SOLID WASTE MANAGEMENT ASSESSMENT
WITHIN URBAN SETTINGS IN BURUNDI, RWANDA, AND TANZANIA

UN HABITAT
FOR A BETTER URBAN FUTURE

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UN-Habitat (Nairobi) trusted me (Stephen E. Mbuligwe (PE, PhD) to undertake the assessment of solid waste management in the nine towns in Burundi, Rwanda, and Tanzania as part of the LVWATSAN Programme Phase II. I am very grateful for the opportunity and trust bestowed upon me.

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EXECUTIVE SUMMARY

INTRODUCTION

The solid waste management (SWM) assessment carried out in the nine towns covered by this report is a component of a larger study covering 15 towns three each in each of the five East African Community (EAC) member countries. The SWM assessment is meant to provide a sound basis for the design of measures intended to improve SWM in the 15 towns. Improvement of SWM in the 15 towns, all of which are in the Lake Victoria Basin, is meant to complement and supplement other similar efforts all of which have the overarching goal of improving public health and environmental protection in the Lake Victoria basin.

On the whole, the project is justified by the fact that improvements in SWM in the 15 towns will complement and supplement other efforts embodied in LVWATSAN II. Notably, SWM improvement will translate into improved protection of the lake and its environs in addition to improvements in livelihoods and health of the communities who depend on the lake.

SOLID WASTE MANAGEMENT ASSESSMENT METHODOLOGY

The main methods used to acquire information and data used to prepare this report were site survey and investigations; checklist-guided interviews; open-ended discussions with government officials and other stakeholders; review of documentary sources; and casual discussions with community members. Photography was used as an extension of site survey and investigations to capture important observations in order to aid their descriptions as well as provide an indelible record of their occurrence. Site survey and investigations were especially employed to get first-hand information on status of different aspects of solid waste management systems of the towns such as collection facilities, medical waste incinerators, and existing as well as planned solid waste final disposal sites.

FINDINGS FROM INDIVIDUAL TOWNS

Cross-Cutting Issues

Analysis of the findings from the individual towns revealed strong similarities as well as stark contrasts of SWM issues and situations. The strongest similarities were invariably intra-country among the surveyed towns. On the other hand, the starkest contrasts were inter-country, that is, between towns in different countries. In this section, findings that were found to be common to more than two countries are outlined to take advantage of the spin-off benefits of this. One advantage anticipated from this is that challenges that are common across the region can more easily and cost-effectively be addressed in similar (even though slightly different) ways. By the same token, good practices and strategies common to many countries in the region can more easily and cost-effectively be enhanced in similar ways

across the region. Notably, this is in line with and unwittingly supports harmonization efforts in other EAC cooperation aspects.

The main findings that were considered to be regionally cross-cutting were characterized under one or more of the following SWM assessment issues and considerations: 1) low primacy and priority of solid waste management, 2) non-supportive policy, legal and regulatory environment, 3) unsuitable institutional framework, 4) non-supportive social-economic environment, 5) non-supportive political environment, 6) solid waste management data poverty, 7) inadequate solid waste resources, 8) non-supportive urban planning, and 9) challenging spatial characteristics.

Solid Waste Management in Burundi Towns

All the three surveyed towns in Burundi suffer from a number of shortcomings. SWM is accorded low priority in service provision while the policy, legal and regulatory environment does not adequately support SWM. For example, cost recovery cannot be introduced because it is not suitably provided for in the relevant policies and laws. The institutional framework is non-supportive because responsibilities for SWM are not properly aligned with the requisite authority and financial resources. The political environment is considered non-supportive because it has not come all out to support SWM with all the means at its disposal. SWM data poverty is characterized by the fact that none of the surveyed towns had any solid waste data in their custody let alone a database; none had any plans to collect the solid waste data in future either. Inadequacy of solid waste management resources is characterized by insufficient SWM budget allocation, inadequate SWM staff (competence and number), poor SWM equipment and facilities, and non-consideration of cost recovery.

Solid Waste Management in Rwanda Towns

Apart from their similar relief features, the three towns in Rwanda share some SWM good attributes and deficiencies. For example, all the three surveyed towns in Rwanda provide litter bins for litter storage along the streets. To the credit of the town authorities, the three towns are comparatively very clean and free from stray solid waste. This is in sharp contrast with the surveyed towns in Burundi and Tanzania. In all the surveyed towns in Rwanda, SWM is accorded a relatively high priority. The political environment is also fairly supportive of and conducive to good SWM.

In spite of the preceding, the three surveyed towns in Rwanda are affected by many shortcomings. Notably, all of the surveyed towns suffer from SWM data poverty. Furthermore, in spite of the relative cleanliness of their streets, the three towns are not free from piles of uncollected solid waste although such piles are normally out of sight. Additionally, in all the three surveyed towns, solid waste final disposal is still problematic.

The current solid waste disposal sites for the towns are not suitable while the ones proposed for future use do not meet the standards for suitable solid waste final disposal sites.

Solid Waste Management in Tanzania Towns

Sengerema, Geita, and Nansio, which are the towns which were surveyed in Tanzania, suffer from a number of shortcomings, which include:

- SWM is accorded low priority in service provision while the policy, legal and regulatory environment does not adequately support SWM.
- The institutional framework is non-supportive because responsibilities for SWM are not properly aligned with the requisite authority and financial resources.
- The towns are affected by SWM data poverty which is characterized by the fact that the towns did not have reliable solid waste generation and composition data.
- Available solid waste management resources are insufficient because of low SWM budget allocation, inadequate SWM staff SWM equipment and facilities, and non-consideration of cost recovery.

CONCLUSION AND RECOMMENDATIONS

The main conclusions that can be drawn from the assessment of SWM in the nine towns in Burundi, Rwanda and Tanzania are: 1) each of the surveyed towns faces SWM challenges, including an unfavourable operating environment, which must be addressed if the planned SWM improvement efforts are to succeed and 2) in each of the surveyed towns there is a potential for SWM improvement utilizing both local and external resources. Many of the surveyed towns face challenges with respect to some or all of the SWM system functional elements. The most problematic SWM functional element is obviously final solid waste disposal. All nine of the surveyed towns have a problem with disposal of the solid waste they collect. For all of the surveyed towns, the existing disposal sites are inappropriate while most of the sites earmarked for future use are also inappropriate.

One of the most important recommendations derived from the field survey findings is that since final solid waste disposal is the most problematic of all SWM functional elements in all the surveyed towns, it should be given first priority in the planned capacity building efforts.

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IMPORTANT ABBREVIATIONS AND ACRONYMS

Abbreviation/ acronym	Long form/explanation
AfDB:	African Development Bank
EAC:	East African Community
LVWATSAN:	Lake Victoria Water and Sanitation Initiative
MDGs:	Millennium Development Goals
OHS	Occupational health and safety
SW:	Solid waste
SWM:	Solid waste management
BF:	Burundi francs (Burundi monetary currency)
NGO:	Non-governmental organization
ACOHAM:	A French acronym for an NGO involved in SWM in Muyinga, Burundi
EWSA:	Energy, Water and Sanitation Authority (Rwanda)
PPE:	Personal protective equipment
PPP:	Public-Public-Private Partnership
RF:	Rwanda franc (Rwanda monetary currency)
TZS:	Tanzania shilling (Tanzania monetary currency)

PART I: INTRODUCTION AND GENERAL INFORMATION

1.0 INTRODUCTION

1.1 Project Background

The solid waste management (SWM) assessment carried out in the nine towns covered by this report is a component of a larger study covering 15 towns three each in each of the five East African Community (EAC) member countries. The SWM assessment is meant to provide a sound basis for the design of measures intended to improve SWM in the 15 towns. Improvement of SWM in the 15 towns, all of which are in the Lake Victoria Basin, is meant to complement and supplement other similar efforts all of which have the overarching goal of improving public health and environmental protection in the Lake Victoria basin. The background to the SWM assessment assignment along with other relevant details is reproduced in Appendix C.

1.2 Project Rationale

On the whole, the project is justified by the fact that improvements in SWM in the 15 towns will complement and supplement other efforts embodied in LVWATSAN II. Notably, SWM improvement will translate into improved protection of the lake and its environs in addition to improvements in livelihoods and health of the communities who depend on the lake.

1.3 Report Scope and Limitations

Even though it touches on other services and aspects, this report focuses on assessment of solid waste management under the auspices of LVWATSAN II. The spatial scope of the study for this report encompasses areas within the jurisdictions of three towns of Muyinga, Ngozi, and Kayanza in Burundi, three towns of Kayonza, Nyagatare, and Nyanza in Rwanda, and three towns of Sengerema, Geita, and Nansio in Tanzania. The six remaining towns three each in Kenya and Uganda are covered in a separate report. The temporal scope of the assessment of solid waste management in all the towns encompasses the situation existing and the data available when the field surveys were carried out between the middle of August and end of September 2012.

1.3 Report Structure

This report is organized into five main parts each of which covers related aspects of the field survey and analysis findings. The breakdown of the report parts is as shown below:

Part I: Introductory and General Information

- Chapter One: Introduction
- Chapter Two: solid waste management assessment framework and methodology

Part II: Findings from Individual Towns

- Chapter Three: General and crosscutting issues
- Chapter Four: Solid waste management in Burundi Towns
- Chapter Five: Solid waste management in Rwanda Towns
- Chapter Six: Solid waste management in Tanzania Towns

Part III: Options for Improvement of Solid Waste Management in the Surveyed Towns

- Chapter Seven: Options for Improvement of Solid Waste Management in the Surveyed Towns

Part IV: Conclusion and Recommendations

- Chapter Eight: Conclusion and recommendations

Part V: Appendices

- Appendix A: Bibliography
- Appendix B: List of people contacted during the field surveys
- Appendix C: Background information on the solid waste management assessment mission

2.0 SOLID WASTE MANAGEMENT ASSESSMENT FRAMEWORK AND METHODOLOGY

2.1 Solid Waste Management Assessment Framework

The assessment of SWM in the 15 towns was carried out with a view to understanding their SWM situation with particular emphasis on the institutional framework so as to eventually be able to identify and develop the requisite training and capacity building programme relevant to specific towns. In order to derive effective (sound and comprehensive) improvement measures, despite the foregoing, the actual assessment carried out for this report was done on the basis of the SWM issues and considerations outlined in this section. Issues that were considered applicable to all towns in a specific country appear in Table 2.1 whereas the ones that were considered to be rather town specific appear in Table 2.2.

Table 2.1: National level SWM assessment issues and considerations

SN	Issues or considerations	Details/explanations
1	Primacy and priority of solid waste management	Primacy and priority in the context of or in competition with other services
2	Policy, legal and regulatory aspects or environment	SWM provision in relevant policies, legislation, and regulations
3	Institutional framework	Institutional framework pertinent to or as relevant to SWM
4	Social-economic environment	Emphasis on the aspects that are supportive, non-supportive (neutral) or outright oppressive
5	Political environment	Emphasis on the aspects that are supportive, non-supportive (neutral) or outright oppressive
6	Solid waste management data availability and reliability	Emphasis is on whether important SWM data are available, are regularly collected and properly archived, and reflect on the real situation
7	Solid waste management resources	o Solid waste management human resources (training and experience) o Solid waste management financial resources (budget allocation) and cost recovery o Solid waste management equipment and facilities
8	Non-supportive urban planning and design	o Inadequate provision or outright non-provision for solid waste management needs in urban plans o Reactive rather than proactive urban planning whereby urban plans devised by urban authorities lag far behind spontaneous growth and development spearheaded by individual residents o Poorly implementation of urban plans incorporating solid waste management needs

Table 2.2: Town level SWM assessment issues and considerations

SN	Issues or considerations	Details or explanations
1	Aesthetic quality	Visually assessable aesthetic and scenic quality of streets and landscapes due to proper SWM
2	Solid waste generation	o Solid waste sources o Solid waste composition o Solid waste generation rates o Solid waste minimization efforts
3	Solid waste management service	o Service coverage o Service beneficiaries o Service levels o Service standards o Service type (office sweeping, street sweeping, litter management)
4	Solid waste management service providers	The actual organizations or entities responsible for providing SWM services
5	Solid waste management system operations (functional elements)	o Solid waste generation o Solid waste storage (storage facilities and storage practices/premises) o Solid waste collection (collection vehicles and collection frequency, collection practices) o Solid waste transfer o Solid waste transportation o Solid waste processing and treatment o Solid waste disposal
6	SWM technologies and technical aspects	Mostly for collection, transportation, processing, treatment, and disposal
7	Solid waste management practices and strategies	All the practices and strategies involved from generation to disposal)
8	Public health and environmental protection	Protection of the environment and health of community members
9	Solid waste management occupational health and safety	o OHS practice and strategies o OHS equipment and facilities
10	Spatial characteristics	Relief features, distance, accessibility, subsurface characteristics, meteorological aspects
11	Urban planning and design	Planning status and issues on incorporation of SWM in urban planning
12	Organizational and management aspects	Planning and design of SWM service delivery and assignment of responsibilities for SWM.
13	Community knowledge and awareness	Awareness and familiarity of community with the SWM needs and challenges
14	Role and involvement of beneficiary community and other entities in SWM	Role played by and degree of involvement of beneficiary communities, private sector and (non-government) other stakeholders in SWM
15	Hazardous waste management	Hazardous waste management (e.g. medical waste) management technologies, practices, and strategies
16	Resource recovery	Recovery of organic or inorganic materials from solid waste for reuse or recycling

2.2 Solid Waste Management Data and Information Acquisition Methodology

2.2.1 Data and information acquisition methods

The main methods used to acquire information and data used to prepare this report were site survey and investigations; checklist-guided interviews; open-ended discussions with government officials and other stakeholders; review of documentary sources; and casual discussions with community members. Photography was used as an extension of site survey and investigations to capture important observations in order to aid their descriptions as well as provide an indelible record of their occurrence. Site survey and investigations were especially employed to get first-hand information on status of different aspects of solid waste management systems of the towns such as collection facilities, medical waste incinerators, and existing as well as planned solid waste final disposal sites.

2.2.2 Solid waste generate rate and composition data

Because the focal towns surveyed for this report did not have reliable solid waste composition and generation data, corresponding estimates had to be prepared using methods that utilised global data. Thus, the solid waste generation data presented in this report were estimated using corresponding data for towns similar to the ones surveyed for this report. The methods depend on population and global per capita generation rate data. The global per capita generation rate takes into account contributions of all sources of solid waste in the town of interest. Population data were obtained from Mott-MacDonald (2010). The total quantity of solid waste generated by a town was obtained using Equation 1 while the total quantity of solid waste generated by sources of each major category was obtained using Equations 2 - 6.

$$Q_{TSW}[\frac{kg}{d}] = W_{GPR}[\frac{kg}{pe \times d}] \times P_T[pe] \quad [1]$$

$$Q_{HSW}[\frac{kg}{d}] = f_{HSW}[\frac{kg}{kg}] \times Q_{TSW}[\frac{kg}{d}] \quad [2]$$

$$Q_{ISW}[\frac{kg}{d}] = f_{ISW}[\frac{kg}{kg}] \times Q_{TSW}[\frac{kg}{d}] \quad [3]$$

$$Q_{CSW}[\frac{kg}{d}] = f_{CSW}[\frac{kg}{kg}] \times Q_{TSW}[\frac{kg}{d}] \quad [4]$$

$$Q_{MSW}[\frac{kg}{d}] = f_{MSW}[\frac{kg}{kg}] \times Q_{TSW}[\frac{kg}{d}] \quad [5]$$

$$Q_{IASW}[\frac{kg}{d}] = f_{IASW}[\frac{kg}{kg}] \times Q_{TSW}[\frac{kg}{d}] \quad [6]$$

The variables and their subscripts as used in Equations 1 and 6 stand for the following:

Q_{TSW} = total quantity of solid waste generated by a town;
W_{GPR} = global per capita solid waste generation rate which takes into account all categories of solid waste in the town;
P_T = total population of the town;
f = ratio of the total quantity of waste from all sources of one category to the total quantity of solid waste generated in the town;
HSW = household solid waste;
ISW = institutional solid waste;
CSW = commercial solid waste;
MSW = market solid waste; and
IASW = informal sector and agricultural waste

It is very important to point out that the data obtained using Equations 1 and 2 are estimates which had to be resorted to in the absence of requisite data. The scope of the surveys for this report excluded acquisition of solid waste generation and composition data using direct measurement methods which would have demanded more time and resources. Much as due diligence was exercised in deriving Equations 1 - 6 and coming up with their input data, there is no doubt that there is a lot of room for improving the resolution and overall quality of the solid waste generation and composition data obtained with the equations. The consulting engineers procured to design the solid waste treatment and disposal facilities for each town will need to validate the data. Also, since the solid waste generation rate and composition data have been estimated using old population data, they will need to be updated every time more reliable and up to date population data become available. Also, depending on the adopted design life of the disposal facilities, the solid waste generation data will need to be projected.

PART II: FINDINGS FROM INDIVIDUAL TOWNS

3.0 GENERAL AND CROSS-CUTTING FINDINGS

3.1 Overview

Analysis of the findings from the individual towns revealed strong similarities as well as stark contrasts of SWM issues and situations. The strongest similarities were invariably intra-country among the surveyed towns. On the other hand, the starkest contrasts were inter-country, that is, between towns in different countries. In this section, findings that were found to be common to more than two countries are outlined to take advantage of the spin-off benefits of this. One advantage anticipated from this is that challenges that are common across the region can more easily and cost-effectively be addressed in similar (even though slightly different) ways. By the same token, good practices and strategies common to many countries in the region can more easily and cost-effectively be enhanced in similar ways across the region. Notably, this is in line with and unwittingly supports harmonization efforts in other EAC cooperation aspects.

The main findings that were considered to be regionally cross-cutting can mainly be characterized according to the SWM assessment issues and considerations outlined in Table 3.1.

Table 3.1: Characterization of solid waste management cross-cutting findings

SN	SWM assessment issues and considerations	Applicability in EAC
1	Low primacy and priority of solid waste management	All EAC countries surveyed
2	Non-supportive policy, legal and regulatory environment	All EAC countries surveyed
3	Unsuitable institutional framework	All EAC countries surveyed
4	Non-supportive social-economic environment	Most EAC countries surveyed
5	Non-supportive political environment	Most EAC countries surveyed
6	Solid waste management data poverty	All EAC countries surveyed
7	Inadequate solid waste resources	All EAC countries surveyed
8	Non-supportive urban planning and design	All EAC countries surveyed
9	Challenging spatial characteristics	All EAC countries surveyed especially Burundi and Rwanda

Details of the solid waste management cross-cutting findings identified and characterized in Table 3.1 are elaborated further in the following sub-sections.

3.2 Low primacy and priority of solid waste management

Findings from all the three countries surveyed for this report show that SWM is given low primacy and priority. The government agencies responsible for SWM also provide other services such as health against which SWM must compete for resources and time. Also, the personnel responsible for SWM have other duties that may compete with SWM for time and priority. Notably, SWM does not have a separate budget allocation in all the towns surveyed. In view of the deficiencies of the current situation, the primacy and priority level of SWM in the surveyed towns need to be elevated. To elevate the primacy and priority of SWM vis-à-vis the provision of other services, it is necessary to have a unit devoted to SWM.

3.3 Non-supportive policy, legal and regulatory environment

Policy, legal and regulatory provisions in all the three countries surveyed for this report, restrict SWM improvement mainly with respect to implementation of SWM requirements and enforcement of SWM regulations. It also restricts SWM improvement by way of restricting cost recovery which is necessary for long-term SWM service sustainability and to cover short-term shortfalls in SWM funding from traditional sources. There is no doubt that Rwanda has made commendable strides in respect of providing a policy, legal and regulatory environment favourable to SWM. However, there is still room for improvement especially with respect to cost recovery.

3.4 Unsuitable institutional framework

All the three countries surveyed for this report have institutional frameworks that are deficient with respect to SWM needs and as such the frameworks do not fully support SWM. One of the main shortfalls of the existing institutional frameworks in all of the countries surveyed for this report is the mismatch between the responsibility for solid waste management and authority over the resources required to provide SWM service. There is no single entity wholly responsible for all aspects of SWM and clearly defined lines of authority and responsibility are lacking. Some SWM responsibility aspects are considered as belonging to one entity at one level and a different entity at another level. If a separate SWM unit is established for each town as suggested in Section 3.3 above, the institutional framework will be streamlined in favour of SWM.

3.5 Non-supportive social-economic environment

Among other things, economic poverty of SWM service beneficiaries, especially households, stands in the way of SWM improvement because it limits the potential for cost recovery in SWM. Furthermore, the fact that historically urban communities did not have to pay for SWM service weights against SWM improvement. Additionally, the fact that urban residents have in the past not normally been as enthusiastic about and responsible for financing SWM as they have been with respect to the other services such as water supply and electricity thwarts SWM improvement efforts.

3.6 Non-supportive political environment

Probably with the exception of Rwanda, political leaders have not consistently and unequivocally come out in favour of implementing SWM improvement needs and enforcing SWM regulations. Even cases of political leaders sending to their constituencies mixed messages regarding SWM needs and responsibilities have been reported.

3.7 Unavailability and unreliability of solid waste management data

Unavailability and unreliability of solid waste management data is a chronic problem in all the countries and all the towns surveyed for this report. This is unsurprising considering that SWM data poverty is one of the hall marks of SWM problems in developing countries. This is however not a consolation because data poverty thwarts solid waste management improvement efforts. As such, the problem needs to be addressed by designing and putting in place suitable systems for regular collection and archiving of solid waste management data. The systems can easily be similar across the EAC region. The establishment and sustainable maintenance of solid waste management data collection system and databases should be part and parcel of the capacity building efforts.

3.8 Non-supportive urban planning and design

Spatial (urban) planning in all the three countries covered by this report can be regarded as non-supportive or not conducive to improved SWM mainly because of the following reasons:

- Urban plans poorly address or do not address at all solid waste management needs such as communal and commercial solid waste storage areas and final solid waste disposal areas.

- In many areas urban planning is reactive rather than proactive whereby urban plans devised by urban authorities lag far behind spontaneous growth and development spearheaded by individual residents.

- Even when urban plans incorporate some SWM needs, they are poorly implemented and often they are overtaken by changes in the situation on the ground.

In view of the above, improvement in urban planning is critical to the desired improvements in SWM. It is clearly advisable for each of the towns to have some form of master plan to guide their development including SWM needs. Preparations of the town master plans must involve appropriately qualified SWM experts. The master plans must then be implemented in strict accordance with their design specifications.

3.9 Challenging spatial characteristics

Spatial characteristics of interest here include relief features and subsurface characteristics of the town of interest, accessibility of SWM service areas, distances that have to be covered, and presence of sensitive environments including water bodies. These pose a challenge to the towns surveyed due to the arguments presented below.

- With respect to relief features, hilly areas such as the ones that characterize the surveyed towns in Burundi have steep slopes which make solid waste collection and transport difficult. Also, it is difficult to get suitable solid waste disposal areas in such hilly areas especially if the valleys are dominated by wetlands.
- Prevalence of hard rock formations such as is the case in the surveyed towns in Burundi and Rwanda makes development of solid waste disposal sites difficult if not impossible.
- Subsurface characteristics such as high water table and soil characteristics dictate the flexibility of solid waste disposal site location options and the required engineering design.
- Extensive water bodies and wetlands such as the ones found in Rwanda and Burundi limit the options for solid waste disposal location.

4.0 SOLID WASTE MANAGEMENT IN BURUNDI TOWNS

4.1 Overview on Solid Waste Management in Burundi Towns

All the three surveyed towns in Burundi suffer from all of the shortcomings listed in Table 3.1 which was discussed earlier. All of the towns additionally have deficiencies pertinent to the issues and considerations outlined in Table 2.2 which was presented earlier.

SWM is accorded low priority in service provision while the policy, legal and regulatory environment does not adequately support SWM. For example, cost recovery cannot be introduced because it is not suitably provided for in the relevant policies and laws. The institutional framework is non-supportive because responsibilities for SWM are not properly aligned with the requisite authority and financial resources. The political environment is considered non-supportive because it has not come all out to support SWM with all the means at its disposal. There is a general feeling that political leaders could do more to support SWM efforts. SWM data poverty is characterized by the fact that none of the surveyed towns had any solid waste data in their custody let alone a database; none had any plans to collect the solid waste data in future either. Inadequacy of solid waste management resources is characterized by insufficient SWM budget allocation, inadequate SWM staff (competence and number), poor SWM equipment and facilities, and non-consideration of cost recovery.

On the whole, the surveyed towns in Burundi have adopted mainly solid waste management systems that incorporate a combination of the use of communal collection points and collection from kerbside. However, solid collection frequencies are irregular and often erratic because of their dependency on availability and condition of repair of collection and transportation vehicles. The door – to – door collection system, which is in fact practised in a house – to – house manner, was neither reported nor observed in the surveyed towns. If it is practiced at all, then it is to a very limited extent and over limited portions of the surveyed towns.

4.2 Solid Waste Management in Muyinga Town

Muyinga Commune (town) exhibits all the deficiencies described in Section 4.1 above. Notably, it does not have a well-defined SWM system with respect to the functional elements of SWM. As noted earlier, no data are available on solid waste composition and generation rates for Muyinga town. However, urban agriculture which is practiced extensively in Muyinga, has an influence on the composition of solid waste. Visual investigations indicated that the organic fraction dominates the waste composition and agricultural wastes account for a significant proportion of the total waste generated. Based on available population data and solid waste generation data for similar towns, the total solid waste generation rate is estimated to be 15,500 kg/day. The breakdown of the waste generation rate by category is given in Table 4.1.

Table 4.1: Muyinga town solid waste generation rate breakdown by waste category

SN	Waste category	Generation rate (kg/d)
1	Household solid waste	12245
2	Institutional solid waste	186
3	Commercial solid waste	279
4	Market solid waste	341
5	Informal sector and agricultural solid waste	2449
	Total solid waste generation rate	**15500**

A number of things are noteworthy about Table 4.1. First, the bulk of the solid waste is organic in nature. Additionally, the bulk of the waste is not collected and a large proportion of it ends up on farms of which they are many in Muyinga and its suburbs.

The fact that the bulk of the waste is organic in nature suggests that resource recovery by way of composting and biogas production is feasible. In fact, composting and direct application of organic solid waste is reportedly widely practiced in Muyinga. Composting and direct application of solid waste on farms accounts for the bulk of the solid waste that is not collected.

The formal solid waste management service serves only a small proportion of potential service areas and potential service beneficiaries, mainly the markets, commercial premises near the market and residential area near the main market and main road. Areas that are not provided with the service including institutions and residential areas burn and bury their waste. Composting is reportedly widely practiced. Storage of the waste is on open areas and crude bays.

The main solid waste service providers are the local government under the mayor and an NGO (association) known by its French acronym as ACOHAM that operates under the guidance of the local government. The local government (the Mayor's office) assists the NGO by giving it a small amount of fuel (50 L per month). The NGO supplements its income by charging its service beneficiaries a small fee. ACOHAM mainly collects from the storage areas and transports it to the disposal area. Short range transport is by using wheel barrows while longer range transport is by using a 1 ton pick-up truck. At the time of the survey the pick-up truck was broken and so there was no solid waste and collection service.

One of the strategies for improving SWM and general cleanliness of the town is having a weekly clean-up day which involves the whole town in cleaning all areas of the town. The town cleanup day is held every Saturday. Obviously, the cleanup efforts and other measures aimed at improving SWM have partial and short-lived success if solid waste disposal is not improved.

Other important observations regarding solid waste management in Muyinga town can be outlined as follows:

- Urban planning and design does not incorporate SWM needs. This is reflected in the fact that there is no provision for solid waste collection points and disposal sites in the plans.
- Based on the existing organization structure, solid waste management issues are under the Sanitation and Hygiene section. However, the official in charge of sanitation and hygiene admitted that the town does not have specific staff dedicated to solid waste management per se.
- Workers involved in solid waste management use crude equipment and facilities. In addition, the workers do not use any personal protective equipment (PPE).
- The town authority does not own any vehicle suitable for solid waste collection and transport to the disposal site. Even the one prior to the field surveys was being hired from a private owner. Unfortunately even this one broke and at the time of the field surveys it was grounded close to the site used for solid waste disposal.
- The town does not have a formal solid waste disposal site; none has been secured or identified for future use either. Currently, the waste is crudely discharged on a banana farm belonging to the president of ACOHAM.
- ACOHAM which is virtually the only entity dedicated to solid waste management in the town needs to be strengthened if it is to provide the service in accordance with acceptable standards. The town Mayor's office reported that it planned to strengthen it so that it could serve the whole town but the plan has not yet materialized.
- It is recognized that the existing institutional framework, legal and regulatory regime are not conducive to effective and sustainable SWM.
- The Muyinga officials are not aware of any resource recovery activities going on in the town's jurisdiction. However, investigations showed that plastic bottles are sold for reuse while scrap metal is exported to Tanzania and Kenya. Nonetheless, the resource recovery market is still small. Apparently, there is no local metal industry that is capable and willing to process scrap metal (steel and aluminium) as is the case in Tanzania and Kenya, for example.

On the whole, the town authority recognizes that solid waste management in the town is not what it ought to be. Therefore it needs to be overhauled in order to implement extensive improvements in all its aspects from storage to disposal.

ACOHAM, the NGO established for the sole purpose of improving solid waste management in Muyinga town, was established through initiatives of Muyinga residents. The NGO is neither affiliated to nor supported financially or otherwise by any external organization. Also, all its members are residents of Muyinga town. this suggests that there is an untapped potential for the community in Muyinga town to play a greater role in improving SWM management. If properly harnessed, this potential can go a long way towards supporting the current SWM efforts. Nonetheless, the town authorities need to step up their support for ACOHAM and similar NGOs because there are clear signs that ACOHAM is faltering because of insurmountable funding challenges.

The spirit demonstrated by members of ACOHAM, who are not paid formal salaries indicates that among the Muyinga residents there is some level of awareness about the need to address their environmental sanitation problems and willingness to contribute to efforts aimed at solving them. The awareness and willingness to contribute towards addressing their problems need only be nurtured and reinforced through additional public awareness and sensitization campaigns.

4.3 Solid Waste Management in Ngozi Town

Solid waste management in Ngozi town is characterized by all the deficiencies identified in Section 4.1. It is also characterized by problems that are similar to the ones highlighted with respect to Muyinga town. Sources of solid waste in Ngozi town include households, markets, commercial areas, informal sector premises and urban agriculture activities, institutions and public offices, garages, and abattoirs. Based on available population data and solid waste generation data for similar towns, the total solid waste generation rate is estimated to be 18,500 kg/day. The breakdown of the waste generation rate by category is given in Table 4.2.

Table 4.2: Ngozi town solid waste generation rate breakdown by waste category

SN	Waste category	Generation rate (kg/d)
1	Household solid waste	14615
2	Institutional solid waste	322
3	Commercial solid waste	333
4	Market solid waste	407
5	Informal sector and agricultural solid waste	2923
	Total solid waste generation rate	**18500**

Some of the solid waste sources such as construction sites generate relatively small quantities of waste and for that reason they do not appear in Table 4.2. Like in Muyinga, urban agriculture and informal sector activities account for a large proportion of the solid waste generated in Ngozi town. Obviously because of the nature of activities and sources that generate it, the bulk of the waste generated in Ngozi town (Table 4.2) is organic in nature. However, a major portion of the organic fraction is removed for application on farms and gardens which abound within and around the town. Notably, in one of the illegal disposal sites plastics dominated the waste reinforcing the assertion that the organic portion is removed before disposal, which is highly commendable. It was also reported that the plastic waste portion remaining after removal of the organic portion was in many cases burnt.

A large proportion of the solid waste generated in Ngozi town is not collected. Since a major part of this is organic in nature, it does not pose a problem in the outskirts of the town and other places where urban agriculture is practiced because it ends up on the farms and gardens. However, it becomes a serious public health and aesthetic problem when left uncollected at the markets and residential and institutional premises as well as commercial premises such as restaurants and hotels in high density town centre areas. This is because the organic portion of the waste especially food leftovers and food preparation wastes tends to decompose easily

and as it does so attracts vermin and becomes a nuisance due to its offensive smell and sight plus the effects of the swarms of flies it attracts.

Notably, fruit peelings and remains, which are dominant constituents of solid waste from residences, markets, institutions, and restaurants, bear strong smells which attract vermin such as flies long before the waste has started to decompose. The fact that due to relatively moderate ambient temperatures waste decomposition rates in Ngozi town are expected to be low is not a consolation because even these temperatures are in practice not low enough to prevent the onset of nuisance. During the field surveys it was evident that the low temperatures were not low enough to prevent or appreciably slow down the decomposition rates; the offensive odor and sight plus swarms of flies were evident at all collection points and disposal locations visited.

SWM service with respect to service coverage, beneficiaries, service levels, service standards, and service type is similar to that for Muyinga town. The majority of the town residents and town areas are not covered by the service. The SWM system for Ngozi town is not well defined. The available solid waste collection service focuses on the central market which is provided with three solid waste holding chambers from which a solid waste collection vehicle collects the waste. When everything is going well, the market solid waste holding chambers are emptied about every ten days. The collected solid waste is discharged on several disposal sites none of which is suitable for the function.

Collection and transportation of the waste is done using a convention truck with a capacity of 7 tons which was meant for transporting construction materials. The vehicle belongs to the Ngozi commune works department. The actual SWM service is provided by a community based organization (CBO) known as TUGIRISUKU. TUGIRISUKU and another association known as MAGARAMEZA were reported by the town authorities as the only CBOs involved in SWM in Ngozi town. Further investigations indicated that MAGARAMEZA, which was responsible for sensitizing and mobilizing people with respect to sanitation and hygiene, did not exist any longer. TUGIRISUKU is responsible for cleaning public places including the markets and streets. Both CBOs used to be supported by the town authorities. The department of sanitation and hygiene supported MAGARAMEZA in a number of ways including providing it with materials to be used in the campaigns. The town authorities support TUGIRISUKU through lending it its pick-up truck and through cash contributions.

SWM costs are supposed to be covered by the budget for sanitation and hygiene, but the budget does not specify the amount to be spent on SWM. Priorities are set by the authorities depending on the prevailing conditions and good judgment. TUGIRISUKU, which is responsible for cleaning public places and streets, is paid only BF 200, 000 per month by the commune for its SWM services. It is supposed to do the required cleaning and transport the waste from the collection bays to the disposal site with this money. Due to the low payment it allocates only two days per week for SWM. During the rest of the week it deals with other things.

Ngozi town has designated Saturday as the clean-up day. It has set aside the time between 7:30 and 10:30 am on Saturday for cleaning the town. It was reported that after the clean-up day the town would be clean for about a week after which it would revert to its previous condition. This suggests that the clean-up day should be organized more often if it is to have long term impacts.

One of the solid waste disposal sites used by Ngozi town is part of a banana farm. The waste is discharged on the site without consent of the farm owner and unfortunately a suitable alternative site has not yet been secured and urban plans do not provide for it.

From generation to disposal, SWM in Ngozi town is clearly carried out without a designed plan and clear strategy. Additionally, OHS needs are clearly not accorded their due importance. For example, SWM workers were found handling solid waste without the use of appropriate PPE. The most important form of resource recovery practiced in Ngozi town is application of the organic fraction of solid waste as an organic fertilizer with or without composting.

With the current SWM practices without proper temporary solid waste storage facilities, without the use of proper collection and transportation vehicles, with the SWM workers not using appropriate PPE, and with the waste being haphazardly disposed of, public health and environmental protection is certainly compromised.

In contrast with Muyinga town, Ngozi town has two coffee bean dehusking industries. A large proportion of the solid waste from the coffee industries is reused. The coffee bean husks are used as fuel in brick making. The bulk of medical solid waste generated in Ngozi town is incinerated. Ngozi commune hospital has incineration facilities.

While some individual Ngozi town residents request to be given solid waste, which is predominantly organic, so that they can apply it on their urban farms, others dispose of their solid waste in empty spaces. The absence of litter bean in Ngozi town compounds the problem of indiscriminate disposal of solid waste.

A new area earmarked for use as the future solid waste final disposal area is located at Kinyana about 5 km from the town centre. Unfortunately, the field survey team was not able to visit and verify the suitability of the site.

4.4 Solid Waste Management in Kayanza

Kayanza, just like Muyinga and Ngozi towns, is also beset with the problems identified in Section 4.1, which are common across the three Burundi towns. It does not have a well-defined and functioning SWM system. Just like Muyinga and Ngozi towns, Kayanza does not have any data on its solid waste generation and compositions. However, based on available population data and solid waste generation data for similar towns, the total quantity of solid

waste generation in Kayanza is estimated to be 11,000 kg/day. The breakdown of the waste generation rate by category is given in Table 4.3.

As depicted in Table 4.3, sources of solid waste and types in Kayanza are similar to those identified in Muyinga and Ngozi towns. The following were identified as especially important sources of solid waste in Ngozi town: army base, schools, the hospital, abattoirs, and the market.

Table 4.3: Kayanza town solid waste generation rate breakdown by waste category

SN	Waste category	Generation rate (kg/d)
1	Household solid waste	8690
2	Institutional solid waste	132
3	Commercial solid waste	198
4	Market solid waste	242
5	Informal sector and agricultural solid waste	1738
	Total solid waste generation rate	**11000**

Resource recovery other than composting and direct use of organic solid waste as an organic fertilizer in urban farms is not extensively practiced in Kayanza. Scrap metal is reportedly collected and exported to Uganda for recycling. Although it was not reported or observed during the field surveys, reuse of drinking water bottles as containers for fluids such as oil is anticipated to take place in Ngozi town just like in other towns.

The main SWM service provider in Kayanza town is commune (town). The authority collects waste mainly from the central market and the streets near the market. Households and institutions typically burn and bury their solid waste. Kayanza Hospital has an incinerator specially installed for medical waste. It also have a provision for storage of ash that results from incineration of medical waste. The incinerator and associated facilities for medical waste management are secured in a gated compound. Use of the organic fraction of the solid waste as an organic fertilizer is practiced extensively as is the case in the other two surveyed towns in Burundi.

The town has 7 SWM workers each of whom is paid BF 10,000 per month for providing cleaning services. The workers use wheel barrows for short range collection of the waste from the individual sources to the holding bay outside the market or other collection areas along the streets. There are only three wheel barrows at the disposal of the workers and the workers are typically not provided with any PPE. The SWM workers work for three whole days per week and work under supervision of the commissioner of the market which means the focus of their work is the market rather than any other part of the town. Occasionally, when the pile of solid waste outside the market becomes excessively high, even market traders take part in removing the solid waste from the collection area. The traders pay the town for the use of the market facilities but they do not pay a direct SWM fee.

Apart from the wheel barrows, the town does not have any other equipment dedicated to SWM. For long range collection and transport of the waste the town hires a vehicle from private owners. The town does not have suitable vehicle of its own.

The town authorities admitted that Kayanza does not have a specific plan for SWM in the town. they also noted that the town does not have a designated solid waste disposal site. Currently, the town discharges the solid waste it collects from the town in illegal disposal sites. One site a site is located in the middle of the town just adjacent to the main street. A site formerly earmarked for final solid waste disposal was abandoned because it turned out to be on a private piece of land. The owner of the land as well as his neighbours refused to let the town use or develop the piece of land as a solid waste disposal site. At the time of the field surveys for this report the town did not have any firm plans for identifying and setting aside suitable land for developing into a designated landfill. Obviously, the situation is bound to get worse because with the rapid growth of the town, land suitable for developing proper landfill will get scarcer with time.

Figure 4.1: Illegal crude solid waste disposal site off the main street in Kayanza, Burundi

Figure 4.2: Crude storage of bones, hooves and horns outside an abattoir in Burundi

Figure 4.3: Medical waste incinerator for Kayanza Hospital

Figure 4.4: Crude solid waste disposal site in a banana farm in Ngozi town

Figure 4.5: Broken pick-up truck used to collect solid waste in Ngozi town

5.0 SOLID WASTE MANAGEMENT IN RWANDA

5.1 Overview on Solid Waste Management in Rwanda

Despite their geographical separations, all of the three towns surveyed in Rwanda share some features and characteristics that differentiate them from the towns surveyed in Burundi and Tanzania. In terms of relief features, all of the three surveyed towns in Rwanda are located on less hilly areas compared to the towns surveyed in Burundi. Apart from their similar relief features, the three towns in Rwanda share some SWM good attributes and deficiencies. For example, all the three surveyed towns in Rwanda provide litter bins for litter storage along streets. To the credit of the town authorities, the three towns are comparatively very clean and free from stray solid waste. This is in sharp contrast with the surveyed towns in Burundi and Tanzania. In all the surveyed towns in Rwanda, SWM is accorded a relatively high priority partly because the importance of solid waste management is recognised and given priority from the highest administrative and political echelons. The political environment is also fairly supportive of and conducive to good SWM.

In spite of the preceding, the three surveyed towns in Rwanda are affected by many of the shortcomings listed in Table 3.1. In addition, they have deficiencies pertinent to the issues identified in Table 2.2. Notably, all of the surveyed towns suffer from SWM data poverty. Good quality solid waste generation and composition data are simply not available and there are no plans in place to rectify the situation. Furthermore, SWM shares resources with other services which are more often than not considered more critical than SWM. Also, even though some degree of cost recovery is practiced, full cost recovery is yet to be implemented in the three towns.

All of the three surveyed towns in Rwanda do not have and do not use appropriate vehicles equipment to collect, transport and dispose of solid waste. They do not consistently engage in good SWM practices either. For example, inappropriate vehicles are used to collect and transport solid waste from sources to disposal sites. In spite of the fact stated above that all of the towns surveyed in Rwanda do not have their own vehicles for collecting and transporting solid waste, it is important to observe that the entities responsible for the collection and transportation of the solid waste hire the required vehicles from private owners whenever they need them.

Further to the above, in spite of the relative cleanliness of their streets, the three towns are not free from piles of uncollected solid waste although such piles are normally out of sight. Additionally, in all the three surveyed towns, solid waste final disposal is still problematic. The current solid waste disposal sites for the towns are not suitable while the ones proposed for future use do not meet the standards for suitable solid waste final disposal sites.

During the surveys for this report in Rwanda, it was observed that the solid waste collection systems actually used in the surveyed towns in Rwanda incorporate the use of communal

storage and collection points especially at markets and similar solid waste sources. However, during interviews and discussions, town officials expressed a strong desire and aspiration for improving their solid waste collection systems and practices so that they do not include either communal collection points or transfer stations. As such, the future solid waste collection system should not include solid waste collection skips or similar facilities. They notably argued that adoption of a solid waste collection system incorporating either communal collection points or transfer stations would be contrary to the Rwanda national policy on solid waste management. Therefore, the only solid waste collection system that can be adopted when improving solid waste management in the surveyed towns in Rwanda is the door – to – door (house – to – house) collection system.

5.2 Solid Waste Management in Kayonza Town

The main sources of solid waste in Kayonza town are: residential areas, markets, shopping areas, including shops, restaurants and hotels; institutions, informal sector activities, and urban agriculture activities. Notably, industries do not feature because there are significant industries in Kayonza town. As noted earlier, solid waste generation and composition data are hard to come by in the three surveyed towns in Rwanda. However, based on available population data and solid waste generation data for similar towns, the total solid waste generation rate is estimated to be 9,600 kg/day. The breakdown of the waste generation rate by category is given in Table 5.1.

Table 5.1: Kayonza town solid waste generation rate breakdown by waste category

SN	Waste category	Generation rate (kg/d)
1	Household solid waste	7584
2	Institutional solid waste	116
3	Commercial solid waste	172
4	Market solid waste	211
5	Informal sector and agricultural solid waste	1517
	Total solid waste generation rate	**9600**

The SWM situation in Kayonza town is characterised by both the good attributes and deficiencies identified in Section 5.1 with respect to characteristic strengths and weaknesses of SWM in the three surveyed towns in Rwanda. One notable good attribute is the provision of litter bins which can be seen lining the streets.

SWM service in Kayonza town is provided by both the public through the environmental health department and a private contractor who is hired by the town authority. The contractor is responsible for cleaning the district administration offices and solid waste collection. The town pays the SWM contractor RF 2,000,000 per month for the office cleaning and SWM services.

The most notable aspect of SWM in Kayonza town is disposal of the collected solid waste. Final disposal is carried out on private land at a location called Cyeru. The disposal area

currently in use comprises several operating and abandoned borrow pits for murram used in road construction. All the borrow pits are located amidst residential buildings. Some houses are as close as 5 m from operational disposal pits. The disposal practice is such that, the solid waste to be disposed of is discharged into a borrow pit a portion of a borrow pit that is no longer in use. The filling of the borrow pit with solid waste continues until the pit is full. Then the waste is covered with top soil.

The borrow pit area owner is paid RF 20,000 per month for the use of his land. The land owner buys top soil for covering the waste at a cost of RF 10,000 per truck trip. The main business of the borrow pit area land owner is selling murram and he is obliged to reinstate the borrow pit area after extracting the construction material. As such, filling the borrow pits with solid waste appears to be a more cost-effective option that using other means.

It is obvious that the biggest SWM challenge for Kayonza town is final disposal of the collected waste. A new disposal site has been secured and partly developed but at the time of field surveys it had not yet been put into use. It is expected that practices at the new disposal site will be better than the ones that characterise the existing one. Nonetheless, it is advisable that the site is vetted anew under this project. The temptation to take for granted that the site is suitable and is properly developed should be resisted.

5.3 Solid Waste Management in Nyagatare Town

Similarly to the situation in Kayonza, the main sources of solid waste in Nyagatare town are: residential areas, markets, shopping areas, including shops, restaurants and hotels; institutions, informal sector activities, and urban agriculture activities. Industries currently operating in Nyagatare town are mainly a granite production plant (East African Granite) and a milk processing industry. The largest institution in Nyagatare is the Umutara Polytechnic University. Another major institution is Nyagatare Hospital.

Based on available population data and solid waste generation data for similar towns, the total solid waste generation rate is estimated to be 15,000 kg/day. The breakdown of the waste generation rate by category is given in Table 5.2.

Table 5.2: Nyagatare town solid waste generation rate breakdown by waste category

SN	Waste category	Generation rate (kg/d)
1	Household solid waste	11850
2	Institutional solid waste	180
3	Commercial solid waste	270
4	Market solid waste	330
5	Informal sector and agricultural solid waste	2370
	Total solid waste generation rate	**15000**

The final solid waste disposal site for Nyagatare is up a very steep slope on Mirama hill some 5 km from the town centre. The site overlooks the town. At the site, some waste is dumped

by the way side even before reaching the top. Discharge points for waste are scattered all over the hill top .and the discharged waste is not covered. The discharged solid waste contains many potential recyclable materials.

Solid waste service providers in Nyangatare are the town itself and a private contractor. Within the town administration, environmental health officers are responsible for SWM. However, they are also responsible for many other duties that are unrelated to SWM. The town has 20 labourers who collect waste from various source areas and discharge it at the transfer stations. They use wheel barrows for hauling the solid waste and typically they do not use PPE. The town regularly hires a privately owned 3.5 ton truck which is used to transport solid waste from the collection areas to the disposal site.

Signifying that the waste had not been collected for some time, at Nyagatare old market there was a pile of uncollected waste. The old market collection site is used as a transfer station although transfer stations are not favoured in Rwanda. The fact that removal of the waste from the transfer stations depended on availability of the transport vehicle which serves many areas contributes to the piling up of the waste at this and other transfer stations.

It was reported that scrap metal is collected and exported to Uganda because the local recycling industry is not yet ready. It is also likely the small quantities of used drinking water bottles are reused as containers for liquids such as oil and kerosene. However, as evidenced by their abundance in discharged solid waste at the disposal site and absence of waste pickers who pick them from solid waste piles, plastics do not yet have a market in Rwanda. This is bound to change once the plastic recycling market in Tanzania and Kenya start looking for new raw material supply sources in Rwanda and Burundi.

The private SWM service provider contracted by the town is responsible for both cleaning district administration offices and general SWM management outside the offices. The contractor is paid RF 1,600,000 per month for both cleaning the district offices and taking care of SWM outside the offices. The contractor estimates that he collects an average of 30 tons of solid waste per week. Given that the solid waste generate rate for the town is about 15 tons/day, only about 29% of the total quantity of solid waste generated by the town is collected by the contractor for disposal at the official disposal site. A large proportion of the remaining quantity is applied on farms as an organic fertiliser. This is possible because a large proportion of the waste is organic in nature and there are many urban farms within and around the Nyagatare town on which the organic waste can be applied.

Before the private contractor was hired, a cooperative was providing the SWM service. According to the town authorities, each household in Nyagatare town is required to pay RF 1000 – 2000 per month as a SWM fee while business premises are required to pay RF 5000.per month.. The contractor collects the SWM fee money directly from the service beneficiaries. The fact that the contractor collects SWM fees from the the service beneficiaries indicates a high level of cost recovery unlike in Burundi towns, for example.

It is notable that the people responsible for solid waste management in Rwanda are not in favour of the use of transfer stations. They argue that transfer stations encourage littering and undue accumulation of uncollected solid waste as was the case near the old market in Nyagatare town.

5.4 Solid Waste Management in Nyanza Town

Reflecting on the situation in both Kayonza and Nyagatare towns, the main sources of solid waste in Nyanza town are: residential areas, markets, shopping areas, including shops, restaurants and hotels; institutions, informal sector activities, and urban agriculture activities. Nyanza town is affected by the lack of reliable solid waste generation and composition data that also affects Kayonza and Nyagatare towns.

Based on available population data and solid waste generation data for similar towns, the total solid waste generation rate is estimated to be 19,200 kg/day. The breakdown of the waste generation rate by category is given in Table 5.3.

Table 5.3: Nyanza town solid waste generation rate breakdown by waste category

SN	Waste category	Generation rate (kg/d)
1	Household solid waste	15168
2	Institutional solid waste	231
3	Commercial solid waste	345
4	Market solid waste	422
5	Informal sector and agricultural solid waste	3034
	Total solid waste generation rate	**19200**

Nyanza town streets are characteristically clean looking with good good quality, aesthetically appealing and well placed litter bins. However, solid waste storage provisions at other locations are not good.

SWM service in Nyanza town is provided by both the public the town authority and the public sector through a contractor. However, the service of the contractor is limited to Nyanza hospital. The contractor provides cleanliness and solid waste collection services to the hospital. He has 41 workers for the hospital alone for sweeping and scrubbing floors as well as doing other related work. The contractor collects and transports non-medical waste from the hospital to the disposal site. The medical fraction of the waste is incinerated in the hospital's incinerator. The contractor was procured through a national open tender.

On the part of the public service provider, SWM management is done by employees of the district. The town employs 47 SWM workers and has 10 handcarts for solid waste collection. Business premises are provided with the SWM service by the town at a fee. In contrast, households and small institutions have to manage their solid waste on their own through burning, burying and composting followed by application on farm.

Apart from collecting solid waste from business premises, the public solid waste management workers are responsible for sweeping roads and streets. They are also responsible for collecting and transporting the waste to the disposal site. It is noteworthy that the 47 SWM workers responsible for the cleanliness of Nyanza town, work on part time basis. They work only between 6:30 and 9:00 am and for this each is paid RF 10,000 per month. After 9:00 am they are free to go elsewhere.

Nyanza town does not currently have a suitable final disposal facility for solid waste. Currently, solid waste collected from the town is discharged by the way side in the outskirts of the town. Also, the sites proposed as interim solid waste disposal facilities are not suitable for a variety of reasons including proximity to water sources and unsuitable geotechnical characteristics (presence of hard rock at one of the sites).

In view of the above, the existing SWM system for Nyanza town faces serious challenges which will need to be addressed soon. Obviously, the most serious challenge is final disposal of the waste collected from the town whose quantity will keep growing.

Figure 5.1: Crude illegal solid waste discharge site in Nyanza, Rwanda

The photograph shown in Figure 5.1, was taken during the surveys. During the validation workshop for this report held in the same town, the crude disposal site was no longer there. It is also notable that, the town had also already developed and started using a temporary solid waste final disposal site. The new site temporarily solves the problem of solid waste final disposal. Therefore, a permanent final disposal site still needs to be provided to Nyanza town under LVWATSAN.

Figure 5.2: Litter bin along the main road in Kayanza, Rwanda

Figure 5.3: Medical waste incinerator for Nyanza Hospital

Figure 5.4: Area earmarked as solid waste final disposal site in Nyanza.

Figure 5.5: Solid waste disposal site in a former murram borrow pit in Kayonza, Rwanda

Figure 5.6: Proposed future solid waste final disposal site for Nyanza, Rwanda

6.0 SOLID WASTE MANAGEMENT IN TANZANIA

6.1 Overview on Solid Waste Management in Tanzania

Sengerema, Geita, and Nansio, which are the towns which were surveyed in Tanzania, suffer from all of the shortcomings listed in Table 3.1 which was discussed earlier. All of the towns are also affected by deficiencies pertinent to the issues and considerations outlined in Table 2.2 which was presented earlier. The main shortcomings affecting the towns can be cited as follows:

- SWM is accorded low priority in service provision while the policy, legal and regulatory environment does not adequately support SWM.

- The institutional framework is non-supportive because responsibilities for SWM are not properly aligned with the requisite authority and financial resources.

- The political environment is considered non-supportive because it has not come all out to support SWM with all the means at its disposal.

- The towns are affected by SWM data poverty which is characterized by the fact that the towns did not have reliable solid waste generation and composition data.

- Available solid waste management resources are insufficient because of low SWM budget allocation, inadequate SWM staff SWM equipment and facilities, and non-consideration of cost recovery.

Solid waste collection systems used in the surveyed town in Tanzania apply mainly a combination of the use of communal storage and collection points and collection from kerbside points. The house – to – house (door – to – door) collection system was neither reported nor observed, which means if it is practiced at all in the surveyed towns, its coverage is very limited.

6.2 Solid Waste Management in Sengerema Town

The main sources of solid waste in Sengerema town are: residential areas, markets, shopping areas, including shops, restaurants and hotels; institutions, and informal sector activities. Notably, industries are not included in the list because there are no significant industries in Sengerema town. As noted earlier, solid waste generation and composition data are hard to come by in the three surveyed towns in Tanzania. However, based on available population data and solid waste generation data for similar towns, the total solid waste generation rate is

estimated to be 38,000 kg/day. The breakdown of the waste generation rate by category is given in Table 6.1.

In addition to the ones highlighted in Section 6.1 above, the main challenges facing Sengerema town with respect to SWM pertain to storage, collection, and final disposal of solid waste. SWM services in Sengerema town also rendered by both a public service provider and a private contractor hired solely for providing SWM service. The public provides SWM service through the health department of the district council. A health officer is responsible for overseeing SWM in the town and supervising SWM workers who work under him.

Table 6.1: Sengerema town solid waste generation rate breakdown by waste category

SN	Waste category	Generation rate (kg/d)
1	Household solid waste	30020
2	Institutional solid waste	456
3	Commercial solid waste	684
4	Market solid waste	836
5	Informal sector and agricultural solid waste	6004
	Total solid waste generation rate	**38000**

Notable observations regarding SWM in Sengerema town can be outlined as follows:

- Urban planning and design does not incorporate SWM needs. This is reflected in the fact that there is no provision for solid waste collection points and disposal sites in the plans.
- Workers involved in solid waste management use crude equipment and facilities. In addition, the workers do not use any personal protective equipment (PPE).
- The town authority does not own any vehicle suitable for solid waste collection and transport to the disposal site.
- The town does not have a suitable solid waste disposal site. The current one is not suitable because of proximity to a school and other human habitats.
- Solid waste resource recovery is extensively practised in Sengerema town. Both scrap metal and plastics are collected.

On the whole, the most serious challenge facing SWM in Sengerema town is the lack of suitable solid waste final disposal site. This problem will need to be tackled even before the challenges pertinent to the other SWM system functional elements have been fully addressed.

6.3 Solid Waste Management in Geita Town

SWM in Geita town bears many similarities with Sengerema town. This could partly be explained by their geographical proximity and similarity as well as similarity in social – economic - characteristics. Similarly to the situation in Sengerema town, the main sources of solid waste in Geita town are: residential areas, markets, shopping areas, including shops,

restaurants and hotels; institutions, and informal sector activities. Geita town does not have significant industrial activities and for this reason, industries are not included in the list of sources of solid waste.

Based on available population data and solid waste generation data for similar towns, the total solid waste generation rate is estimated to be 50,000 kg/day. The breakdown of the waste generation rate by category is given in Table 6.2.

Table 6.2: Geita town solid waste generation rate breakdown by waste category

SN	Waste category	Generation rate (kg/d)
1	Household solid waste	39500
2	Institutional solid waste	600
3	Commercial solid waste	900
4	Market solid waste	1100
5	Informal sector and agricultural solid waste	7900
	Total solid waste generation rate	**50000**

In Geita town there is also a private contractor hired to provide SWM services alongside the health department. The contractor is hired through and works under the supervision of the health department of the district.

Notable observations regarding SWM in Geita town are similar to those identified with respect to Sengerema town. They are as follows:

- SWM service coverage is mainly limited to the markets and business premises in the town centre.
- Urban planning and design does not incorporate SWM needs. This is reflected in the fact that there is no provision for solid waste collection points and disposal sites in the plans.
- Workers involved in solid waste management use crude equipment and facilities. In addition, the workers do not use consistently use suitable personal protective equipment (PPE).
- The town authority does not own any vehicle suitable for solid waste collection and transport to the disposal site.
- The existing institutional framework, legal and regulatory regimes are not conducive to effective and sustainable SWM.

It is noteworthy that, solid waste resource recovery is extensively practised in Geita town. In fact the largest scrap metal and plastic recyclable dealer in all the towns surveyed for this report resides and operates from Geita town.

In Geita town, final disposal of solid waste is currently a serious challenge. However, this is bound to change in the near future because the town has identified and acquired a suitable site

about six km just off the main road in the direction of Sengerema town. Geita is the only town of all the nine surveyed towns that has secured a suitable site for final disposal of solid waste.

Geita town now needs to formally acquire the earmarked disposal site land and secure it to protect from encroachment and land use change malpractices.

6.4 Solid Waste Management in Nansio Town

Mirroring the situation in both Sengerema and Geita towns, the main sources of solid waste in Nansio town are: residential areas, markets, shopping areas, including shops, restaurants and hotels; institutions, and informal sector activities. Like the other three surveyed towns in Tanzania, Nansio suffers from a shortage of good quality solid waste generation and composition data. Nonetheless, based on available population data and solid waste generation data for similar towns, the total solid waste generation rate is estimated to be 21,500 kg/day. The breakdown of the waste generation rate by category is given in Table 6.3.

Table 6.3: Nansio town solid waste generation rate breakdown by waste category

SN	Waste category	Generation rate (kg/d)
1	Household solid waste	16985
2	Institutional solid waste	258
3	Commercial solid waste	387
4	Market solid waste	473
5	Informal sector and agricultural solid waste	3397
	Total solid waste generation rate	**21500**

SWM service provision in Nansio town incorporates the district council through the health department and CBOs which work under the supervision of a health office from the health department.

The following issues, some of which are similar to the ones identified with respect to Sengerema and Geita towns, can be pointed out regarding SWM in Nansio town;

- SWM service coverage is mainly limited to the markets and business premises in the town centre.
- Urban planning and design does not incorporate SWM needs. This is reflected in the fact that there is no provision for solid waste collection points and disposal sites in the plans.
- Workers involved in solid waste management use crude equipment and facilities. In addition, the workers do not use consistently use suitable personal protective equipment (PPE).
- The town authority does not own any vehicle suitable for solid waste collection and transport to the disposal site.

- The town does not have a suitable solid waste disposal site because of not being properly developed and operated to protect the river located close to it. If the current disposal site is properly designed, constructed and operated it can still suffice the needs of the town while protecting both public health and the environment..
- Solid waste resource recovery is vibrant in Nansio town with both scrap metal and plastic materials being in demand. There is even a local market for used drinking water bottles. The bottles are used as buoys in the fishing industry in addition to being reused as liquid containers.

Although the challenges faced by Nansio town are essentially similar to the ones facing Sengerema and Geita towns, Nansio town has additional special challenges resulting from the fact that it is located on an island. Its being located on an island limits the town's solid waste disposal options. It has limited options because land is limited on the island.

Figure 6.1: Solid waste collection bay at the main market in Sengerema, Tanzania

Figure 6.2: Tractor and trailer and wheel barrows used in solid waste management in Sengerema, Tanzania

Figure 6.3: Solid waste communal storage bay in a neighbourhood in Sengerema town, Tanzania

Figure 6.4: Litter bin at Kijiweni landing site in Sengerema, Tanzania

Figure 6.5: Crude communal solid waste storage point in Geita town, Tanzania

Figure 6.6: View of site selected for final solid waste disposal for Geita town

PART III: OPTIONS FOR IMPROVEMENT OF SOLID WASTE MANAGEMENT IN THE SURVEYED TOWNS

7.0 OPTIONS FOR IMPROVEMENT OF SOLID WASTE MANAGEMENT IN THE SURVEYED TOWNS

7.1 Overview

From the findings revealed by the surveys carried out in the towns covered in this report, it is obvious that efforts on improving solid waste management in the surveyed towns need to use a two-pronged strategy. The recommended approach incorporates the following:

- Learning from and improving on current practices and strategies from the same town, from another town in the same country, and from another town in another country within the EAC region countries covered by the study; and
- Adopting new practices, strategies, and technologies that have a high likelihood of succeeding taking cognizance of local spatial, social-economic, and other characteristics.

It is noteworthy that, although the surveyed towns are currently relatively small and heavily influenced by rural links, they will soon grow and outgrow their rural links. As the towns become more urban and the role of urban agriculture decreases, what happens to the organic component of the solid waste currently generated in these towns will change. As such, there will be a need for changes in practices, strategies, and technologies pertinent to solid waste management in these towns. Because of the foregoing and other related eventualities related to urbanisation and economic growth of the towns, the solid waste management systems for the surveyed towns need to evolve with the towns and as such the solid waste management systems for these towns will need to be periodically reviewed and updated.

7.2 The Role of Resource Recovery in Solid Waste Management Improvement

Findings from the surveys carried out in the selected towns in Burundi, Rwanda, and Tanzania have shown the huge potential that resource recovery has in improving solid waste management as well as contributing to income generation. Notably, the surveyed towns have demonstrated the potential for resource recovery for both organic and inorganic fractions of solid waste. To enhance the role of resource recovery in improving solid waste management in the surveyed towns, pre-collection resource recovery is recommended. Advantages of pre-collection solid waste resource recovery include:

- It reduces the overall costs of all the downstream solid waste management system functional elements; and

- It leads to more efficient and convenient resource recovery because small quantities of solid waste are handled and the focus can be directed at only those waste streams that really contain recoverable resources.

On the whole, for every piece of solid waste resource recovered, cost is saved, efficiency is improved, income is generated, landfill space is served, and life of virgin material source is increased.

7.3 Specific Recommendations for Burundi Towns

Learning from the current practices, the future solid waste collection system can use a combination of the use of communal storage and collection points and collection from kerbside points. Collection and transportation vehicles can be adopted based on experiences from LV-WATSAN I.

For in-house storage of solid waste at household level, plastic or aluminium bins with capacities between 50 – 70 L are recommended. Capacities between 50 and 70 L can store quantities of waste commensurate with the anticipated solid waste collection frequencies. Solid waste storage bin made using steel and similarly heavy material are not recommended because they will be difficult to handle and carry. For cost-effectiveness, plastic bins are preferable to aluminium ones. The solid waste storage bins must have securely fitting lids (preferably hinged lids) to keep out rain and vandalising animals. They must also have handles for facilitating lifting and carrying by one or two people.

Burundi towns need to provide litter bins along the streets and for this they can learn from experiences gathered by towns Rwanda. The designs of the litter bins currently used Rwanda seem perfectly applicable to Burundi towns.

7.4 Specific Recommendations for Rwanda Towns

In line with good solid waste management practice hierarchy, households, institutions and other generators of solid waste should be encouraged to minimise solid waste generation. To this end, reuse and recycling of potential solid waste constituents should be strongly encouraged. Use of the organic portions of solid waste which is currently widely practised in the surveyed towns especially at household level should be sustained. As an extension and improvement of this practice, composting should be formally supported especially at institutional level where the practice is most likely to be taken up and take root easily.

Hazardous waste must be managed separately from the rest of the waste generated by the surveyed towns. The portion of hazardous waste that is amenable to incineration should be appropriately incinerated. The rest of the hazardous waste should be properly managed as recommend for hazardous waste taking into consideration characteristics of the individual

constituents. The need for incinerating some hazardous waste constituents implies that the towns may need incineration facilities. Whether dedicated or shared incineration facilities will be needed will depend on quantities and characteristics of hazardous waste that needs to be incinerated.

The current practice of incinerating medical waste as practiced at Nyanza Hospital, for example, is commendable and should not only be sustained but also improved. The practice should additionally be extended to medical waste from all sources in each town. It may not be practical or even economical for each source of medical waste to have an incinerator of its own. Therefore, it is recommended that the incinerators owned by the major hospitals in each town be used to incinerate medical solid waste from all other sources. The hospitals can then charge a reasonable fee for the use of their facilities.

As discussed earlier, the national policy on solid waste in Rwanda precludes the adoption of any solid waste collection system that incorporates the use of communal storage or collection points including the use of skips and related facilities, the door – to – door (house – to – house) solid waste collection system is the only one applicable to the Rwanda towns.

For in-house or yard storage of solid waste at household and other levels, properly shaped solid waste storage bins made of plastic or aluminium are recommended. Invariably the storage bins must have lids as discussed with respect to the case of Burundi towns. The basic solid waste storage bin for household or institutional level use can have a capacity of between 50 L – 70 L.

Although, Rwanda towns have litter bins along many of their streets, there is still room for improvement by way of increasing the number of litter bins and increasing the number of streets covered in line with demand.

In line with the wishes and aspirations of the Rwanda towns, solid waste collection vehicles must have a low loading height of no more than 1 m unlike those currently in use. They must have extended sides and a top cover so that the solid waste can be covered completely during collection and transportation. To facilitate easy discharge at the disposal site, they must have a tipping mechanism.

Experience has shown that carrying capacities of the vehicles suitable for serving the door – to – door solid waste collection system in the surveyed towns in Rwanda can preferably be at least 3.5 tons.

No specific brand of vehicle is recommended because many manufacturers produce vehicles with the specifications given. In any case, the vehicles have to be very durable and as such they must be procured from manufacturers with a good track record for durability and after sale service.

The surveys carried out in the three towns in Rwanda do not give credence to any specific need or advantage for using compactor trucks. The use of compactor trucks for collecting and transporting solid waste in the surveyed towns is not encouraged because:

- A large proportion of the solid waste generated in the surveyed towns is of high density (a very small portion, probably packaging materials from commercial sources is bulky waste), which precludes the need for pre-disposal compaction of the solid waste;
- A large proportion of the solid waste generated in the surveyed towns has a high moisture content, which means during compaction consolidation of the solid waste will occur with resultant production of large quantities of water which is not only not desirable but may also damage the compactor trucks;
- The solid waste generated in these towns often contains stones and similarly hard materials, which can potentially damage the compactor trucks; and
- The capacity and sizes of the standard compactor trucks may not be suitable for providing services in the streets of the target towns.

It is conceivable that over time in the future the above listed demerits of using compactor trucks may disappear and conditions suitable for the use of compactor trucks may prevail. When this happens compactor trucks may unconditionally be applicable to collect and transport solid waste in the surveyed towns. Currently compactor trucks can only be used without problems if they are used to collect and transport well sorted, low moisture and stone-free bulky commercial solid waste. If they are used with dense solid waste, the compaction mechanism, which is not cheap, will be rendered redundant.

The three surveyed towns in Rwanda have selected sanitary landfilling as their preferred method for disposal of solid waste. However, none of the three towns has yet to identify and acquire a suitable site for locating the solid waste landfill facilities. Therefore, the town authorities need to urgently identify and acquire appropriate, suitably located and sufficiently large solid waste final disposal facility sites. The identification and selections of the sites must be done with the help of the consulting engineer procured to design the disposal facilities. Needless to add, the selection of the sites must consider all applicable public health and environmental protection needs.

It is important to point out with respect to final disposal of solid waste that the biggest challenge pertinent to landfilling of municipal solid waste pertains to ensuring that a sanitary landfill is operated as a sanitary landfill. Designing and constructing a solid waste final disposal facility as a sanitary landfill is not effective if no effort is put on ensuring that the facility is operated as a sanitary landfill. In fact, experience shows that many originally designed and constructed sanitary landfills failed because they were not operated as sanitary landfills must be operated. Therefore the officials of the surveyed towns in Rwanda must make sure that the landfills that are going to be designed and constructed for their towns are always operated as sanitary landfills.

7.5 Specific Recommendations for Tanzania Towns

The findings from the surveyed Towns in Tanzania regarding the most suitable solid waste collection system are similar to those for Burundi. As such, the future solid waste collection systems in Tanzania towns can use a combination of the use of communal storage and collection points and collection from kerbside points. Similarly to Burundi, the collection and transportation vehicles can be adopted based on experiences from LV-WATSAN I.

For in-house, yard, and on-plot storage of solid waste at household and institutional levels, plastic bins with capacities between 50 – 70 L are recommended. The solid waste storage bins must have securely fitting lids (preferably hinged lids) to keep out rain and vandalising animals. They must also have handles for facilitating lifting and carrying by one or two people.

Like Burundi towns, Tanzania towns do not have litter bins along their streets. Therefore they need to provide them learning from experiences from their counterparts in Rwanda. There is no doubt designs of the litter bins currently used Rwanda are applicable to Sengerema, Geita, and Nansio towns in Tanzania.

PART IV: CONCLUSION AND RECOMMENDATIONS

8.0 CONCLUSIONS AND RECOMMENDATIONS

8.1 Summary and Concluding Remarks

The main conclusions that can be drawn from the assessment of SWM in the nine towns in Burundi, Rwanda and Tanzania are: 1) each of the surveyed towns faces SWM challenges, including an unfavourable operating environment, which must be addressed if the planned SWM improvement efforts are to succeed and 2) in each of the surveyed towns there is a potential for SWM improvement utilizing both local and external resources. Many of the surveyed towns face challenges with respect to some or all of the SWM system functional elements. The most problematic SWM functional element is obviously final solid waste disposal. All nine of the surveyed towns have a problem with disposal of the solid waste they collect. For all of the surveyed towns, the existing disposal sites are inappropriate while most of the sites earmarked for future use are also inappropriate. Therefore, improvement in solid waste disposal facilities and practices holds the key to the success of all the other planned SWM improvement efforts. Additional concluding remarks can be outlined as follows:

- In all of the surveyed towns and countries SWM is given low primacy and priority in terms of time and resources in the context of other services.
- In all of the surveyed towns and countries reliable solid waste generation and composition data are not available and there are no plans for systematic collection of such data in future.
- All the surveyed towns do not have and do not use appropriate SWM equipement and facilities especially with respect to storage, collection, transfer, transportation, and disposal. Some do not have or use suitable cleaning equipment and most do not provide their workers with appropriate PPE for the workers' safety and health protection.
- In some of the surveyed towns communities have initiated worthwhile SWM improvement efforts that are supported by their respective authorities.
- The private sector can play a pivotal role in SWM improvement both on its own and through public-private partnership (PPP) arrangements. This assertion is supported by the fact that in many of the surveyed towns, the private sector is playing a very active role in SWM.
- Financing SWM services is one of the most important influencing factors for poor SWM in the surveyed towns, which means cost recovery must be incorporated in the planned SWM improvement efforts.
- The existing legal, regulatory and political regimes in all of the surveyed countries are not favourable to effective SWM.
- Urban planning practice in all the three surveyed countries is not supportive of or conductive to improved and effective SWM and as such it needs to change to support other planned SWM improvement efforts.

- As attested by the grassroots SWM improvement initiatives exhibited in some of the survey towns, communities in the surveyed towns are aware of and could contribute to SWM improvement efforts. If properly enhanced, the potential inherent in the SWM beneficiary communities can contribute towards the planned SWM improvements.

- Authorities in the surveyed towns are obviously not only aware of the need but also try within the limited means at their disposal to improve SWM in their towns. Their efforts are hampered by limited resources and unfavourable operating environments.

8.2 Recommendations

Based on the field survey findings and conclusions drawn from them, the following recommendations can be made to guide subsequent efforts on improving SWM in the selected towns:

- On the whole, improvements are needed on all SWM system functional elements, but since disposal is the most problematic of all SWM functional elements in all the surveyed towns it should be given first priority in the planned capacity building efforts.
- Since limited financial resources was identified as the most influential cause of poor SWM in the surveyed towns, cost recovery must be included in the planned capacity building efforts.
- Institutional framework pertinent to SWM was cited as one of the impediment to effective SWM improvement. Therefore, individual countries must be encouraged to review their respective institutional frameworks with a view to improving them for more effective SWM improvements.
- The planned capacity building efforts must include providing to the selected towns SWM equipment and facilities that are well suited the individual towns. The towns must also be urged to provide their workers with appropriate PPE.
- Capacity building efforts must incorporate the role of the private sector through public-private partnership arrangements or with the private sector as an independent contracted service provider.
- The planned capacity building efforts must incorporate building the capacity of the selected towns to collect good quality solid waste generation and composition data which will be needed as a firmer basis for improved SWM.
- To add more value to the planned SWM improvements and enhance contributions of the local communities, capacity building efforts must incorporate employment creation and income generation for the local communities. To this end, grassroots – based organisations including women and youth groups such as the ones currently operating in some of the surveyed towns must be considered in the capacity building plans.

- Since the legal, regulatory and political regimes were identified as being unfavourable to effective SWM improvement, individual countries must be urged to review them with a view to making them favourable to the effective SWM improvement.
- Urban planning practice in all the surveyed towns need to change so as to be more proactive with respect to providing for SWM needs such as communal solid waste storage sites, transfer stations, and final disposal sites.
- The changes needed to be made and new things needed to be introduced to improve SWM in the selected towns will call for competencies and skills far beyond what was needed previously. Therefore, the capacity building efforts must incorporate training of the personnel who will be responsible for SWM in the improved regime.

PART V: APPENDICES

APPENDIX A: REFERENCES

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APPENDIX B: LIST OF KEY PEOPLE CONTACTED

Country	SN	Name of person contacted	Designation/organization
Burundi	1	Gaspard Kabundele	UN-Habitat Burundi, LVWATSAN II
	2	Bonaventure	LVWATSAN II
	3	Joachim	LVWATSAN II
	4	Amri Selemani	Mayor Muyinga town
	5	Mashaka Mbonimpa	Sanitation and Hygiene in charge Muyinga Province
	6	Jean Pierre Mponoie	Head of urban planning and housing department Muyinga
	7	Manirambona Razak	President of ACOHAM Muyinga
	8	Clotilde Caraziwe	Mayor, Ngozi commune
	9	Desire Ndayisaba	Sanitation and hygiene in charge, Ngozi commune
	10	Nina Gretta Niyongere	Health officer, Ngozi commune
	11	Melchiode Manilagaba	Urban planner, Ngozi commune
	12	Rukia Itangishaka	President of Tugirisuku Association, Ngozi town
	13	Silvester Nsaguse	Advisor/Secretary to the Mayor of Kayanza
	14	Joseph Nahimana	Public health officer for Kayanza province
	15	Gervas Manarakiza	Director of Kayanza Hospital
	16	Emmanuel Ndayiragise	Urban planner, Kayanza town
	17	Jovith Nikobamye	Technician of health and sanitation, Kayanza commune
	18	Augustine Sindai Hebura	Technical Maintenance officer for Kayanza Hospital

Country	SN	Name of person contacted	Designation/organization
	19		
	20		
Rwanda	1	James Sano	Deputy Director General EWSA
	2	Jacques Nsengiyumva	NPO - UN-Habitat Rwanda,
	3	Clement Gafishi	Coordinator – LV WATSAN II, Rwanda
	3	Bruce Uwukunda	Environmental expert LVWATSAN II
	4	Town mayors/assistants	All towns
	5	Stanley Muganwa	Deputy Director /Mayor for Nyagatare Sector
	6	Abdallah Mulenzia	Mayor, Nyanza town/District
Tanzania	1	Philbert Ishengoma	UN-Habitat Tanzania, LVWATSAN II
	2	Gogadi Mgwatu	LVWATSAN Tanzania

ACOHAM , association involved in solid waste management in Muyinga town
Tugirisuku, a CBO involved in SWM in Ngozi town

APPENDIX C: DETAILS ON BACKGROUND TO THE SOLID WASTE MANAGEMENT ASSESSMENT ASSIGNMENT

1. Background

The phase one of Lake Victoria Region Water and Sanitation Initiative (LVWATSAN) was developed as a collaborative effort between UN-HABITAT, the Governments of Kenya, Tanzania, Uganda, and the Secretariat of the East African Community, and was to give support to small towns in the Lake Victoria region towards attainment of the water and sanitation targets of the Millennium Development Goals. The initiative was designed to demonstrate that the water and sanitation targets could be met in these towns with modest investments targeted primarily to rehabilitation of existing infrastructure, with due emphasis on capacity building at local level to ensure the sustainability of these services. Towns covered in the phase one included Kisii and Homa Bay and in Kenya, Masaka and Kyotera in Uganda, Bukoba and Muleba in Tanzania and the Tanzania Uganda border town of Mutukula. Three additional towns Bunda Bondo and Bugembe were later added in this phase.

The programme activities among others included design and improvement of solid waste management (SWM) systems for the targeted secondary towns. These towns were of populations ranging between 20,000 and 200,000. This meant that the waste quantities in each town could be small at the time but was projected to increase rapidly in the coming years as a result of rapid urbanization experienced in the developing world.

Efficiency of basic service provision by any local authority depends on revenue it is able to collect from businesses and population within its jurisdiction. Because the targeted local authorities in this programme were relatively small, this equally translated into a meager economic power but which had to be shared to provide all the basic services that included solid waste management. Conventional donor support to local authorities have however failed in many places due to luck of cognizance of the afore said facts, leading into establishment of systems that are economically incongruent.

It is in this cognizance that the LVWATSAN solid waste management system developed in this phase as a tailor made approach which apart from introducing specially designed and economically viable SWM equipment, it also recognized the role of local communities through promotion of low cost waste recycling activities as part of local economic development.

The phase one of this initiative have come to its successful conclusion with outcome that include improved access to water and sanitation services in the project towns, functional and gender focused arrangements for sustainably managing and monitoring the rehabilitated systems, institutionalized capacity building programmes to regularly update the capacity of stakeholders, and a contribution to the reduction in pollutant loads entering into the Lake Victoria. These outcomes reformed the local environment and have led to an improved health status and productivity of the population within the targeted towns. It has further presented a real opportunity for the improvement of the situation on the ground by combining physical investments in infrastructure provision with targeted capacity-building, while at the same time protecting the lake environment on which the region depends for survival.

2. Current Programme status

The successful conclusion of phase one has led to development of phase two to replicate the model into fifteen more towns in the region with Rwanda and Burundi as additional

countries. This phase is currently being implemented by UN-HABITAT in partnership with the East African Community (EAC), Governments of Kenya, Tanzania, Uganda, Rwanda and Burundi through the Lake Victoria Basin Commission with financial support from the African Development Bank (AfDB). UN-HABITAT in this phase is responsible for the training and capacity building component of the programme and a total of 15 towns are the planned beneficiaries.

The LVWATSAN Programme Phase II, Training and Capacity Building Component is designed to deliver an integrated package of capacity building interventions to improve service coverage and delivery and to ensure long term sustainability of the investments. The targeted secondary urban centers like was the case in phase one, face unique problems in managing physical infrastructure due to their weak institutional framework, limited human resources capacity and inadequate financial resources to sustain the operations and maintenance. This component is being rolled out within the framework of the water sector reforms and the local government reforms which took effect a few years ago in East Africa and were intended to establish sustainable institutions within a decentralized governance framework to promote efficient services delivery at the town level. Solid waste management component is one of the major activities being addressed in this new phase. The targeted towns are:

1. **Rwanda:** Kayonza, Nyagatare and Nyanza
2. **Kenya:** Isebania, Kericho and Keroka
3. **Tanzania:** Geita, Nansio and Sengerema
4. **Uganda:** Buwama-Kayambwe-Bukakata, Mayuge and Ntungamo
5. **Burundi:** Ngozi, Kayanza and Muyinga (Francophone consultant)

3. Mission Objectives

The main objective of this mission is to conduct detailed study in the fifteen towns on SWM situation with particular emphasis on the institutional framework to identify and develop the requisite training and capacity building programme relevant to specific towns.

The assignment will be conducted concurrently in four countries beginning week of 12th August with an end date of 30th August 2012, and finally Burundi in the first week of September as reflected in the work-plan.

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FOR A BETTER URBAN FUTURE

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