month (USD 2,800). For collection services for households, contracted households pay directly to the company at a negotiated rate. Business entities such as hotels and markets sign a contract with the collection company and pay a negotiated amount on a monthly basis. The company in charge of public cleaning at the district level including district and sector offices, is paid a fixed rate of 2,400,000/month (USD 2,650) by the municipality.

Waste management financing mechanisms

The district of Muhanga does not have other sources of income than the hygiene tax. They apply a Polluter Pays Principle (PPP) where waste generators are responsible to pay the service providers. MSWM is not considered as a separate activity but as a component of sanitation and hygiene.

Therefore, the cost incurred for the maintenance of the landfill is covered by the district using the district general budget gathered from the Hygiene Tax. The Hygiene Tax ranges from Frw 5,000 to 10,000 (USD 5.50 – 11.00) per month based on the size of the business. There is no tipping fee at the communal dumpsite.

Waste Collection service price setting

There is no regulated pricing mechanism for waste collection services enforced by the municipality. The price is negotiated between collection companies and waste generators. For businesses, the prices range between Frw 2,000 and 30,000 (USD 2.20 – 33.00) based on the generated volume and collection frequency. For households, the collection company has reported that the monthly charge ranges from Frw 1,000 to 2,000 (USD 1.10-2.20) based on the income level. Table 2 presents price caps for households based on their income level, which was reported through the household survey conducted by GGGI.

Table 2. Price caps for solid waste collection in Muhanga⁶

Price cap (Frw)	N	High income	Middle income	Low income
1000	20	8	8	4
2000	5		3	2
3000	1	1		
4000	3	2	1	
TOTAL	29	11	12	6
Income ratios		38%	41%	21%

According to the survey result, the waste collection fee that is currently paid by households, ranges from Frw 1,000 (1.10 USD) to 4,000 (4.40 USD) while 80% of the survey respondents pay between Frw 1,000 (1.10 USD) to 2,000 (2.20 USD). Based on the survey, the level of willingness to pay for the service ranges from Frw 200 (0.22USD) to Frw 1,000 (1.10 USD). This indicates that there is a significant gap between the current waste collection fare and the level of willingness to pay for the service.

2.5 Summary of findings for Muhanga city

Table 3. Overview of MSWM in Muhanga

Solid waste generation	<ul style="list-style-type: none"> Waste per capita: 0.6 kg/day Daily waste generation: 50 tons
Solid waste composition	<ul style="list-style-type: none"> Organic waste (64%), Plastic (2%), Paper (2%), others (28%)
Collection and transportation	<ul style="list-style-type: none"> Collection service coverage: 30% of serviced areas; 7.5% of urban population Waste collection service is provided by private companies: one company collecting solid waste from households, businesses, and road sweeping activities; one company cleaning and collecting waste from district and sector offices Collection trucks: one roll-on-truck owned by private companies and one non-roll-on-truck owned by the district; both are not partitioned.

⁶ Source: adapted from Households' survey conducted by the consultant, September (2018)

	<ul style="list-style-type: none"> Collection frequency: once a week or more than once a week (hotels, restaurants) based on negotiation between the collection companies and waste generators Service reliability: irregular service due to limited physical capacity of the collection companies User charges setting: no standardized collection fee structure enforced by the district government; rates are negotiated from Frw 1,000 to Frw 4,000 (USD 1.10 – 4.40) per month for households
Waste-to-resources	<ul style="list-style-type: none"> There is no waste-to-resource initiative except small junk shops for metals and plastics located in the public markets. Some waste picking is evident at the uncontrolled dumpsite but no clear commercial enterprises.
Waste disposal	<ul style="list-style-type: none"> No sanitary landfill All collected waste is accumulated into an uncontrolled dumpsite. Some waste generators (e.g. hospitals) dispose of waste on-site.

2.6 SWOT analysis of the solid waste management system in Muhanga

The following SWOT analysis illustrates the strengths and weaknesses of the current solid waste management system in Huye. Main opportunities identified can be a foundation to overcome the challenges and manageable threats and build a more sustainable waste management system.

Strengths

- Strong engagement and ownership of the district officials in improving the waste management system
- Existence of service providers and a company to provide waste collection services and public cleaning.

Weaknesses

- No regulatory framework and price structure on collection fees enforced by the municipal government
- Limited facilities for treatment and disposal of the waste – no sanitary landfill in the city
- Waste management system based on a “collect and dump” approach with limited facilities and initiatives for waste-to-resource.

Opportunities

- A sanitary landfill located in Ruhango (30km away from Muhanga)
- A sanitary landfill and Faecal sludge treatment plants located in Nyanza (about 40km from Muhanga)
- Some degree of waste segregation at source practiced by business entities and households, which can be built upon and promoted.

Threats

- Low affordability/willingness of households to use waste collection services
- Limited financial capacity/experience in generating municipal own source revenue through the waste management system
- Limited physical capacities and transportation fleet of waste collection service providers leading to households’ resistance to using the collection service.

Chapter 03.

Opportunities for improving MSWM in Muhanga and Huye

3.1 Potential intervention areas to improve MSWM in Huye

The following Table 4 presents potential intervention areas to improve solid waste management mechanisms in Huye. The table illustrates the rationale of each intervention and types of intervention area in relation to the above SWOT analysis. The description presents on how the intervention can be implemented. It is important to note that recommended interventions are not isolated but can be designed to create co-benefits across environmental, economic and social outcomes. Some other intervention areas need to be combined to optimize their impacts on the value chain. These intervention areas can be characterized into different types including, but not limited to, policy, infrastructure, market development and capacity development based on main activities entailed by those interventions. However, while all identified interventions are of great importance, as far as the district needs to influence the entire value chain, it is important to prioritize these interventions in line with the strategic goals of the municipal government and urgency of the issues faced.

Table 4. Potential intervention areas to improve MSWM in Huye

#	Intervention area	Description and rationale for the intervention	Stakeholders	Benefits/Challenges expected in development and implementation	Type of intervention			
					Policy	Infrastructure	capacity building	Market development
1	Waste collection service accountability program	<ul style="list-style-type: none">Assigning service zones and KPIs for each collection company.Companies are required to develop collection schedules	Regulatory authority (RURA), District government, private waste collection companies	Clear roles and responsibility leading to strong enforcement and increased service coverage and service quality.	√		√	

		and report performance to the relevant authority in order to increase service accountability and quality						
2	Micro- or other finance schemes for waste collection companies	<ul style="list-style-type: none"> Providing (micro) financing schemes to waste collection companies to improve transportation fleet. Specific conditions on types of trucks purchased will be enforced. 	Waste collection Companies, MFIs, Development partners	<p>Regular service; increased service coverage; modern transport fleet separating waste sources.</p> <p><u>Predicted challenge:</u> High investment risk for investors which requires risk leverage mechanisms.</p>	√		√	√
3	Promotion of use of organic compost with assured quality	<ul style="list-style-type: none"> Increasing the demand of organic compost by promotion of use of organic compost/fertilizer through policy interventions. This intervention includes increasing capacity of the facilities that process the organic waste to acceptable standards. 	Development partners, District, MFIs, companies, communities, Ministry of Agriculture, District, Private companies, Agriculture cooperative, Rwanda Standard Bureau, Rwanda Agriculture Board	<p>Organic compost recognized as fertilizer alternative; landfill lifetime increased.</p> <p><u>Predicted challenges:</u> Limited participation in source separation at household level which might affect the efficiency of proposed technology</p>	√	√	√	√
4	Harnessing opportunities for recycling of plastics by linking local stakeholders	<ul style="list-style-type: none"> This activity is to build a system where the plastic materials disposed at the landfill site can be sold to a domestic recycling company operating in the city through a systematic approach. 	Village leaders, waste collection companies, district, recycling companies, households	Increased opportunities for recycling for plastics waste-to-resources; increased involvement of local stakeholders in the waste recycling value chain; increased waste separation at source	√			√

5	Implementation of source separation mechanisms	<ul style="list-style-type: none"> This intervention can be made through 1) introduction of volume-based waste bags, 2) deployment of organic waste boxes for waste collection services. 	Households, collection companies, head of the villages, district government		√		√	
6	Design a sustainable business model for municipal own-source revenue generation	<ul style="list-style-type: none"> This intervention aims to explore possible income streams through the entire value chain and generate municipal own-source revenue generation in the waste sector. These income streams may include tipping fees, commissions on each contract signed, and concession fees on contract signed to manage the landfill, etc. 	District, RURA, private service providers, Development partners	More income streams created and generated for improving waste-to-resource facilities and activities at the municipal level.	√		√	√

3.2 Recommended intervention areas to improve MSWM in Huye

Based on the intervention areas discussed in Table 4, it is concluded that Huye district government should focus on two areas i) promotion of municipal waste collection services and waste-to-resource initiatives, ii) increasing municipal own-source revenue generation in the waste sector. Therefore, the following intervention areas will be prioritized:

1. Promotion of waste collection services and waste separation at source
2. Valorization of the waste-to-resource value chain for plastics and organic wastes
3. Development of a business model to generate income streams in the waste management for the Huye district government

Intervention area #1

Promotion of waste collection services and waste separation at source

This intervention can be summarized as the 'Waste collection service accountability program', which includes components on monopoly zones, source separation mechanisms, and community mobilization campaigns.

Currently, there is no accountability system for the poor-quality of service provided by private service providers, as the district government does not have any means to track the quality of service provided by private companies and there are no incentives for reporting. To address this challenge, the waste collection service accountability program will be introduced where the district government creates monopoly zones for service areas of each collection company. It is recommended that monopoly zones follow the administrative structure of the district. As some cells of a sector can be considered either rural or urban, it is also possible to create monopoly zones by creating other boundaries that consider only urban villages. In this case, the head of the villages can be included in the accountability structure during the contract negotiation. This accountability program would require collection companies to develop clear and consistent collection schedules and route plans thus to present them to the relevant authorities of their service zone. A clear contractual framework needs to be developed and signed between the company and the municipality, including the reporting framework and timeline clarifying reporting line and focal points. This will enable the district government to monitor the companies and to evaluate them on a regular basis. This may improve the service quality and hence, resulting in high service adoption and coverage attributed to the increasing "honesty/consistency (company) – faith (household)" paradigm.

Once the monopoly zones are assigned to collection companies, the municipality can enforce source separation mechanisms at the household level through the collection companies' KPIs. This is mainly to segregate organic waste from the residual waste at source thus to increase efficiency in organic waste composting process at the landfill site. There are two ways to enforce source separation mechanisms: i) Distribution of organic waste boxes, ii) Volume-based plastic bags⁷ for organic wastes. The collection companies can play an important role in implementing this scheme as they have a direct relationship with households. The district government and village authorities will be responsible for mobilizing people's participation through educational campaigns. Regular campaigns and capacity building programs shall be implemented in order to raise awareness on municipal waste collection services as well as a source separation mechanism as a result, it is expected to increase the waste collection coverage at the city level.

⁷ This is a waste collection mechanism where waste generators dispose waste in a designated waste bag and fees are charged according to the size of the waste bag.

The accountability of local authorities will be achieved by including MSWM into their performance contracts (management by objectives) particularly from village to sector levels. These performance contracts will be used as a benchmark to develop a reporting framework for both companies and local authorities from village to the sector levels.

Intervention#2

Valorization of the waste-to-resource value chain for plastics and organic wastes

This intervention aims to increase waste-to-resource opportunities in two waste streams – plastics and organic waste. For plastics, it seeks to improve the linkage between the stakeholders in the plastic recycling value chain so the raw materials collected at the landfill site can be supplied to the local plastic recycling company. The plastic recycling company operating in Huye sources its raw materials from Kigali, albeit with plastics being collected and stored at the landfill in Huye. Therefore, it is critical to build a system to connect local stakeholders in the value chain. It is advised to the district government to map out all actors in the plastic recycling industry and create an information platform and institutional mechanism to support local actors to actively collaborate for plastic collection and treatment.

Replication of a waste bank model to enhance the role of existing junk shops is a way to be considered. A waste bank is a system in which customers exchange separated recyclables for cash bonus or credits in their bank accounts, or in exchange for public goods and services, and thus encourage community participation in recycling.

For increasing waste-to-resource opportunities for organic waste, it is recommended that the district government introduces a regulatory framework to increase the demand side of the value chain. The company managing the landfill produces 15 tons/year and only sells 5 tons/year equivalent to 33% of the produced compost, which leads to investment risk. The organic compost is currently not recognized by the national fertilizer policy which contributes to low uptake for produced compost. Therefore, policy support for promotion of the organic compost is expected to have a positive impact on increasing the demand in the local market.

It is important that the regulatory framework to advocate for organic waste is accompanied by improvement of infrastructure facilities by availing various tools to measure temperature, moisture content, windrows covers, and safe storage of the compost in order to ensure the quality of the compost during and after composting process. Facilitating the certification process of the final compost product through the Rwanda Standards Board can be considered as a local and regional marketing tool. Consequently, it is then important to initiate advocacy for the recognition of this type of fertilizer as an alternative with benefits, and no harm.

Intervention#3

Development of a business model to generate income streams in the waste management for the Huye district government

The district has only one revenue source which is the district government budget to finance solid waste management system from collection to management of the landfill. Neither collection company pay tipping fees at the disposal site, nor does the company managing the landfill pay concessional contract fees to the district government. This results in resource constraints to cover the operational budget and allocation of resources for improvement of facilities at the landfill. Therefore, this intervention seeks to create municipal own source revenue in the collection and disposal services, i.e. tipping fee, contract commission, which will allow the district government to make necessary investment in solid waste infrastructure and governance related activities such as inspection and enforcement on both service providers and waste generators.

3.3 Potential intervention areas for Muhanga

Table 5. Potential intervention areas to improve MSWM in Muhanga

#	Intervention area	Description and rationale for the intervention	Stakeholders	Benefits/Challenges expected in development and implementation	Type of intervention			
					Policy	Infrastructure	capacity building	Market development
1	Solid waste management performance contract	<ul style="list-style-type: none"> Incorporating municipal solid waste management into the performance contract at the district level to increase collection coverage rate as well as the accountability of the collection services. 	District government, village leaders, companies, development partners	<p>Increased service coverage; improved service quality; clear accountability framework</p> <p><u>Predicted challenge:</u> Anticipated delays in government approval for incorporating solid waste management into performance contracts.</p>	√		√	
2	District specific bylaw shaping solid waste collection services and goals	<ul style="list-style-type: none"> This is to develop the waste collection services fee structure and regulations on waste management services delivery at the district level. 	District government, Collection companies, Waste generators	Strong enforcement and increased service coverage	√		√	

3	Improvement of transportation fleet for waste collection and disposal	<ul style="list-style-type: none"> This is to provide (micro-) financing or tax benefits to collection companies to improve the capacity of their trucks and ensure the separated collection of different waste streams thus to support improved waste collection services. 	Collection companies, district, development partners, MFIs	Improved service quality and coverage rate; improved quality of compost; improved/separated collection and transportation	√		√	
4	Establishment of transit sites focusing on treatment of organic wastes	<ul style="list-style-type: none"> This platform aims to establish at least two transit sites where resource recovery activities are conducted, and organic waste is adequately treated. Residual waste will be transported to the dumpsite while recyclables will be transported to the landfill in Ruhango. 	District government, private collection companies, Development partners, Private sector operator	Increased opportunities for waste-to-resource of plastics and organic waste; Creation of green job opportunities; Reduced GHG emissions from collection and transport vehicles	√	√	√	√
5	Development of a sustainable business model for the solid waste management system.	<ul style="list-style-type: none"> This is to develop municipal own-source revenue generation mechanisms to build a sustainable management model in the waste sector for the district government. 	Districts government, development partners	More operation budget in MSWM mobilized and allocated.	√		√	√

6	Long term service contracts between companies and the district government	<ul style="list-style-type: none"> This is to increase the contractual period for the private sector therefore they are committed to making financial investment in their facilities. The recommended contract year is at least 5 years from currently 1 year. 	Service providers, district government	Reduced investment risks; engagement of strong service providers; increased quality of the service	√			
7	Deployment of waste banks	<ul style="list-style-type: none"> This is to support community-based waste banks where households can exchange recyclable materials for direct monetary/service or other benefits. 	Village leaders, waste pickers, households, NGOs	Increased recycling rate; high involvement of village leaders in waste-to resource initiatives			√	√

3.4 Recommended intervention areas for Muhanga

Based on the intervention areas discussed in Table 5, there are two imminent challenges to be tackled in Muhanga: i) Limited infrastructure for disposal and treatment of waste and ii) Lack of a regulatory framework in MSWM. Therefore, the intervention areas are identified as below:

1. Developing transit sites with decentralized waste composting and other recycling facilities
2. Developing a regulatory framework for waste collection services and pricing

Intervention area#1

Developing transit sites with decentralized waste composting facilities

There is currently no sanitary landfill and the collected waste is disposed at an uncontrolled dumpsite in Muhanga. Moreover, the composition of waste generated in Muhanga has evidenced little recycling potential for non-biodegradable materials. It is important to highlight that waste-to-resources initiatives should focus on treatment of organic waste in order to divert the waste from the dumpsite. This can then be achieved by creating transit sites with decentralized composting facilities; whereby the organic waste can be processed and therefore avoid being transported to the dumpsite. It is also important to highlight that these interventions should be

undertaken alongside the enforcement of behavior change campaigns on waste separation at source. It is recommended that the waste source separation to be included in the local leaders' performance contracts.

Intervention area#2

Developing regulatory framework for waste collection services, pricing, and disposal

In Muhanga, there is currently no regulatory framework or guidelines on MSWM enforced by district government, which hinders the promotion of the sustainable solid waste management system at the city-wide scale.

In order to address this gap, the following actions are recommended to improve the process of setting adequate price caps and creating stakeholder accountability:

- 1) Redefining service zones (monopoly zones)
- 2) Defining a fair and equitable price structure
- 3) Pricing for waste disposal and management of the dumpsite

Redefining service zones

The creation of service zones is critical for increasing accountability for both service providers and waste generators, as it will support the enforcement of set regulations. Currently, the companies are allowed to provide services to any household at any place based on their promotion and negotiation. Under the current system, the municipality has a limited control over the quality of the service as the service areas are not well defined. It is also difficult to monitor their performance. The monopoly zones created would ease the administrative burden on district government and improve accountability of all stakeholders including service providers, local authorities and households. The company can participate in competition to service more than one monopoly zone to ensure the market viability.

Defining a fair and equitable pricing structure

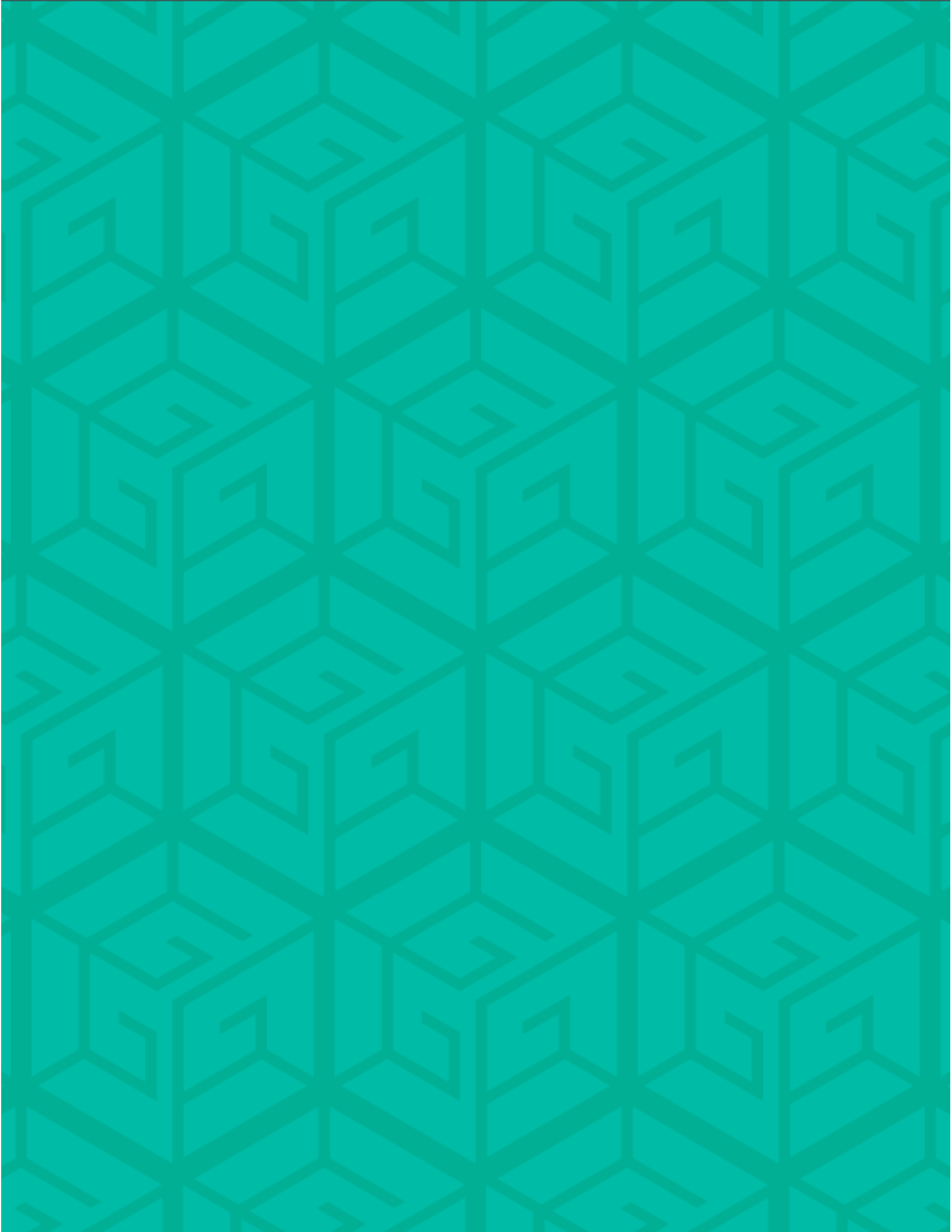
The provision of waste collection services incurs different costs including, but not limited to, fueling collection trucks, maintenance of trucks, labor and administrative costs, and tipping fees. Some of these costs are also influenced by important parameters. For example, fueling collection trucks is influenced by the distance from between the monopoly zone and the disposal site,

changes in the price of fuel as well as the cost of vehicle maintenance. Based on the lessons learned from the experience of Kigali, it is recommended that the Muhanga district government in collaboration with RURA defines a pricing structure of the municipal waste collection services.

Once the regulatory framework on collection service fees and service zones is better established, the municipality in partnership with private collection companies should take an active role in promotion of waste collection services and source separation practices, including through educational campaigns and engagement with local influencers.

Pricing for waste disposal and management of the dumpsite

Currently the collection companies dispose waste at the uncontrolled dumpsite without paying a tipping fee. The company who is managing the dumpsite also does not pay concessional contract fees to the district government. In order to increase opportunities for revenue generation to manage the solid waste management system, it is recommended that the municipality sets regulations to collect the tipping fee for disposal of the waste arriving at the dumpsite which will increase income for the municipality through management of MSW. This should go hand-in-hand with the establishment of a more controlled sanitary site.



Conclusion

To support implementation of the above intervention areas in Huye and Muhanga, it is critical to set a clearer vision in managing solid waste, which outlines key goals, indicators, and timeframes. The absence of a shared vision of all relevant stakeholder constitutes an impediment for effective execution of ideas, good governance and awareness raising. As solid waste management is at a rudimentary stage of development in secondary cities in Rwanda, greater participation from those across the system will be the key element for success of any waste management initiative. Sustainable solid waste management requires behavior change and active participation of all, as well as clearer regulations and policy enforcement by municipal government. Although increasing access to adequate waste collection services is a primary goal of the municipality, GGGI recommends that improved waste-to-resource initiatives are implemented in conjunction to increasing waste collection coverage in order to ensure a sustainable system overall.

Although this assessment focuses on solid waste management, it is further recommended that consideration be given to cross-sector opportunities, such as integrated solutions for solid waste and fecal sludge management through co-composting facilities. Both Huye and Muhanga do not have fecal sludge treatment (FST) plants therefore, investment in integrated infrastructure which can address the waste and sanitation challenges collectively should be considered and assessed further.



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