

UNESCO-IHE INSTITUTE FOR WATER EDUCATION



Making sanitation matter: Analysis of the sanitation issues in Rwanda and the possibilities for introducing Ecological Sanitation in Kigali city

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Title page photo:

i)On the left :Unplanned areas of Kigali (Gitega sector)

ii)On the right: Ecosan toilet(UDD toilet) at Kayonza road (WSP, 2007)



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The findings , interpretations and conclusions expressed in this study do not neither necessarily reflect the views of the UNESCO-IHE Institute for Water Education, nor of the individual members of the Msc committee, nor of their respective employers

Dedication

To my lovely husband **Evariste** who allowed me to attend the course.
To my mum **Nathalie** whom I left with my kids.

Abstract

This MSc research concerns sanitation policy and practice in Rwanda, with specific focus on unplanned areas in Kigali. This study was driven by the concern that the current pace towards achieving the sanitation related Millennium Development Goals in Rwanda falls far behind that needed. The research strived to assess the priority given towards sanitation in Rwanda, with an inclination to the possibility of introducing ecological sanitation (Ecosan) technology as an alternative sanitation practice in unplanned areas of Kigali.

During a two month field work period semi structured interviews took place with identified key informants in the sanitation sector on issues pertaining to service provision. This involved first investigating the status and use of the existing facilities in one of the unplanned settlements in Kigali (Gitega sector) and secondly comparing their adequacy to sanitation developments in the rural areas, with special attention to the introduction and functioning of Ecosan technology.

With regard to policy and implementation using a responsibility –activity matrix, this study shows there are both gaps and overlaps in the sanitation sector. Through a review of water and sanitation policies, the study reveals that while a comprehensive policy and institutional framework has been developed, there is no strategy for implementing and prioritising sanitation. This is reflected in the lack of financial resources allocated for, and projects developed in the sanitation sector. The current status of the sanitation facilities show them to be unsanitary and as such a health hazard, compounded by the fact that a lot of households were found sharing common facilities.

With this study we hope to contribute to an acceleration of improvement of sanitation in Rwanda by identifying the current hindrances and barriers to achieving the Millennium Development Goals (MDGs) within a reasonable amount of time.

Keywords: Institutions in water and sanitation sector, slums, ecological sanitation

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List of acronyms and abbreviations

AEP: Adduction d' Eau Potable (Drinking Water Supply)
ADB: African Development Bank
ADEBA: Arab Bank for Economic Development in Africa
CICR: Communauté Internationale de la Croix Rouge
DEA: Division de l'Eau et de l'Assainissement
DFID: Department for International Development
DWS: Drinking Water Supply
DWSS: Drinking Water Supply and Sanitation
ECOSAN: Ecological Sanitation
EPCO: Environmental Engineering and Pollution Control Organization
EU: European Union
FEA: Fond de l'Eau et Assainissement (Water and Sanitation Fund)
GTZ: Gesellschaft für Technische Zusammenarbeit (Technical Cooperation Agency of Germany)
MDGs: Millennium Development Goals
MIGEPROFE: Ministry of Gender and Family Promotion
MINITERE: Ministry of Lands, Environment, Forestry, Water and Mines
MINECOFIN: Ministry of Finance and Economic Planning
MINAGRI : Ministry of Agriculture
MININFRA: Ministry of Infrastructures
MINEDUC: Ministry of Education
MINALOC: Ministry of Local Government
MOH: Ministry of Health
MVK: Mairie de Ville de Kigali (Kigali City Council)
NGOs: Non Governmental Organization
O&M: Operation and Maintenance
PNEAR National Rural Water Supply and Sanitation Programme
REMA: Rwanda Environmental Management Authority
RURA: Rwanda Utilities Regulatory Agency
RCVP: Rwanda concept Village Project
RwF: Rwandan Francs
SNV: Netherlands Development Organization
UNICEF: United Nations Children's Funds
WHO: World Health Organization
WSS: Water Supply and Sanitation
WSP-AF: Water and Sanitation Program - Africa

1 INTRODUCTION

1.1 Background

In 2000, the UN member states under the auspice of the United Nations adopted the Millennium declaration consisting of eight goals and made a commitment Millennium Development Goals (MDGs) which the UN member states have committed themselves to meet in 2015. One of the MDGs is to halve the number of people without adequate water supply and basic sanitation by the end of 2015. According to (WHO and UNICEF, 2006), 1.1 billion people(17%) do not have access to water while about 2.6 billion people(41%) do not have access to improved sanitation services.

In addition, developing countries are struggling to meet the Millennium Development Goal (MDG) target to reduce by half the proportion of people without access to basic sanitation by 2015. To focus attention on this global problem of sanitation, the United Nations declared that 2008 would be the International Year of Sanitation.

The current situation in water and sanitation services for millions of peri urban residents represents a major challenge for the 21st century (Paterson *et al.*, 2007). In slums the problem of sanitation is critical, complex and is aggravated by high population density, poor urban infrastructure, lack of space, lack of secure tenure, and high level of poverty (Morgan, 2004). Rapid urban population increase is a challenge to the local government to provide housing space, water and sanitation facilities required for human dignity and public health.

If the Millennium Development Goals are to be achieved, innovative approaches need to be developed to reduce the time span from policymaking to services delivery (WHO and UNICEF, 2006). In addition to that if we are to maximize the impact and the prospects for sustainability of Water Supply and Sanitation programmes, institutional aspects need to be addressed comprehensively as a part of a collaborative approach with projects partners (DFID, 1998).

On top of that, considering the environmental damage, the health risks, and the worsening water crisis, resulting from our present sanitary practices, a revolutionary rethink is urgently needed if we are to correct this misconception and realistically have a chance of achieving the Millennium Development Goals of providing sustainable sanitary services (Werner *et al.*, 2003).

To address sanitation problems, Ecological Sanitation (ecosan) has been developed as an alternative solution. (Morgan, 2004) defines ecosan as a system that makes use of human excreta and turns it into something useful, where the available nutrients can be recycled to agriculture to enhance food production, with minimal risk of pollution of the environment and with minimal threat to human health.

The approach of ecosan will not only contribute to MDG 7, target 10. The ecosan will go beyond one goal, by using the excreta as fertiliser it will contribute to the increase of food production then MDG1 (Target1 and 2) can be achieved. Ecosan approach can also

contribute to MDGs 4 by its advantages of reducing diseases related to faecal matter and also it contributes to the reduction of child mortality.

As ecological sanitation is still a relatively new approach, these types of sanitation systems are usually not yet included in the legal national frameworks of different some of Sub Saharan countries. However, (WHO, 2006) recognises the importance of human excreta and sets the guidelines for safe use of waste water, excreta and grey water. The objective of these guidelines is to maximize the health and environmental benefits associated with the use of wastewater, excreta and grey water in agriculture and aquaculture.

Rwanda is located in East Africa and faces enormous challenges in reaching the MDGs due to its recent past and the accelerated and uncontrolled growth of its capital city Kigali. This city is characterised by a high population of 1 million with population density of 1370 people per sqkm. There has been also rapid rural urban migration in search of better living conditions and most of them live in slums areas of Kigali.

Though over 80% of the country's population has access to latrines, only 8% of these meet national hygienic standards (MINITERE, 2006). Throughout Rwanda, the most common type of sanitation facility that is widely used is the traditional pit latrine both in Kigali city as well as in the rural areas. In both cases, the latrines are suffering from mal maintenance and therefore present hygienic hazards. An example of this is the high child mortality. The rate of child mortality under five years old is estimated at 203/1000. Poor sanitation and malnutrition are major factors contributing to this high child mortality rate. In Kigali, this situation is particularly true in the slums areas. Most of slums areas are built in hilly areas with a limited space and no proper design and maintenance of the latrines which are generally filthy.

The government of Rwanda has recognised the lack of adequate sanitation facilities in the country by putting in place an institutional framework to govern water and sanitation. Besides the Water and Sanitation Policy, there are other national documents that focus on sanitation (MINITERE, 2004b). Despite the government's commitment and the willingness to improve the living conditions of its citizens, the consequences of the war and 1994 genocide still make it difficult to overcome socio-economic problems due to widespread poverty.

This research project therefore focussed on assessing the level of priority given towards sanitation within existing institutional framework for water and sanitation in Rwanda, and also exploring the challenges and opportunities of implementing ecological sanitation in unplanned urban areas of Kigali. In the following sections the details of Rwanda as case study is provided.

1.2 General back ground on the study areas

The main focus of the research was in slums areas of Kigali. Since the population for slums areas result from the migration from rural areas to urban areas, it seems that ecological sanitation implemented in rural areas could be possible to be adopted in slums areas. Therefore there was a need to have a brief description on both areas (slums areas of Kigali and rural areas). The Figure 1-1 shows different areas that have been considered in this study and their details are described below.

Rwanda

Rwanda is located in great lakes region of east Africa. Rwanda has 5 provinces namely North Province, South, East, West and Kigali city. Rwanda has a population of nine million on the area of 28338 km² with population density of over 300 people/km² (MINITERE, 2006). Rwanda has a population growth of 3% per annum.

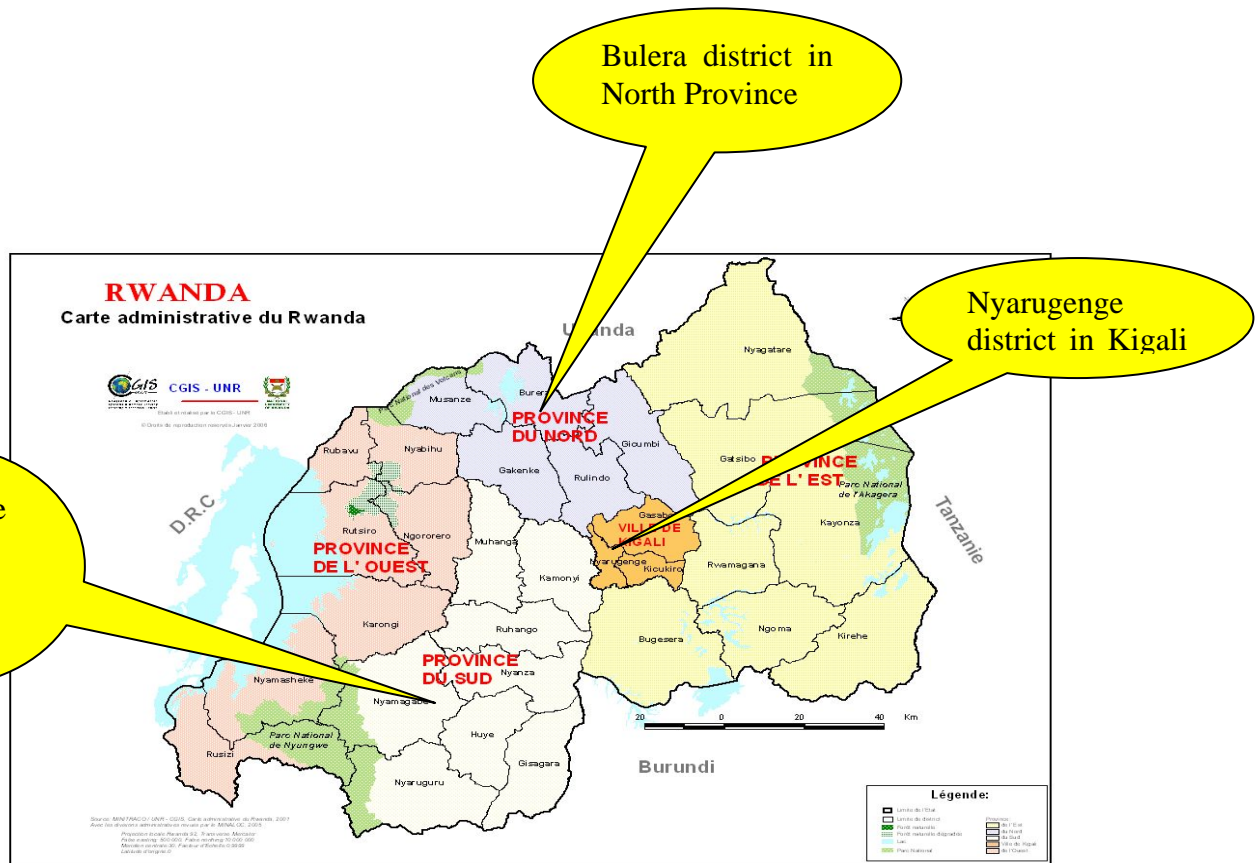


Figure 1-1: Administration map of Rwanda (<http://www.minaloc.gov.rw>)

The country possesses water in abundance (lakes, rivers and swamps). These rivers meanders between hills and ridges scattered all over the country, the reason Rwanda is famously known as the “country of a thousand hills”. The annual rainfall varies from 700 mm to 1400 mm in the East and in lowlands of the West, from 1200 mm to 1400 mm in central plateau and from 1300 mm to 2000 mm in the high altitude region with an average of 1200 mm per year¹.

Kigali

Kigali is the capital of Rwanda and mainly a commercial city. Kigali covers an area of 730 km² with a population of 1 million inhabitants (Sano, 2007). Population density in Kigali is estimated at 1670 inhabitants/km². Kigali is built on a hilly landscapes sprawling across ridges with wet valleys in between. The study selected one informal settlement in Kigali namely Gitega sector (Nyarugenge district). Nyarugenge is the centre of business since the establishment of the city by 1907. A big part of slums areas is located in Nyarugenge district due to migration of people from rural areas to urban areas looking for employment. There has been unplanned construction in this district.

¹ National water and Sanitation Policy (2004)

According to (OZ-Architecture, 2006), population density in Gitega sector range from 200-300 people/hectare(20000 to 30000/km²). The people who move here then also need the water and sanitation as basic infrastructures. Regarding sanitation facilities in Kigali City, most of the population use pit latrines that are not well maintained (details are provided in chapter 4).

Rural areas (Bulera and Nyamagabe district)

Bulera district is located in North Province of Rwanda. The city lies near Lake Bulera and the Volcanoes National Park in the north-western part of the country. It is recognised as one of the volcanic region in Rwanda. Nyamagabe district is located in South Province of Rwanda and contains much of the former Gikongoro Province. It is also contain the eastern half of Nyungwe Forest.

1.3 Problem statement

Provision of improved sanitation and water facilities in urban areas is a prerequisite to safeguard public health and well-being of the people living in cities and surrounding areas as well as for environmental protection.

In Kigali, 70% live in informal settlements where the common method used for sanitation is traditional pit latrines which are poorly designed, dirty and not well maintained (MINITERE, 2006). Consequently, these pit latrines cause a negative impact on health and also on the environment such as contaminating surface², groundwater and water related diseases. The management of sanitation facilities including faecal sludge management i.e. pit emptying in slums areas of Kigali is left to the initiative of residents. On top of that, in Rwanda out of ten major causes of morbidity the first five are water borne diseases(WBD) and 69.5% of the death are caused by WBD (Kabalisa, 2007).

The local government has the mandate for management of sanitation facilities in Kigali but this is probably hampered by lack of financial resources, lack of trained staff, knowledge of appropriate systems etc. For example, in the new estate development, the local government shows an interest in water based technologies. Therefore, Kigali city council needs a tremendous effort to improve the current situation of sanitation in the slums areas of Kigali. Choices will have to be made regarding different alternatives for improved sanitation systems according the available resources and social acceptability.

On the other hand, it is likely that ecological sanitation (UDD toilet) based on recycling and reuse of nutrients could be one of the options to provide sustainable sanitation in unplanned areas of Kigali. The low cost and the management of UDD toilet compared to the existing sanitation facilities make it affordable to the poor people as well. Since it has been successfully implemented in rural areas of Rwanda (in pilot project) it could be also be an alternative solution to slums areas of Kigali.

² From flooding in heavy rain events

1.4 Objectives

The **overall objective** of this research is to assess the level of priority given towards sanitation within the institutional framework for water and sanitation sector in Rwanda and to explore the possibilities /appropriateness of ecological sanitation in the slums areas of Kigali.

Specific objectives:

- 1) To identify the various stakeholders involved in planning and implementation of sanitation, their roles and responsibilities in Rwanda.
- 2) To assess the level of priority given towards sanitation given by various institutions/stakeholders in Kigali (by looking at the issues of demand, policy and financial).
- 3) To identify opportunities and barriers faced in planning and implementing improved sanitation including Ecological Sanitation in slums areas of Kigali.

1.5 Research questions

Main research questions: To what extent does the existing institutional framework for water and sanitation consider or give priority towards sanitation? And what are the opportunities and barriers of ecological sanitation as a viable sustainable sanitation option in Rwanda?

Sub-questions:

1. Who are key actors/stakeholders in provision of sanitation in Rwanda and Kigali in particular and what are their roles and responsibilities?
2. What is the policy framework that is currently governing water and sanitation in Rwanda?
3. What is the financial mechanism (annual budget) allocated to sanitation within the water and sanitation sector in Rwanda?
4. What is the level of sanitation demand in Kigali, particularly in unplanned areas of Kigali?
5. What is the current level of service provision of sanitation in Kigali, particularly in unplanned areas?
6. What are opportunities and challenges in planning and implementation of improved sanitation facilities including Ecological Sanitation slums areas of Kigali?

1.6 Scope and limitations of the study

The work focused on the excreta management in the unplanned urban areas of Kigali city. Other aspects of sanitation (grey water management, solid waste management and drainage) are not in the scope of this thesis.

2 LITERATURE REVIEW

2.1 Introduction

This research is concerning with water and sanitation in Rwanda, and in the slum areas of Kigali in particularly. Therefore three issues are central: Institutions, slums and sanitation options. Relevant literature on slums areas specifically in Kigali is provided. Additionally, a review on the institution arrangement in water and sanitation sector is also given. Finally, the concept of ecosan, its importance and different experiences in East African countries is also reviewed.

2.2 Slums in developing world

2.2.1 Urbanisation and slum formation

It is estimated that currently almost one billion people are living in urban slums around the world (Martinez *et al.*, 2008). Most of the slums are found in the cities of the developing countries. If nothing is done on the current rapid growth of urban areas of developing countries, the number of slums dwellers is predicted to double by 2030 (UN_HABITAT, 2006). Slum dwellers now live primarily in the cities of Africa, Asia and Latin America, although a smaller number also live in cities of the developed world (UN_HABITAT, 2006).

Additionally, this global concern about poor living conditions in slums has been addressed by the United Nations. The UN set the target 11 of MDG7 which aims to achieve “a significant improvement in the lives of at least 100 million slum residents by 2020”. However this represent 5 percent of the predicted “worse case” total global slum population in 2020. Similarly, this target will not be realised if the urban poor living in those slum areas do not have better access to basic infrastructures (sanitation, water supply, roads etc).

In Kigali, the capital city of Rwanda, 70% of the population lives in informal settlements that have developed into slums. The slums are mostly found in steep hilly areas. These areas are characterised by limited space and generally limited access to basic infrastructures and services.

2.2.2 Definition of slums

There is no internationally accepted definition of slum. It varies between countries depending upon the socio-economic conditions of a particular society but life in slums has common characteristics (Majale, 2007). The (UN_HABITAT, 2003) UN Expert Group Meeting defines a slum as “an area that combines, to various extents, the following characteristics:

- Inadequate access to safe water,
- Inadequate access to sanitation and other infrastructures
- Poor structural quality of house

- Overcrowding
- Insecure residential status

2.2.3 Attitudes towards slums in Kigali

The world is urbanizing at rapid pace. Slums are caused by rural-urban migration as well as natural growth (UN_HABITAT, 2003). The majority of migrants are driven to the city by poverty and start their urban life in the worst areas. In these areas, overcrowding and lack of drainage and sanitary systems create conditions hazardous to health in slums areas (Gulis *et al.*, 2004). Providing basic infrastructures to slums is becoming serious problems to some governments of developing countries. The slums are mostly located at difficult location such as river banks or low lying areas subjected to flooding and also in hilly areas susceptible to landslide and erosion (UN_HABITAT, 2003).

In Kigali particularly, slums areas are located to the hillsides with poor housing. These areas have developed haphazardly without any plan. Slums of Kigali lack basic services and basic infrastructures such as roads, adequate latrines, solid waste collection and storm drainage. Figure 2-1 shows typical houses in unplanned areas of Kigali while the Figure 2-2 shows the narrow streets in unplanned areas of Kigali.

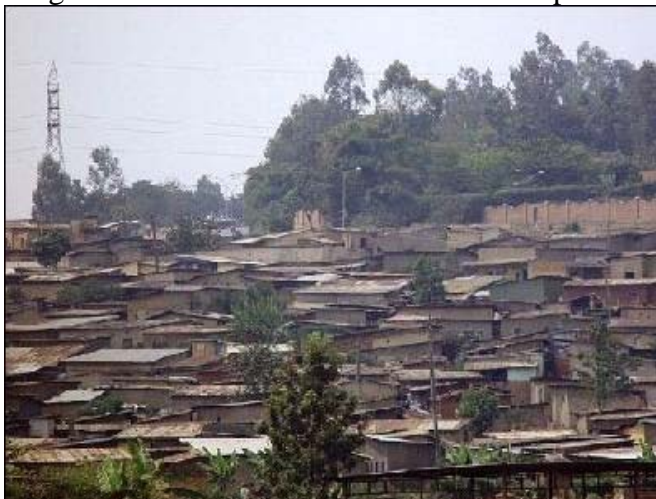


Figure 2-1: Unplanned areas of Kigali (Gitega sector)



Figure 2-2: Narrow street in unplanned areas of Kigali (Kalimba, 2007)

Kigali city council has taken the measures to stop the rural urban migration. The municipality introduced an approach of stopping rural migration by imposing a work permit and residence for every city dwellers (MININFRA, 2006). The government also tried to implement the development project in rural areas to avoid the rural population to come to the cities but this approach is also failed because it was not offering opportunity to stay in rural.

Due to rapid increase of slums areas in developing countries, governments react differently to slums formation. Different approaches have been developed and adopted to stop slum formation such as eviction, upgrading, clearance etc. The set of policies that have been employed to improve the welfare of slum dwellers are diverse (Takeuchi *et al.*, 2007). Many land policy interventions aims to realize the value of land for the landowners, and leading to the eviction of slums dwellers, with or without compensations (Takeuchi *et al.*, 2007).

Kigali city council adopted the approach of clearance and resettlement. Currently in Kigali city, the slums residents are moved from their properties and receive certain amount of compensation and sometimes given land to build new houses³. Currently there is pilot project where 250 household from Muhima slum is moved to Batsinda settlement. According to (Kalimba, 2007), the inhabitants from Muhima slum were moved after the negotiation with the municipality. However, the community complained that they got the compensation of the houses but not for the land. Additionally, the community are not happy with this program of resettlement since the new settlement is located far away for their job and daily activities that generate the incomes (15km from the Kigali city).

However, another alternative is the upgrading the slums. This programme of upgrading aims at improving availability and access to local public services (Lall *et al.*, 2008). In principle the upgrading does not only increase the welfare of the slums dwellers who received these interventions, but also may also increase the welfare of the non slums dwellers in the neighbourhood.

2.2.4 Institutions in slum upgrading program

To have success in upgrading program the partnership involving the state(public), voluntary(NGOs and CBOs) and the private sector could offer a promising solution to the challenge of meeting the poor people (Otiso, 2003). The National state plays an important role in urban service provision including the poor. The other important part is the Community Based Organisations. CBOs are usually unregistered, informal and grassroots organizations (Otiso, 2003). The CBOs are very important during the implementation of the project if they are well organized. The CBOs can work with NGOs and communicate the needs of the community to the government.

CBOs could be involved in the provision of the service to the community without fear of the specter of dependence, since they are able to use social pressure by mobilizing the community to contribute on the service (Otiso, 2003). However due to limited capacity (organizational, financial) the CBOs has been found not a solution at all. The lack of trust between CBOs and community continues to increase in South Africa (Allison, 2002). In Kigali, CBOs are involved in collection of solid waste than in human waste excreta management. The CBOs in Kigali are formed by women and supported by the local government. In Kigali, the CBOs are still need to be supported by a public institution to attain sustainable collection and recycling of waste. CBOs could include also in their mandate the management of human waste excreta.

2.3 Institutions in Water and Sanitation sector

2.3.1 Definition of institutions

Institutions are defined differently by different authors. (DFID, 1998) gives two different definitions of institutions. The institutions are defined as the arrangements which exist in society. The second interpretation is more specific and refers to an individual organization. Then an organisation is defined as an individual body with

³ Discussion interview with the staff of Kigali City Council

explicit structure and hierarchy of authority and the formal allocation of tasks and responsibilities.

On the other hand, (Leach and Scoones, 1999) argue that institutions are distinguished from organizations. Institutions are thought of as "set of rules in use" and those rules are maintained by people's practices while organisations may be thought as groups of individuals bound together by some common purpose to achieve objectives.

Those organisations exist because there is a set of working rules that define and give the meaning of those organizations. It is important to note that the second definition is the one adopted in this study.

There exist two different forms of institutions: formal institutions and informal institutions.

- ✓ Formal institutions are referred to rule of state law which requires exogenous enforcement by organization such as legal framework etc. Formal institutions are designed to minimise uncertainty⁴ in terms of standardising interpretations of the law) and to concentrate judicial powers in authorised structures (Mehta *et al.*, 1999).
- ✓ Informal institutions are mutual agreement among the social actors involved, or by relations of power and authority between them such as churches. The informal institutions could be legitimised by customary law and by social or religious norms and behaviour patterns.

2.3.2 Why are institutions important?

According to (Cleaver, 2006), institutions are channels through which people are represented, and through which their needs are articulated. But one could ask if the needs of people are really considered particularly the poor people in society through institutions.

(Allison, 2002) gives an example of South Africa where Cape Metropolitan Council(CMC) was operating on restrictive urban by law that demand waterborne sewerage rather than informing people about the range of sanitation choices and let them decide what is most appropriate for their needs, taking their limited resources into consideration.

Besides the limitation of involvement of people in the decision making bodies, the institutions have to be legalised. As explained above, formal institutions should minimise the uncertainty that means power relationship has to be known within institutions. However this is not the case on the ground where a multiplicity of institutions exist (Mehta *et al.*, 1999). Therefore the creation of unifying legal and regulatory system is seen as a central task, whereby the uncertainties of multiple overlapping formal and informal legal systems are eliminated and order is imposed.

In 2006, the East African Regional Conference on Water Supply and Sanitation for the urban poor has taken place in Nairobi Kenya .The conference has emphasized on the roles of institutions in provision of water supply and sanitation sector for urban poor of the region. The managers of key WSS institutions across east, central and southern Africa called for political commitment from governments, and urged good corporate governance and institutional leadership to accelerate access to services for the urban

⁴ Uncertainty describes a situation where we don't know what we don't know(Mehta et al, 2001)

poor. They also identified the need to strengthen the capacities of regulators to implement pro-poor regulation measures, and the challenge of enabling local small scale water and sanitation service providers to operate in low-income settlements (WSP-AF and GTZ, 2006).

2.4 Sanitation and ecological sanitation

2.4.1 Definition of sanitation

Basic sanitation is defined as the lowest cost option for securing sustainable access to safe, hygienic and convenient facilities and services for excreta and dignity while ensuring a clean and healthful living environment both at home and in neighborhood of users (WHO and UNICEF, 2006).

(DWAF, 2002) defines sanitation as collecting and disposing -in a hygienic manner - of waste, including human excreta, household waste water and rubbish and that good sanitation includes appropriate health and hygiene awareness and behavior, and acceptable, affordable and sustainable sanitation services. Furthermore, ((WHO and UNICEF, 2006) gives a definition of unimproved sanitation and improved sanitation as shown in Table 2-1 below:

Table 2-1: Improved and unimproved sanitation facilities (source: WHO and UNICEF, 2006)

Improved sanitation facilities	Unimproved sanitation facilities
Flush or pour flush to piped sewer system, septic tank, pit latrine	Flush or pour flush to street, yard, plot, and open sewer, ditch and drainage way
Ventilated improved pit latrines	Pit latrines without slab or open pit
Pit latrine with slab	Bucket
Composting toilet (UDD toilet as well)	Hanging toilet/latrines
	No facilities or bush or field

The excreta disposal system is considered adequate if it is private or shared by members of the same family (but not communal or used by the general public) and if it hygienically separates human excreta from human contact. A detail discussion of the improved and improved latrines in Kigali is provided in section 4 of this report.

2.4.2 Sustainable sanitation

Rapid urban increase development offers the opportunity to develop more imaginative and more responsive sanitation arrangements that combine and make use of current options in a sensible way (Mara *et al.*, 2007).

(Mara *et al.*, 2007) identifies four fundamental principles for sustainable sanitation, as follows:

- **Human health:** Sanitation arrangements should improve human health and must not create any conditions harmful to it.
- **Affordability:** Sanitation arrangements must be affordable for the households using them. In developing countries in particular consideration must be given to the affordability of sanitation arrangements for poor and very poor households.

- **Environmental sustainability:** Sanitation arrangements should not result in any adverse environmental impact. The wastewater should be well treated and be reused for other agriculture purposes.
- **Institutional appropriateness:** Sanitation arrangements should be managed at the lowest appropriate level. The household is a major actor in sustaining human health and the environment. The community should participate from the planning stage to the implementation where appropriate, there should be participate in operation and maintenance of these arrangements or improvements. This is especially important when they are charged for using these services.

2.4.3 Overview of ecological sanitation and focus of this research

A sanitation system that provides ecological sanitation is a cycle- sustainable, closed loop system, which closes the gap between sanitation and agriculture (Figure 2-3). (Langergraber and Muellegger, 2005) argue that conventional sanitation concepts such as flush toilets based on water are neither ecological nor economical solutions in both industrialized and developing countries. Those systems were designed in such way that human excreta are a waste; suitable only for disposal and that the environment is capable to assimilate this waste. However, Ecological sanitation takes the opposite view and shows that human excreta are not just waste but it can be a resource.

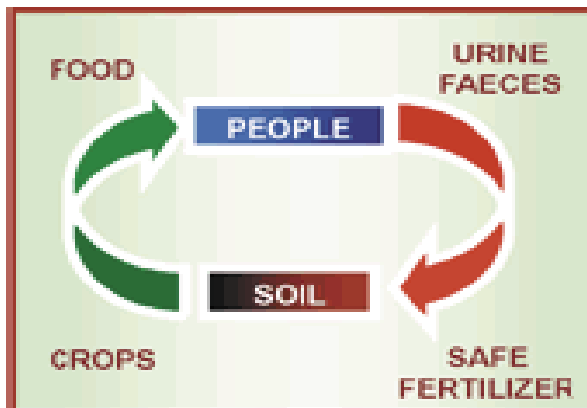


Figure 2-3: Closing the loop on sanitation (www.ecosanres.org)

The Ecosan paradigm in sanitation is based on ecosystem approaches and the closure of material flow cycles. Human excreta and water from household has been recognised as a resource (not as a waste) which should be available for reuse (Werner *et al.*, 2003). The basic principle of ecosan is to close the nutrient loop between sanitation and agriculture, with the objectives of:

- Providing affordable, safe and appropriate sanitary systems
- Reducing the health risks related to sanitation, contaminated water and waste
- Improving the quality of surface and groundwater
- Improving soil fertility
- Optimizing the management of nutrients and water resources

In the past, this system has been developed more frequently in rural areas than in urban areas so that the experience in urban areas is still quite limited (UNESCO and GTZ, 2006).

2.4.4 Challenges of ecological sanitation implementation

The concept of ecological sanitation surely has many advantages. However, it also has some challenges due to the fact that it is a radically different approach from the conventional systems (Drewko, 2007). Just as any kind of sanitation facilities when it is misused, it results to the failure of its purpose. The main problem occurs when urine is mixing with faeces, this result in odour and contaminates the urine with pathogens making it unsuitable for direct application in agriculture. Another problem of UDD toilet is that the men is required to sit to urinate, therefore some of men would resist to this requirement, hence the failure of the UDD toilet. This could be addressed by installation of dry urinal.

A shift away from the conventional pit latrine or flush toilet to ecosan is connected with change in behaviour, which is what people generally find hard to undergo. The physical appearance of faeces and urine in latrines is repulsive to people. However, the material is less objectionable once it has disappeared in water and relocated to a treatment site (Nawab *et al.*, 2006). He argues that the promotion of ecological sanitation needs to understand both people's attitudes and behaviour and develop feasible strategies for sensitizing and motivating people on the needs for developing appropriate environmental practices. This is because people look at things through their cultural lenses.

(Winblad and Simpson-Hébert, 2004) define this obstacle as fear of human excrement which we might refer to as 'faecophobia'. Faecophobia is a personal or cultural response to the fact that human faeces are malodorous and potentially dangerous. To tackle this challenge, more open discussions around sanitation need to be undertaken in the villages such that people can relate their cultural and religious knowledge and perceptions with scientific knowledge on sanitation, health hygiene and recycling (Nawab *et al.*, 2006).

Additionally, current legislations are mainly focused on the conventional sanitary systems, which is another limitation to implement ecosan systems in many countries. Ecological sanitation, where sanitized human excreta are reused in agriculture, is a concept that seems often to fall outside of the existing regulatory framework (Johansson and Elisabeth Kvarnström, 2005). Moreover, Ecological Sanitation is so new that few cities and towns today have any regulations that refer to eco-san systems (Winblad and Simpson-Hébert, 2004). With ecological sanitation included in the cities regulations, there would need further studies on different aspects of eco-san for the urban setting, such as the best ways to collect, store and utilize urine and how to transport it to farmers.

The United Nations Millennium Development Goals urgently need an alternative approach to more and more criticized conventional systems in order to achieve the goal 10 for sanitation; ecological sanitation is proved as a sustainable technology to meet that goal as shown on the following chapter. However, facing the above-mentioned challenges, there is still a way to go for the success of ecosan.

2.4.5 Link of ecological sanitation with MDGs

Ecological sanitation provides alternative solutions with or without water, while providing containment, treatment and recycling of excreta. It can involve soil based composting toilets in shallow reinforced pits, dry urine-diverting toilets with storage

vaults, urine-diverting mini flush toilets and even high-tech vacuum systems (Rockström *et al.*, 2005).

The essential advantage of ecological sanitation is that: its flexibility allowing an optimal adaptation to the local social, economic, ecological and climate conditions. Diverse technologies have been developed from quite simple low technology to sophisticated high technologies (UNESCO and GTZ, 2006), hence a wide range of option is available for both rich and poor also urban and rural populations.

In this research we focus on human excreta and in particular the use of UDD toilet. After separation with urine, the sanitised human excreta can be used as fertilizer. If necessary they can be treated together with solid waste /animal manure in way suited to local condition and they can be used in hygienically safe form as dry fertiliser, compost or a fluid fertiliser. Urine can be used as effectively fertiliser. In such case Urine diversion toilet (UDD) is recommended or waterless urinal.

The approach of ecosan will not only contribute to MDG 7, target 10. As an improved sanitation it will contribute also to the MDGD7, target 11. The ecosan will go beyond one goal, by using the excreta as fertiliser it will contribute to the increase of food production then MDG1 (Target1 and 2) can be achieved. Ecosan approach can also contribute to MDGs 4 by its advantages of reducing diseases related to faecal matter and also it contributes to the reduction of child mortality.

2.4.6 Experiences from the East African countries

Introduction of ecosan in the region has been focused on the poor communities in the rural areas and in slums areas. Many NGOs has been active in this respect although some governments has been involved (WSP, 2005).

2.4.6.1 Uganda

Uganda has promoted National strategy for ecological sanitation. The main target are based on the long term overall objective of improving living conditions of the population in Uganda by ensuring better sanitation practices, personal hygiene and food security through better management of human excrements. In Uganda ecosan has been implemented in different districts namely Kisoro, Kanungu, Rakai and Mbarara (Niwigaba *et al.*, 2006).

Kisoro town was chosen as a case study community for an ecosan pilot project due to local concerning hydro geological situation, the poor sanitation coverage and absence of an operating sewerage system (Langergraber and Muellegger, 2005). More than 250 dry toilets have been built in Kisoro district (1999-2000) for private household. It is noticed that private toilet has been more accepted than public ones. Public toilet has been always found misused.

Kalungu Girls Secondary School (Masaka district): A typical problem of this region is that although water is plentiful, water quality is poor. The project was implemented in 2003 with 45 dry urine diversion toilets being built for the pupils (mainly outdoor but additionally 2 indoor dry toilets for each dormitory). Urine and faeces treated is used in the schools for agricultural activities. The pupils and the teachers are proud of their well

working toilets which are kept clean and well maintained. Since this was such a successful project, visits or families are picking the idea and requests are increasing (WSP, 2005). It has been successful in this school because the community (pupils and teachers got a full understanding of using ecosan.

On the other hand ecosan was a failure said by the community in one village called Ddimo. In this village ecosan was implemented and after two months the first block latrines were in a terrible state (Kaggwa *et al.*, 2003). This was due to poor understanding of the ecosan technology by the local community, poor participation of the local community in the implementation (i.e. construction was left to the committee alone) resulting in lack of a feel of ownership by the locals, poor operation and maintenance (O&M) practiced, affordability of the user (the small fee levied was found to be quite high), after handed over the system there was a lack of on going technical assistance and cultural – religious aspects.

2.4.6.2 Tanzania

Unplanned settlements have kept increasing in many Tanzanian towns, and the problems of diarrhea and other faecal – related diseases remain highly endemic despite enormous efforts over the past few decades to control them. Conventional forms of centralized and individual sanitation systems are not sustainable solution to sanitation problems in the country (WSP, 2005).

To address these problems, the piloting Ecological Sanitation Project in Tanzania have been implemented by Environmental Engineering and Pollution Control Organization (EEPCO) in unplanned settlements at the peri-urban part of Dar Es Salaam (Majumbasita). The community welcomed the ecosan as a solution to latrines construction in their premises because of permanency, simplicity, durable, affordable, environmentally friendly and hygienically safe relative to traditional normal pit latrine. Reuse of nutrients for agriculture purpose was also a positive element of the facilities. In those settlements, 95 units (double vault, urine diversion) were constructed in household level and 6 stances in school (WSP, 2005).

2.4.6.3 Lesson learned from East African countries

From few examples of the East African countries (Uganda and Tanzania) as well as Rwanda, it has been seen that those countries experienced the same problem of low coverage of sanitation, shallow ground water in some places; unplanned area with poor sanitation facilities usually the unlined pit latrines as a common facility in those areas. Water borne diseases caused by poor sanitation are also a common problem in East African countries.

It can be concluded that conventional forms of centralised individual sanitation systems are not sustainable solution to sanitation problems in the region however if there is good understanding of ecosan toilet by the planners, designers as well as the community, dry toilet can work and can be considered as a viable solution (WSP, 2005). Local condition, social/cultural issues, environment condition, involvement of the community in implementation and operation is highly recommended.

3 METHODOLOGY

This chapter discussed the strategy used, a detail description of how this research study was designed and conducted is also provided.

3.1 Overview and selection of case study

A research methodology refers to the choice and use of particular tools and strategies for data gathering and analysis. This particular research was done by the use of a descriptive case study. (Yin, 2003) defines its advantages of this methodology as one of the strategy which allows the user to retain the holistic and meaningful characteristic of real life events such as individual life cycle, organizational, managerial process, etc. (Yin, 2003) emphasizes that the distinctive need for case studies arises out of the desire to understand the complex social phenomena.

- **Why choose slums areas of Kigali?**

The case study was used to get all necessary information about Kigali particularly unplanned urban areas of Kigali (Nyarugenge district) and to find out the reasons behind the low coverage of sanitation in Kigali particularly slums areas urban areas. Kigali was chosen as a case study because it is the capital city of Rwanda where 70% are formed by unplanned areas. Additionally, the sanitation facilities in unplanned areas are poorly maintained and dirty which resulting into health problems and environment problems. It is important to note that the author was also going outside of Kigali city in two rural areas where ecosan project has been implemented in order to learn the applicability of ecosan in slums areas as an alternative solution.

3.2 Research plan

The research plan is shown on Figure 3-1 on the next page:

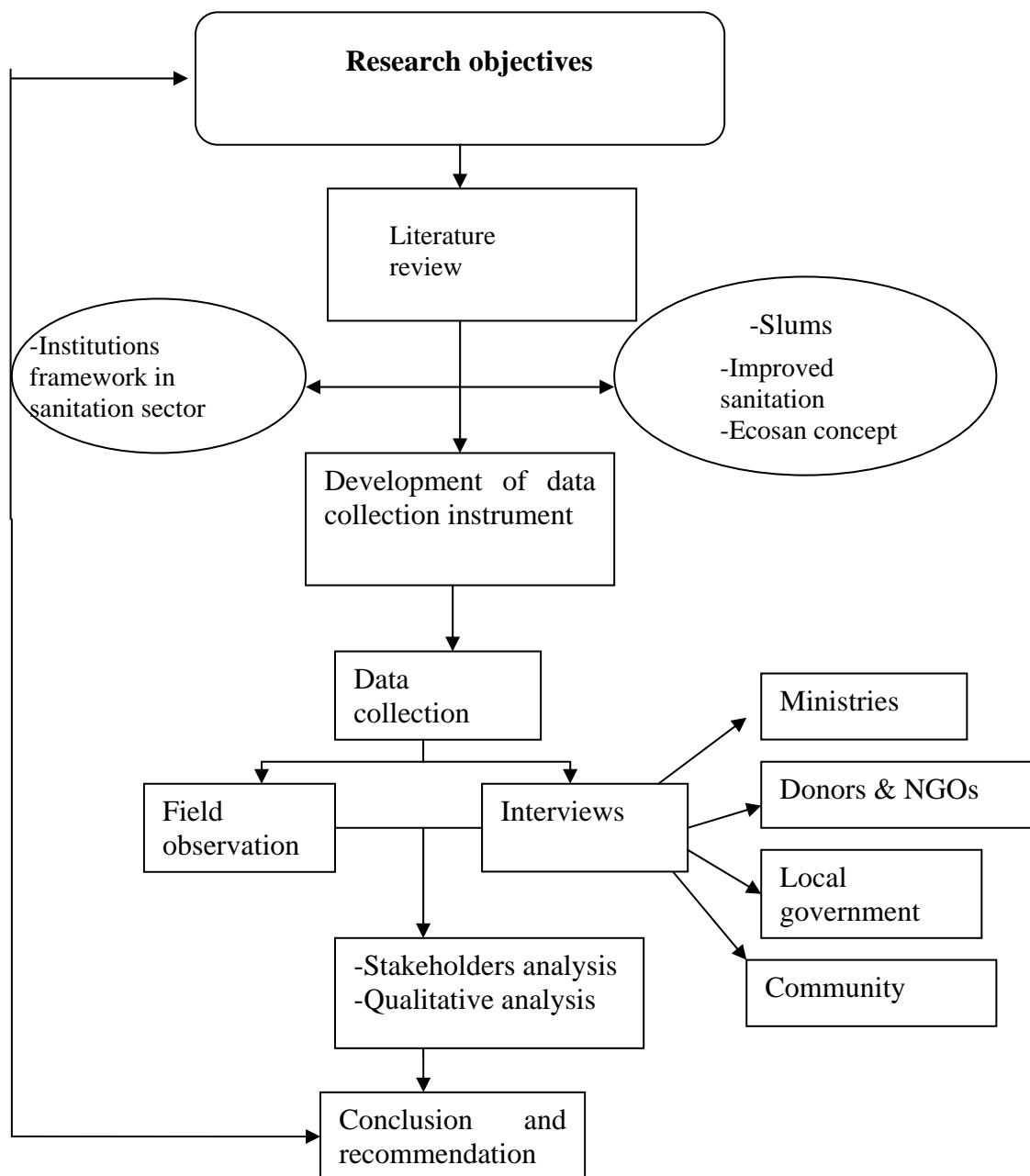


Figure 3-1: Research plan

3.3 Data required

The stage of developing the research question and a review of literature led to the step of determining what kind of data would be required, identifying sources where the data would be obtained from, and proposing what strategy would be used to obtain the data. The data required are summarized in data matrix shown on Table 3-1. The data matrix proved to be useful while conducting field study because it helped to stay focused.

Table 3-1: Data matrix for data collection during fieldwork

S/No	Research Question	Data needed to answer	Where to obtain this data	How to obtain this
1	Who are key actors/stakeholders in provision of sanitation in urban areas of Rwanda and Kigali in particular and what are their roles and responsibilities?	Stakeholders involved in sanitation in Rwanda and their interests	Stakeholders identified: ministries, regulators, local government, NGOs and donors	Review of document and Semi structure interview
2	What is the policy framework that is currently governing water and sanitation in Rwanda?	- Existing policies that focus on sanitation - Weakness & strengths regarding sanitation in these policies	Policies documents or reports about the policies	Review of relevant document(national reports)
3	What is the financial mechanism (annual budget) allocated to sanitation within the water and sanitation sector in Rwanda?	Priority given towards sanitation in terms of financial resources allocation	- Periodic and annual financial reports - Stakeholders identified: ministries, regulators, local government, NGOs and donors	- Review of national reports and journals /books
4	What is the level of sanitation demand within Kigali, particularly in slums areas of Kigali?	- Sanitation facilities on the ground	Through community and others stakeholders identified	- Observation - Semi structure interview
5	What is the current level of service provision of sanitation facilities in Kigali, particularly in slums areas?	- Existing coverage - Current service provider - Quality of service (how the septic or pit latrines are emptied?)	Community, Kigali city council and Local government	- Semi structure interviews - National reports
6	What are opportunities and challenges in planning and implementation of improved sanitation facilities including ecosan in slums areas of Kigali?	Opportunities and barriers for introducing ecosan in slums areas of Kigali	Stakeholders identified Relevant document	- Semi structure interviews - Review of national reports and literature

3.4 Methods used

This study has been carried out in three phases. The first phase was literature review and the preparation of semi structure interview. The second phase involved data collection and fieldwork in Rwanda. Semi structures interviews and informal interview also has been done during the fieldwork were used to get much information. Finally in the last phase the data collected has been analyzed and writing down the thesis.

3.4.1 Literature review

A review of relevant literature was carried out. This included the journals, books and national reports about institutions, slums development, sanitation and ecological sanitation issues in slums areas. The review provided the author with the theory and a deeper understanding of the research problem and enabled the author to answer the research questions and make some conclusion based on other related experiences or relevant literature.

3.4.2 Interviews

According to (Yin, 2003), the interview is the most important source of case study information. Semi structure interviews were conducted with fourteen institutions involved in sanitation in Kigali and in two institutions in South Province (Appendix 2).

The semi structures were preferred rather than questionnaire because of the need to get much information and find out how sanitation is getting priority within the formal institution framework in Rwanda. (Saunders *et al.*, 2000) argues that this method is used in qualitative research in order to conduct an exploratory not only to reveal but also to understand the what, the how but also give a chance on exploring the why. By this method the data needed from the stakeholders was gathered and also the one that are not expected.

The author had the opportunity to do some informal interviews with different staffs in different institutions. In Gitega sector, a number of 15 households levels were interviewed with the use of semi structured interview. Appendix 3 provides detail information on the stakeholders identified during fieldwork (key informants).

- **Data management from interviews**

Each day during field work, the data obtained were edited in daily note book, matched with the questions and the organisation of the data was done based on the responses. In addition to that the formatting of the document, storing, and compiling the data was also done.

3.4.3 Field observation

Another technique used during data collection period was field observation. This was used to get information on technical hardware of sanitation facilities and to test the demand of sanitation within the community. Field trips were made to 15 families in Kigali specifically Nyarugenge district (Gitega sector).

In order to test the opportunity and barriers of sanitation in Rwanda, several trips were made to different ecosan toilet already implemented in Rwanda (details see section 4.4). I visited the following places:

- Ecosan toilet (UDD toilets) implemented at South Province (ex Gikongoro)
- Ecosan toilet (UDD toilets) at North Province of Rwanda (ex Ruhengeri)

A visit to ecosan toilet at Gikongoro found that those toilets have been implemented only in schools and hospitals, the details are provided in chapter 4 of this report. The author had opportunity to visit also ecosan toilet constructed in Ruhengeri (North Province) where UNICEF and local administration help the community to construct themselves those ecosan toilet at their home (refer to chapter 4).

Another visit is made to Batsinda new settlement; this place will be occupied by the poorest people who were displaced from unplanned area of Nyarugenge district. Biogas toilets constructed in new settlement were visited in order to compare with the ones used in the former places.

3.5 Data processing and analysis

There is no standardised approach to the analysis of qualitative data. According to (Saunders *et al.*, 2000) many authors have been critical on qualitative data where they argue that the only form of displaying the information for qualitative researchers has been always narrative text. But (Miles and Huberman, 1984) argues that the qualitative analysis is robust but more creative, inductive rather than deductive. There are general formats for displaying qualitative data in order to make it enjoyable; those formats can be summarized (tables, matrix, chart, checklist), networks and figures (Miles and Huberman, 1984).

This study used the following methods to analyse the data:

- For analysis of stakeholders (their roles and responsibilities) in water and sanitation, an activity- responsibility matrix is used in order to identify the gaps.
- Based on the bad and good experiences of ecosan toilet implemented in rural areas of Rwanda and in other countries and also based on the literature, an analysis was done with the findings from various stakeholders and then the conclusion was drawn.
- The compiled data was analysed to see if there was any missing data. This was done iteratively with the field work which has been carried out to fill in any missing data. Every day after field work, all the data was edited in note book.
- Triangulation: The data obtained from interview were analysed by coming back to the research question and literature review. The data obtained was verified using a cross checking with documentation from journals or reports or a relevant example. The triangulation was helping the author to stay within the boundaries of this research study.

4 SANITATION SITUATION IN RWANDA

4.1 Introduction

This chapter discusses the current situation for sanitation in Rwanda. In this research the term sanitation is used to refer to excreta management; the other components of sanitation, namely greywater management, solid waste management and drainage are not discussed. Firstly this chapter gives an overview of the progress of sanitation coverage in Rwanda towards the achievement of Millennium Development Goal, Goal 7 target 10. The chapter further provides a description about ecosan pilot project that are currently implemented in rural areas of Rwanda. Finally the chapter provides details of types of human excreta disposal in Kigali specifically in slums areas. The data presented in this chapter is a combination of literature and data from fieldwork.

4.2 Sanitation coverage and MDG target for sanitation

4.2.1 Clarification of definition of MDG7 target 10

The Millennium Development Goal 7 provides easily understood targets that we can all work towards achieving however that for water and sanitation they can be misunderstood and misused (Bostoen and Evans, 2008). MDG7 target 10 declares the need of halve population without basic sanitation, does not specify what technology satisfies basic sanitation (Mayumbelo, 2006). The uncertainty in the definition of what is “improved” sanitation can be seen from the fact that target 10 refers to “basic Sanitation”, while “improved sanitation” is the term used in indicator 31 of the same target. Thus the proportion of the population with “**access to basic sanitation**” is an indicator expressed as the percentage of people using “improved sanitation facilities”.

Table 4-1: Goal 7 targets and indicators (UNStats, 2005)

Goal 7: Ensure environmental sustainability	
Targets	Indicator:
<i>Target 10:</i> <i>Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation</i>	30. Proportion of population with sustainable access to an improved water source, urban and rural 31. <i>Proportion of population with access to improved sanitation, urban and rural</i>
<i>Target 11:</i> <i>By 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers</i>	32. Proportion of households with access to secure tenure

4.2.2 Problem with measuring access to improved sanitation

There is no suitable indicator to measure what is adequate and improved sanitation and also there is lack of consistent definition and measurement on the adequate sanitation (Cotton and Bartram, 2008). For instance, “improved sanitation” is defined to include a house connection to a sewer or septic tank, a pour- flush latrine, a simple pit latrine and a ventilated improved pit latrine. The excreta disposal system is considered adequate if it is private and if it hygienically separates human excreta from human contact (Cotton and Bartram, 2008).

Furthermore other limitations for assessing improved sanitation have been identified:

- data from administration source: they generally refer to existing sanitation facilities, whether used correctly or not (UN_HABITAT, 2003)
- Improved sanitation could still be unsustainable and cause pollution, e.g.:
 - septic tanks and pit latrines without proper faecal sludge management
 - sewer system without wastewater treatment plant or with poorly performing WWTP⁵
- Public toilets are not counted but could be an adequate solution for slum areas
- Greywater management is generally not included in the analysis

4.2.3 Sanitation Coverage in Rwanda

Most residents of Rwanda have unimproved sanitation facilities (around 80% of Rwandese people). At the moment the improved sanitation coverage is low standing only at 8% (both rural and urban areas) (MINITERE, 2004b). However this figure may not be true reflection of sanitation as they have been no survey to gather exact data on sanitation coverage in Rwanda⁶. Data on sanitation in Rwanda is not collected in a consistent manner and this is shown by the fact that different national documents show different data on sanitation. Lack of data on sanitation is one of the constraints in sanitation sector which could be quite easy to overcome.

According to (UNDP, 2006), Rwanda still has a long way to go before achieving MDG 7, targets 10 and the following issues that need to be addressed:

- Strong political will: A need to focus on sanitation and hygiene strategies development and guidelines at district level and national level
- Strong sector collaboration and resource mobilization,

Figure 4-1 shows the current and future sanitation coverage in Rwanda.

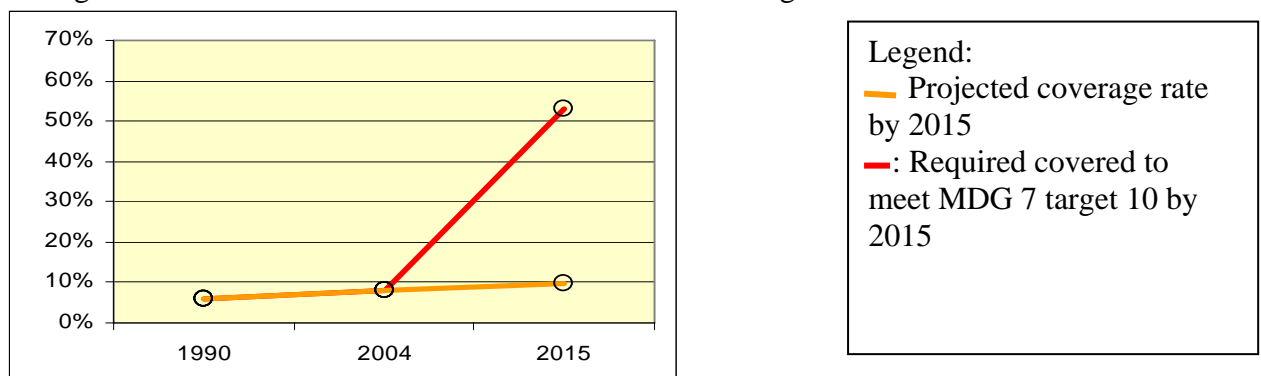


Figure 4-1: Improved sanitation coverage (predicted and required) versus time in Rwanda (Adopted from MINITERE (2006))

⁵ WWTP: Waste Water Treatment Plant

⁶ Interview with employee of MOH in charge of hygiene and sanitation (refer appendix 2)

In 1990, Figure 4-1 shows about 6% of all Rwandese had access to improved sanitation facilities. In 2004, this value was 9%. This shows an increase of 3% in 14 years, which is very low coverage rate to reach MDGs and national target. In order for Rwanda to achieve the MDG7, target 10 the country supposes to have coverage of 53%⁷ with improved sanitation.

According to EDPRS paper (2006), in 2001 Rwanda had set the national target for improved sanitation coverage of 65% by 2015. However, if the rate of progress from 1990 to 2004 was extrapolated, then in 2015 only 10% would have access to improved sanitation (not taking into account population growth!). However this is misleading idea since there was 1994 genocide, and there is a new government since then. The current trend shows that tremendous efforts are needed in the sanitation sector for Rwanda to achieve goal 7 of target 10 of the MDGs or the expectation of vision 2020. In general, there is a high expectation of achieving the MDGs in Rwanda, however realistically the current data on coverage is questionable.

4.3 Sanitation facilities in Kigali

The previous section 4.2 has given figures on the sanitation coverage of the whole country. The situation for Kigali, with respect to excreta disposal, is shown on Figure 4-2 and is based on data collected by a group of consultancy OZ architecture in 2006.

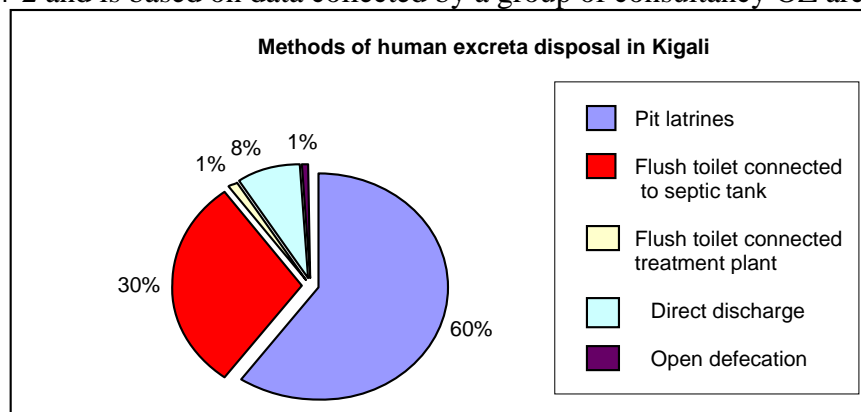


Figure 4-2: Methods of human excreta disposal in Kigali (OZ-Architecture, 2006)

4.3.1 Pit latrines

As shown in Figure 4-2 the unlined pit latrines are the widely used in Kigali specifically in slums areas. The pit latrines serve about 60 % of the population of Kigali. This figure shows that most of people have a latrine which is either private or shared with other households. In our sample (N=15), people from Gitega sector⁸ were interviewed for this research. 40% of the interviewees share a latrine with the neighbor (15 people share one latrine), while 60% have a private latrine. According to interviews, the people that shared latrines were not happy and argue that nobody care about the maintenance hence the risk of contaminating the sanitation related diseases. This makes the people to opt for alternative which are bad (bushes, open ditches,etc). It is also important to note that shared pit latrines do not count for MDGs target, only if not shared and with a slab.

⁷ 94%:2 =47% no access
53% with access

⁸ Gitega sector: slums areas in Kigali

Although most people have pit latrines, most of the pit latrines do not meet the national hygienic standards such as: free of bad odor, cleanness and the concrete slab. Figure 4-3 and Figure 4-4 give examples of private pit latrines in Gitega sector.



Figure 4-3: Private pit latrine at Gitega; an example of pit latrine with slab but bad smell. Though this toilet is covered by the slab, it smelt badly and was not clean. In the same sector, another pit latrine is shown in Figure 4-4 below:



Figure 4-4: an example of a pit latrine in bad condition in Gitega sector (Sano, 2007)

The pit latrine shown in Figure 4-4 does not have a concrete slab, only wooden beams and without door. This is an example of having access to sanitation facilities but not improved sanitation facilities as explained in Section 4.2 of the report.

These latrines are constructed by the owners. A pit latrine is described as a pit for accumulation and decomposition of excreta and from which liquid infiltrates into the surrounding soil. Pit latrines are very common in slums areas of Kigali. Usually when the pit is full the residents dig another one. The depth of the pit ranges between 10 and 15m⁹ and it can last 5-10 years. According to the interviewees they dig deep because they do not have any option for emptying the pit and even the design of the pit does not allow it to be emptied.

With the limited space, the absence of pit emptying system and the sludge management, the problem comes when those pit latrines are full. Though the pit could be emptied by

⁹ 10-15 depth: this is unusually deep

using vacuum tankers, it seems that the community is not aware of the existence of such system and it could be unaffordable to many poor people. Thus the residents simply abandon the full pits and dig a new pit.

In general, pit latrines have the purpose of excreta disposal. Advantages and disadvantages of pit latrines can be summarized below. The pit latrines have some advantages such as:

- Cheap to construct
- Easy to maintain
- No need of water for functioning
- Keeping excreta contained and out of the environment(away from children)

However they cause a number of problems when they are not well maintained or used by many people in crowded living condition:

- Attraction of flies, bad smell
- Ground water pollution resulting from percolation of liquid from the pit (note that some of the people in Kigali use the groundwater for drinking).
- In slums areas where there is no hygienic method of emptying and disposing the pit content, the faecal sludge management of pit latrines is difficult when the pit have filled up(no space to dig for new pits). In general, pit latrines are more appropriate for less densely populated areas and in areas with low ground water table.

4.3.2 Flush toilet connected to septic tanks and soak aways

In Kigali, many of the high income people have flush toilets that are connected to a septic tank and/or a soak away pit. According to (OZ-Architecture, 2006), 30% of Kigali population has flush toilets connected to a septic tank. In the draft report of (SGI-Lahmeyer, 2007) for sanitation master plan in Kigali , it is reported that only 21% of the residents have flush toilets in Kigali. This is an example of the inconsistency of sanitation data in Rwanda as mentioned earlier. These are two national documents but they are contradicting each other. In the sample of 15 households surveyed in Gitega sector, none has a flush toilet.

Flush toilets are mainly found in commercial buildings, estate houses and government buildings. This system is connected to septic tanks. The effluent from the septic tanks discharges into soak pits and drains into the soil.

Septic tanks have the following advantages for the slums areas of Kigali:

- It is convenient for the user
- It can be a safe method for treating and disposing of household wastewater if the population density is sufficiently low so that groundwater pollution does not occur
- It can also take the greywater from the household

On the other hand, the following are the disadvantages of flush toilets and septic tanks for slums areas of Kigali:

- This system is expensive therefore it is affordable only to a small section of people
- If there is no water it becomes unhygienic
- It requires a lot of water for use
- It can cause groundwater pollution (from the soak pit)
- It requires faecal sludge management when the pit is full

Since slums areas of Kigali are constructed in steep areas, the flush toilet connecting to the septic tank may pollute downstream water courses.

4.3.2.1 Faecal sludge management

There are three institutions that are in charge of emptying pit latrines and septic tanks namely: Kigali city council with one vacuum tanker for emptying, Ministry of Defence with two vacuum tankers, and private company with two vacuum tankers. According to interviews in Kigali city council, the service of emptying septic tanks or pit latrines in Kigali is poor. The faecal sludge from pit latrines and septic tanks is dumped in an open land fill at the periphery of Kigali, probably causing further environmental pollution in that area. According to one interviewee in the inspection department in Kigali City Council¹⁰, more investment is needed in the septic tanks emptying service. This is particularly important given the prevalence of onsite sanitation; and the five vacuum tankers are not sufficient for Kigali city.

4.3.3 Sewer system and wastewater treatment plant

According to one interviewee from Kigali city council, there are 3 wastewater treatment plants in Kigali:

- “Caisse social 2020 estate”, which treats wastewater from about 300 houses.
- “Caisse Social Kacyiru” with an activated sludge treatment process and serves about 50 households.
- Centre Hospital University of Kigali (CHU/K) has also a system of treating wastewater. The type of wastewater treatment process found at CHU/K is the activated sludge process.

4.3.4 Open defecation and direct disposal

Open defecation is not usually found in Kigali city itself but in neighboring peri-urban and rural areas of Kigali; about 1% of the population defecates in the bushes. Direct excreta disposal was a serious problem in the past where during the night people used to empty and discharge their waste into open drainages. This problem has been reduced because Kigali City Council has put in place a department of inspection of infrastructures in Kigali.

4.3.5 Biogas toilet

“Biogas toilet” also called “Bio-latrines” are toilets connected to biogas digesters (an underground tank not similar to a septic tank) in order to generate gas. (Srinivasan, 2007) defines biogas digesters as a form of access to modern energy services in rural areas with the potential to considerably improve health and sanitation. Biogas technology can yield significant socio economic and environment benefits. Biogas is promoted by Kigali Institute of Sciences and Technology (KIST), there are currently implemented in different institutions in Rwanda.

In Kigali, biogas toilet have been constructed at Lycee de Kigali school to address the sewerage problems at the school by providing a 25m³-fixed dome digester connected to 6 bio-gas toilets. The methane gas produced is used to cook for about 400 students (interview discussion with staff of Kigali city council¹¹). In South Province (former

¹⁰ Mr Kalim Zilimwabagabo, in charge of inspection in Kigali city council

¹¹ Interview with Ephem Rukurabeza

Cyangugu Province), there is a Biogas plant that treats toilet waste from prisoners by using fixed-dome anaerobic digesters. This biogas plant was built in order to generate energy for cooking - savings in kitchen fuel is around 80% and also it is also provides sustainable solution for the treatment of wastewater from 6,000 prisoners (Butare and Kimaro, 2002).

Plans are underway to clean and upgrade the slums and provide basic services infrastructures. It is expected that in June 2008, 250 families in Muhima slum expected to be transferred to areas where basic infrastructures is provided to them. Batsinda is one of the new settlements for poor people from slums areas of Kigali. Biogas toilets are constructed as sanitation facilities. Four households share one digester for generating gas. The gas is used for cooking purpose.

Advantages of Biogas toilet are the following:

- Biogas plant could generate gas which can be used for energy for cooking and lighting.
- Biogas technology can further contribute to the improved health and reduced medical expenditures by reducing the indoor smoke from open fires(Srinivasan, 2007).
- Biogas can further reduce the global warming (Pei-dong *et al.*, 2005).Biogas toilets are now common in many Asian countries (e.g.: China, India, Nepal, and Bangladesh).

Disadvantages of bio latrines connected to digester are the following:

- High initial cost for the common types of biogas plant compared to the means of poor people
- Needs skilled construction workers
- Operational risk since methane is flammable

4.4 Experience with UDD toilets (Ecosan toilets) in rural areas of Rwanda

The previous chapters were discussing the methods of discharging human waste that are used in Kigali. This section will focus on rural areas of Rwanda where “ecosan toilets¹²” have been implemented (refer to appendix 5). This is done in order to learn from rural areas and evaluate the applicability of “ecosan toilet¹³” in slums areas urban areas of Kigali.

In the context of achieving the Millennium Development Goals and the “Vision 2020”, the Ministry of Lands, Environment, Forest, Water and Mines (MINITERE) has signed a protocol of agreement with the Common Development fund for execution works of 100 blocks of public toilets (using UDD toilets) along principal roads (high ways) in the whole country (MINITERE, 2006). This agreement was signed in June 2006. Out of 100 toilets 10 public toilets are already completed and they are now in use, 16 public toilets (UDD) are under construction. UDD toilet has been built in rural areas of South Province and North Province of Rwanda as shown on the Figure 1-1.

¹³ “ecosan toilet”: more specifically called urine- diversion dehydration (UDD)toilets however biogas toilet is also considered as an ecological sanitation

The FEA (Water and sanitation Fund) has provided funds to build UDD toilet in former province of Gikongoro in public institutions (schools, hospitals and prisons). Currently the toilets are being constructed in several schools namely secondary school of Kibeho, secondary school Nyamagabe and Kigeme hospital. According to a sociologist at FEA, FEA provides training to the teachers and pupils on use of UDD before construction work of the UDD toilet is taken place. For Nyamagabe school and others where UDD toilet are already built, the pupil understand very well the use of UDD and the management of sanitised excreta, because the school has hygiene and sanitation in its curricula. The functioning of UDD toilets will be explained below in section 4.4.1.

4.4.1 UDD toilet at Nyamagabe secondary school (South Province)

UDD toilets were constructed at Nyamagabe secondary school. It was clean at my time of visit (see in side the room of the UDD toilet on Figure 4-5). However, it is noticed that it was not favorable time to assess the maintenance because the pupils were on holidays.



Figure 4-5: inside the room of UDD toilet at Nyamagabe secondary school

At this school, the dried faeces are used in the garden of the school. According to the interview with the staff of FEA, the UDD toilets are provided to that school because of lack of adequate sanitation facilities and water scarcity in the region. Additionally, the school is not connected to water supply system.

4.4.2 UDD toilet at Kigeme hospital

A bad experience is seen at Kigeme hospital where there was nobody in charge of maintenance of UDD toilets. The UDD toilet at Kigeme hospital smelt badly and the flies were everywhere because nobody was in charge of the management of the system. Later on, FEA put in place a person for management and cleaning of the toilet and that person has a role to give explanations to every patient on how to use that toilet. It is observed that this is not a simple job and may be not appropriate technology to the hospital due to different reason. Firstly, UDD toilet is not self evident because before using a UDD toilet, there is a need of explanation. Secondly, there must be urinal for men for avoiding the mixture of urine and faeces.

Apart from those two experiences at Nyamagabe School and Kigeme hospital, it has been recognized that those UDD toilets are appropriate in former Gikongoro where soils are low in productivity and there is a demand for cheap fertilizer. Currently, FEA is introducing the reuse of human excreta after drying in other schools and this project receives other requests for UDD toilet from other schools.

4.4.3 UDD Toilet for household in Bulera district (North Province)

In North of Rwanda (formal Ruhengeri) in the Bulera district there is a big project of UNICEF funded by the government of the Netherlands. It is estimated that the project will reach 800 000 residents in rural areas with improved sanitation facilities and safe hygiene practices (UNICEF, 2007). This a demonstration project where UNICEF works on raising awareness among the population and provides construction materials for UDD toilets.

According to an interview with Mr Kubwayo, employed by UNICEF in charge of PHAST¹⁴ in Bulera district, in the past 80% of the population used to defecate in the bushes and the remaining 20% used pit latrines. Pit latrines are not suitable in that area because it is volcanic and therefore difficult to dig. The pit has at least 2m depth. Figure 4-6 shows pit latrine that is in use for the population of Gahunga sector (Bulera district). In the same sector the UDD toilets is promoted and now it is in use (see Figure 4-7)



Figure 4-6: Pit latrine in Gahunga village



Figure 4-7: UDD toilet for household in Gahunga

The pit latrines do not meet hygienic standards and safety standards. To address the problem of hygiene and sanitation, local government with UNICEF promoted the use of UDD toilet at household level (Figure 4-7). This type of UDD toilet is constructed on the initiative of the community in Bulera district. It is more appropriate to this region and the materials can be found locally. The communities are aware of the sanitized excreta and there are using it in the potatoes garden (Figure 4-8).

¹⁴ PHAST: Participatory Hygiene and Sanitation Transformation



Figure 4-8: Potatoes garden with use of sanitised excreta in Gahunga village

4.4.3.1 Public UDD toilet in Bulera district

UNICEF and Bulera district constructed a public UDD toilet in the Rugarama business centre (Figure 4-9). The public toilet constructed in Bulera district has four cubicles for each bloc. There is a person in charge of maintenance and cleaning. This UDD toilet is located in the center of Rugarama where some commercial residents and bars are located in the village. Unfortunately it is not clean even with someone to maintain it. I noticed that the people are not aware on how to use UDD toilet. On the other side it is observed that the urinals are not yet constructed which has been identified as main cause of the bad condition of this public UDD toilet.



Figure 4-9: Public UDD toilet in Rugarama business centre

Generally, in Bulera district (North Province), the people are aware about the importance of having improved sanitation. This is shown by the initiative of the community in construction and also the request of the community for subsidies for UDD toilet received by the district. UNICEF and local government provide the local trained people and the community find some of the construction material such as rocks, soil, wood, cement if necessary and sand. However, both the government of Rwanda and UNICEF do not provide any subsidies to individual household for construction of the latrines. The UNICEF constructs the demonstration model, these are found in strategic points such as markets, governmental building (offices). Households are encouraged to build their own latrines.

4.4.4 Comparison of the UDD toilet in different regions of Rwanda

This section provides a comparison of UDD toilets that are currently in use in Bulera and Nyamagabe districts. Table 4-2 shows the UDD toilets visited, their condition status and lesson learnt.

Table 4-2: Comparison of the UDD toilet in Bulera and Nyamagabe district

UDD toilets in rural areas	Condition status at my time of visit	Lessons learnt
UDD toilet at Nyamagabe secondary school	<ul style="list-style-type: none"> • Clean and well maintained 	i) when the people are well informed and educated, the use of UDD toilet becomes success ii) For the soil in low productivity, like former Gikongoro, there is demand of fertiliser therefore the UDD meets that need iii) Sanitation issue in the curricula of the school is seen as an opportunity to promote the use of UDD toilet in the schools.
UDD at Kigeme hospital	<ul style="list-style-type: none"> • Bad smell • Not well maintained with the person in charge 	<ul style="list-style-type: none"> • Need exhaustive consultation and education to the local community¹⁵
UDD toilet for household (Gahunga village)	<ul style="list-style-type: none"> • Well maintained 	<ul style="list-style-type: none"> • Better solution for rocky area • Use sanitized excreta as fertiliser in the garden • Some are still using pit latrines because of religious resistance against handling human excreta
Public UDD toilet at Rugarama centre without urinal for men	<ul style="list-style-type: none"> • Bad smell • Not maintained 	<ul style="list-style-type: none"> • Need of education to the community how to use UDD toilet • When the service is free of charge so none care about the maintenance • Urinals waterless for men is always needed for public toilets

In summary, at household level, it is observed that those toilets are clean and well maintained. Through PHAST programme in Bulera district, the use of human excreta as fertilizers is known by the population and they are using it as fertiliser for growing maize and potatoes in the district. However in public areas, it is still challenge to educate people how to use dry latrine where the faecal should be separated from urine. When the faeces are mixed with the urine, it causes bad smell just like pit latrines. Another issue for public toilet or toilet for hospital, there should be waterless urinals for this simplifies the use of UDD toilets.

¹⁵ Mayumbelo (2006)

It can be concluded that for both areas, ecosan is suitable and appropriate due to the following reasons:

In Bulera district there is a rocky area then no need of excavation. Environment is protected as well due to limited bushes defecation and sanitation related diseases caused by poor maintenance of unlined pit latrines. This is similar to slums areas of Kigali where there is no space to dig and no facility for emptying the pit latrines. It could be a solution since this system is cheaper than the conventional system, even the poor people can afford it. Soil with low productivity like the one of Nyamagabe which require extra fertiliser would need a system which aims of recycling and reuse of nutrients.

4.5 Greywater treatment and disposal

It is important to note that greywater is out of the scope of the study. However during the fieldwork, it is noticed that the people for slums areas of Kigali and rural areas dispose greywater into the drainage in front of their houses and there was a bad odor. The water from kitchen, bath and laundry is known as “greywater”. Greywater is not harmless both from environmental and hygienic point, therefore greywater as a part of sanitation should be taken into account when addressing the problem of sanitation both in rural and urban areas (Ridderstolpe, 2004). In ecological sanitation (ecosan) systems this greywater is usually not mixed with human excreta. It must be treated and be reused.

4.6 Concluding remarks

The poor sanitation services in the slums areas of Kigali require immediate action of improvement to bring them on a path to meeting the millennium development goals by 2015. Different criteria have been developed to assess a suitable option for an emergency case, peri urban (slums) and rural areas (Münch *et al.*, 2006). The following are the criteria to be considered also for slums and it is considered for the slums areas of Kigali:

- Not pollute ground water or surface water
- Not require water for transportation waste since water is precious in slums areas
- Sanitised waste to destroy pathogen and protect human excreta
- Low capital cost, operation and maintenance costs(to be financially sustainable)

As a rule of thumb, the pit latrines are not appropriate for the highly densely populated areas due to limited space. Since the community use groundwater for drinking, pit latrines could cause groundwater pollution in the slums areas of Kigali (Sano, 2007). The septic tanks that infiltrate the effluent into the ground do not meet the mentioned criteria. Those systems of septic tanks are costly and also they require water for flushing. Additionally Kigali city council does not have adequate service for emptying the pits. Both pit latrines and septic tanks do not give an easy opportunity of recycling and re-use of nutrients.

Biogas toilet meets all the criteria except the one of financial sustainability. It is very costly and the poor can not afford it. Therefore the best option for slums areas of Kigali is the UDD toilet. The UDD toilet does not pollute the surface or groundwater since they are built above ground level. The UDD toilet contributes to the reduction of over exploitation of natural water sources, which continue to be scarce, as a result of population pressure in the country.

5 POLICY FRAMEWORK OF WATER AND SANITATION SECTOR IN RWANDA

5.1 Introduction

This section gives a brief description of the policies that emphasize sanitation. The aim is to assess to which extent sanitation issues has been considered in policies that focus sanitation. Along with the Water and Sanitation sector Policy (2004), several other documents that emphasize water and sanitation issues such as:

- Vision 2020 (2000)
- The Economic Development and Poverty Reduction Strategy Paper (EDPRS) (2006)
- Decentralization policy (2001)
- National Investment Strategy (2002)
- National human settlement policy (2004)
- Environment policy (2004)

Vision 2020 has been recognized as the overarching through which to achieve economic development of the country supported by the document Economic Development and Poverty Reduction Strategy Paper (EDPRS), Decentralization Policy, Environmental policy , Water and Sanitation Policy, National Investment Strategy and others social-economic policy papers. Linkage and complementarity can be demonstrated in the following diagram on the Figure 5-1 below:

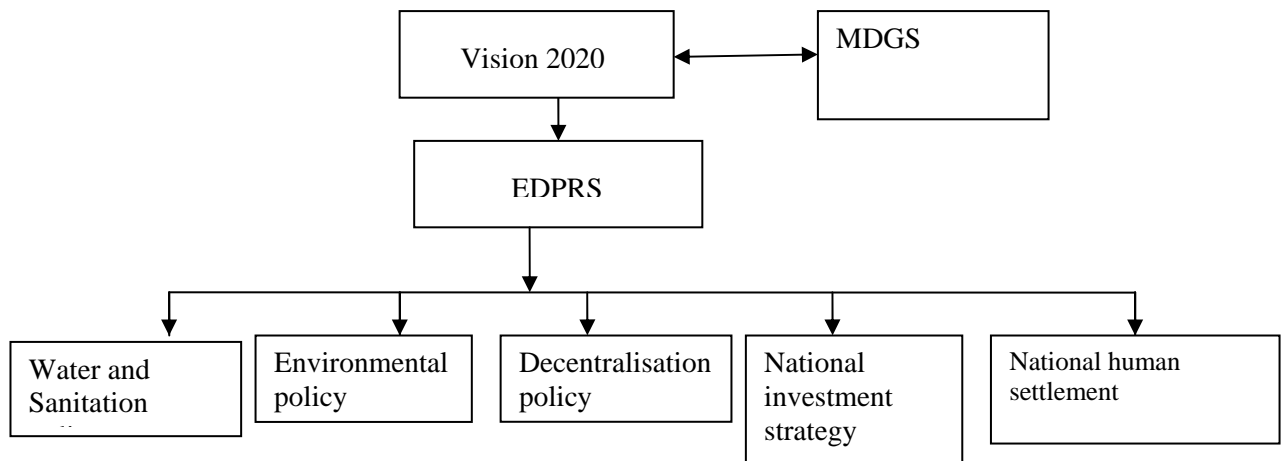


Figure 5-1: Relationship of relevant policies that focus on sanitation sector in Rwanda

5.2 Vision 2020 (2000)

After the 1994 tragedy of genocide 1994, the government of Rwanda has put the effort on the development of the country and come out with a document called “VISION 2020”. This ambitious but realistic document aims to transform the country into a

middle income country by the year 2020 (MINECOFIN, 2000). The aspirations of vision 2020 have to be realized around six pillars and three cross cutting. Environmental sustainability is one of the priorities on the six pillars. Vision 2020 underlines the sustainability of water resources management and protection, maintenance of water and sanitation infrastructure.

This document sets out goals that should be achieved in 20 years to improve the living standards of Rwandese taking year 2000 as baseline. This includes providing safe potable water to all Rwandese by 2020. Similarly, vision 2020 recognizes lack of adequate sanitation facilities as the cause of water borne diseases. And it aims at providing sufficient sewerage and disposal systems both in rural and urban areas.

5.3 Economic Development and Poverty Reduction Strategy Paper (EDPRS) (2006)

The Government of Rwanda launched a second Poverty Reduction Strategy in 2006, having produced its first Poverty Reduction Strategy Paper (PRSP) in 2002 (MINECOFIN, 2006). The Cabinet has accepted a proposal that the new strategy will cover a five year period and to name it the ‘Economic Development and Poverty Reduction Strategy’ (EDPRS).

This document underlines the importance of water and sanitation as paramount to reduction of poverty. It states that the sustainable improvement of water and sanitation sector is essential to:

- Positively impact on maternal and child health
- Improve enrolment of schooling for girls
- Reduction of health expenses at household and national level by reducing cases of diseases to water and poor sanitation.
- increase of productivity because of improved health

The EDPRS sets out the objectives, priorities and major policies for a period of five years (2008-2012). However, there are no specific strategies in place to achieving the set goals related to sanitation.

5.4 National Water and Sanitation Sector Policy (2004)

The country recognizes the importance of water and sanitation to the welfare of its population by revising water policy (2001) to incorporate concepts such as decentralization, participatory approach, privatisation and funding through programme approach. The new Water and Sanitation Policy has been elaborated in 2004 after Water and Sanitation Policy developed in 1992, revised later on in 1997 as well as in 2001.

This document guides water and sanitation in the country. Beside the issue of water and sanitation in this document, water availability for agriculture, industrial, transportation, energy and other economic sectors have been addressed in order to improve agriculture productivity, and contribute to Vision 2020 and achievement of MDGs. The box 1 below includes principles on which Water and sanitation sector policy is based on:

Box 1: Principles of water and sanitation sector (MINITERE, 2004)

Principles of the sector policy

The water and sanitation sector-based policy is based on the following principles:

- Each person has right to access to water services
- Water has value and is a social and economic good
- Priority should be awarded to safeguard the satisfaction of the county's water needs
- Men as well as women should equally participate in the water resource protection and management
- Water resource management should be integrated and made watershed
- Water use should be rational and should take into account the environmental concern
- The quality and quantity standards of water should be respected
- The polluters will have to pay for the damage thus created
- The gender perspective should be taken into account at all levels of water management
- The beneficiaries should be responsible of their water and sanitation services
- Each rural water supply must systematically contain a sanitation component
- The utilization of transboundary water resource should be equitable
- All water sector partners should be involved in water resource management

In the water and sanitation policy there is no specific strategy towards sanitation per se but issues related to sanitation is consistently added to water supply. But the fact is that water supply and sanitation fall under the mandates of different institutions. In addition, some principles are not clearly defined in this policy. For example in chapter four of this policy states the development of water supply systems and sanitation services, here it is not clear how this development will be done and who will do it.

However, some actions have been taken. The organic law for environment was adopted in 2005. In this law there are several articles related to sanitation. For example article 83 states that it is prohibited to discharge wastewater or hazardous waste in wetlands, except after treatment in accordance with the instructions that govern it, nor any activity or hazardous waste that may damage the quality of water is prohibited. But this article did not specify who authorise the disposal of waste into the wetlands: the Minister responsible, environmental council, or individual environmental inspectors. The absence of standards and clear regulations makes the system prone to political manipulation and corruption through bribing of officials.

Kigali city has taken up the call to address sanitation problems by requesting institutions to construct micro sewage system treatment on their premises and compelling all new developed estates to make a provision for sewage treatment plant (SGI-Lahmeyer, 2007).

Moreover, the government of Rwanda received a grant from the African Development Bank (ADB) for water supply and a portion was allocated to sanitation sector.

With these funds, a Sanitation Master Plan is under study by Consultant Groupement SGI-Lahmeyer in collaboration with ELECTROGAZ¹⁶. It is hoped that Sanitation Master Plan will highlight the problem of sanitation sector for Kigali city.

Furthermore, the National Strategy on Sanitation and Promotion of Hygiene is currently being studied (MINITERE, 2007). This draft document highlights the roles of different actors in sanitation. This strategic paper which is financed by the government of Rwanda under supervision of MINITERE defines the action plan for period of five years (from 2007- 2012). It is hoped that once finalised and adopted the National Strategy on Sanitation and Promotion of Hygiene will complement the implementation the Water and Sanitation Policy.

5.5 Decentralisation Policy (2001)

In May 2001, a National Decentralisation Policy was elaborated with the overall objective to ensure political, economical, social, managerial /administrative and empowerment of local populations to fight poverty by participating in planning and management of their development process (MINALOC, 2001).

During the implementation of decentralisation policy, administration and political division were created and revised. This transformation was a result of 5 regions (Intara) from 12 prefectures (regions) in 2006. The lower structure was changed from commune to district (Akarere). From Akarere to the immediate lower level umurenge (sector), followed by Akagari (cell). Policy Implementation process started in 2001 and has been through “adoptive approach” with three phases, guided by elaborated policy instruments.

Decentralization policy is not a onetime action but an ongoing process. If it has to be successful, it needs to be conceived as the transfer of power and authority to the people, not only to local government (Kauzya, 2007). To achieve this, it requires innovative ways of structuring and institutionalizing the interface between the community and their local government. Rwanda has taken a first step of institutionalizing by putting in place the community Development Committees (CDC) at all level till to the lowest (cell).

However, it seems that decentralization policy is not well the implemented. For example at district level, few are the district or local communities who have recognised that before counting on the external support, they should find ways of solving their problems by using their internal resources (UNICEF, 2007).

5.6 Environment Policy (2004)

Environmental policy in Rwanda was launched the first time in 2004 which was a starting point of Organic Law for Environmental Protection and later on Rwanda Environment management Authority (REMA) by 2005. The Policy statement related to Health and sanitation is to include health and sanitation at the centre of environment issues. This policy proposed some actions:

¹⁶ ELECTROGAZ: National Water utility

- The establishment of a system for collection, transportation, repository and disposal of waste;
- The establishment of an appropriate system for the conduit and disposal of waste water and rain water in towns and in settlements (Imidugudu);
- The establishment of protection standards between dumping grounds and human settlements and water sources to develop and strengthen institutional and technical capacities for the management, control and monitoring of unsuitable products;

For this policy the strategies are very well defined and clear. Some of the actions are started to be implemented for example in Batsinda settlement, the systems of disposal are biogas toilet which are environmentally friendly technologies, and also every house has rainwater tank. For the point of establishment of the standards there not yet established as explained the previous chapters.

5.7 National Investment Strategy (2002)

The 2002 National Investment Strategy document/policy like the Environmental policy encourages the private sector to participate in the provision water and sanitation systems in rural and urban areas at affordable prices for the community.

The policy provides incentives to attract the companies to invest in water and sanitation. For example the law no 14/98 of 18/12/19998 grant a zero taxation of imported equipment and raw material at 5% to companies that invest 50000\$ (local investor) and 100000\$ (foreign investor).

Nonetheless, currently the private sector is limited to a few areas such as: consultancy, supply of construction material, and supply of local artisans. In Kigali, two private companies opened their business namely Aqua San and ROTO involved in manufacturing of plastic water tank and mobile plastic latrine. In particular, private sector seeks for revenues and benefits. A city like Kigali, where 70% is formed by informal settlement, without sanitation infrastructures could be a barrier for private sector in management of sanitation facilities.

5.8 National Human Settlement Policy (2004)

The main objective of the national human settlement policy in the urban areas is to improve the settlement conditions of the urban population. However the policy did not say anything about sanitation. It did not determine also land use for sanitation facilities in urban areas (MININFRA, 2004).

6 RESULTS AND DISCUSSION

Even though 2 months of fieldwork was hardly enough to fully grasp the complexity of the water and sanitation in Rwanda, this chapter presents a first analysis based on the findings of this research project. A detailed description and analysis of the formal institutional framework for water and sanitation in Rwanda is provided, followed by an analysis of financing mechanisms of water and sanitation sector in Rwanda. The opportunities and barriers of improved sanitation including ecosan are also discussed.

6.1 Institutional framework for water and sanitation in Rwanda

At the national level, the Water and Sanitation Sector falls under the responsibility of the Ministry of Land, Environment, Forestry, Water and Mines (MINITERE). MINITERE is responsible for formulating and monitoring national policies, laws and strategies. In addition, MINITERE is responsible for organizing, planning and coordinating the sector's activities.

Other actors in Water and Sanitation Sector include:

- Rwanda Environment Management Agency (REMA) is an agency which falls under MINITERE and is responsible for developing laws and regulations.
- Rwanda Utilities Regulatory Agency (RURA) is a regulator under MININFRA responsible for regulating telecommunications, electricity, gas, water, sanitation and transport.
- Non Government Organizations (NGOs) are coordinated through MINALOC
- Donors provide financial and technical assistance to the water and sanitation sector. According to (MINITERE, 2006), donors can be divided into two parties:
 - ✓ Bilateral donors namely Germany, Austria, Belgium and Japan
 - ✓ Multilateral donors including World Bank, FIDA, African Development Bank (ADB), Arab Bank for Economic Development in Africa (ADEBA), UNICEF and European Union (EU)
- Additional actors are MOH, MINEDUC, MIGEPROFE & MINECOFIN

All these partners collaborate through MINITERE.

A detailed description of the roles and the responsibilities is provided in Appendix 3. The linkages between different sectors are displayed in **Figure 6-1**. The stakeholders' organigram was generated from information collected during the interviews and relevant documents such as Water and Sanitation policy (2004) and the draft document on national strategy on sanitation in Rwanda (2007).

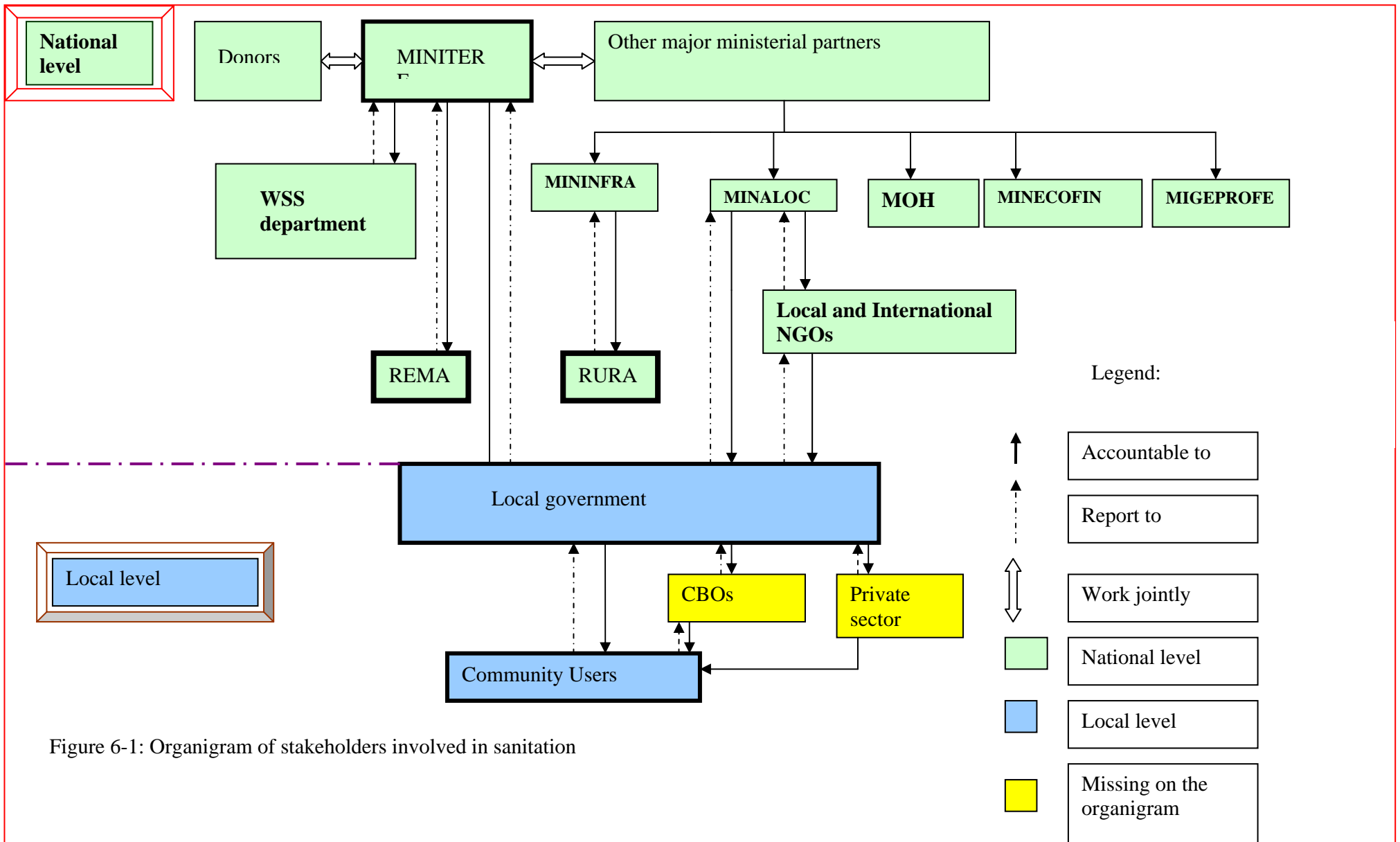


Figure 6-1: Organigram of stakeholders involved in sanitation

There are a number of stakeholders involved in water and sanitation sector. At national level, this organigram is formed by many ministries and others actors. At local level, some important stakeholders such as the private sectors and Community Based Organizations (CBOs) are not on the organigram. CBOs can play a crucial role in the planning and implementation of project.

CBOs in Kigali city which are mainly formed by women or widows are involved in collecting the household solid waste, with little involvement in the management of human excreta waste. Due to the limited capacity of CBOs (human resources and financially), they are dependent on local governments to provide financial assistance, to pay the community mobilizers, transportation of wastes and to conduct community awareness campaigns¹⁷.

Therefore, since Kigali city is developing policies and regulations that require residents to dispose human waste in environmental sustainable ways, more stakeholders would be needed in the provision sanitation service to complement each other. For example CBOs could play a big role in the operation and management of the sector (O&M). If these CBOs have all necessary means to work they can be involved in the emptying the septic tank or collecting the dried human excreta in case of UDD toilet.

On the other hand, additional institutions might create a problem when the responsibilities of the various sectors institutions are not well defined resulting in gaps and overlaps in responsibilities. The Table 6-1 presents the identified gaps and overlaps within institutional framework for water and sanitation in Rwanda.

¹⁷ Interview discussion with the staff of Nyarugenge district

Table 6-1: Stakeholder matrix

	Institutions	Responsibilities							Monitoring & evaluation
		Development of policies & strategy	Regulations	Financial allocation	Trainings	Planning design	Implementation of the projects	O&M	
National government	MINITERE					//////////	////////////////////////////////////		
	MININFRA	////////////////////////////////////					////////////////////////////////////		
	MOH	////////////////////////////////////				//////////			
	MINECOFIN								
	MINALOC						////////////////////////////////////		////////////////////////////////////
	MINEDUC								
	MIGEPROF								
	RURA								
	REMA								
NGO's	RCVP								////////////////////////////////////
	SNV					//////////			////////////////////////////////////
	FEA								////////////////////////////////////
Local government	Kigali city council	////////////////////////////////////						//////	////////////////////////////////////
	Nyarugenge district					//////////	////////////////////////////////////		////////////////////////////////////
Donors	World Bank & UNICEF				//////////	//////////			
Community	Users						////////////////////////////////////	//////	
Private sector								//////	

Legend:

	responsible
//////////	involvement

From the Table 6-1 above it is seen that:

- **Overlaps in responsibilities:**

As mentioned in the previous paragraph, lack of clearly defined roles and responsibilities result in duplication of the work or overlap of responsibilities. This implies a low output of the sanitation sector which further impacts on service delivery. The fact that there is no clear assigning of responsibilities between stakeholders involved in water and sanitation, it results on having similar activities. For example MINITERE, REMA and RURA all have the responsibility of making laws and regulations for sanitation management, however at the moment there are no laws and standards for sanitation. Therefore accountability becomes a problem if the rules are not followed. According to the REMA employee, in charge of inspection, inspection is supposed to be done for every effluent of wastewater discharging into the environment, however it is constrained by the lack of laws and standards of effluent they have not been published yet. In addition, RURA is currently more involved in telecommunications than in developing the rules of sanitation sector.

The stakeholders could focus on their main responsibility without considering what could be the impact on others. WHO (2006) also argues that the health status of the community can be a result of planning and decision making in others sectors not only from health sector.

The Water and Sanitation Sector in Rwanda has focused on potable water supply and less so in sanitation and the effects on the environment. The Appendix 5 shows that 20 projects of potable water have been implemented and 9 sanitation related projects (this means 30% are sanitation related projects). If the water, sanitation and health sector collaborated better, the burden of diseases caused by water related diseases could be addressed and the environment protected better well.

- **Gaps in responsibilities :**

Gaps were found in operation & management (O&M), and monitoring and evaluation where none of the stakeholders identified is responsible. Some argue that in most developing countries, water and sanitation is a political instrument, with higher profile to new investment on infrastructures compared to O&M (Sepällä, 2002). In Kigali, O&M is left to the community to employ the service of private individuals to empty pit latrines and septic tanks because there is no institution in place which deals with issues of O&M. This means that there is no service provision of emptying the pit latrines and septic tanks.

Likewise, low attention is given to monitoring and evaluation of the sanitation sector in Rwanda resulting in lack of reliable data on sanitation. The data available are not consistent in national document because there is nobody responsible for it. The lack of reliable data becomes the danger of poor planning and design of appropriate technology of sanitation facilities in the country. With the drafted National Sanitation Strategy it is hoped that roles and responsibilities would be better defined to improve monitoring and evaluation.

The gap between the national and local levels in terms of translating the National Sanitation Policy into action was observed. This becomes a complex matter due to the

fact that the decentralization process has not included the necessary financial support, thus constraining the local governments at district level (UNDP, 2006). According to UNICEF (2007), the administrative structures at local level have limited staff with sufficient technical, financial, managerial capabilities to effectively manage the water and sanitation sector.

The available staff number of 7 people employed by MINITERE raises the question on the ability to carry out the responsibilities assigned to MINITERE, taking into account the institution is responsible for the whole country. The number of staff in water and sanitation department was reduced from 40 to 7 people as part of the administration reform process (UNDP, 2006). Therefore it is questionable if the output of the sector will be as the one expected.

6.2 Financing Water and Sanitation in Rwanda

On National level, water and sanitation sector is funded by the development budget of MINITERE. A big percentage (98%) the funds is from external donors and is spent on water, sanitation infrastructure as well as water resources management through Water and sanitation unit. It is reported that 70% of them are grant-funded while 28% are loan-funded. Example is the budget for rural water supply and sanitation in 2004 where the total budget was 62652Euros (Refer to Appendix 6).

Sanitation is under water and sanitation sector where more attention is given to water. Kigali city as well is getting the funds through this national mechanism. WSP-AF (2007) classified the challenges of sanitation sector in terms of financing into two categories:

- ✓ Financing mechanism
- ✓ Competitions of needs and priorities

6.2.1 Financing mechanism

The water and sanitation sector is working under the following mechanism as shown by the Figure 6-2.

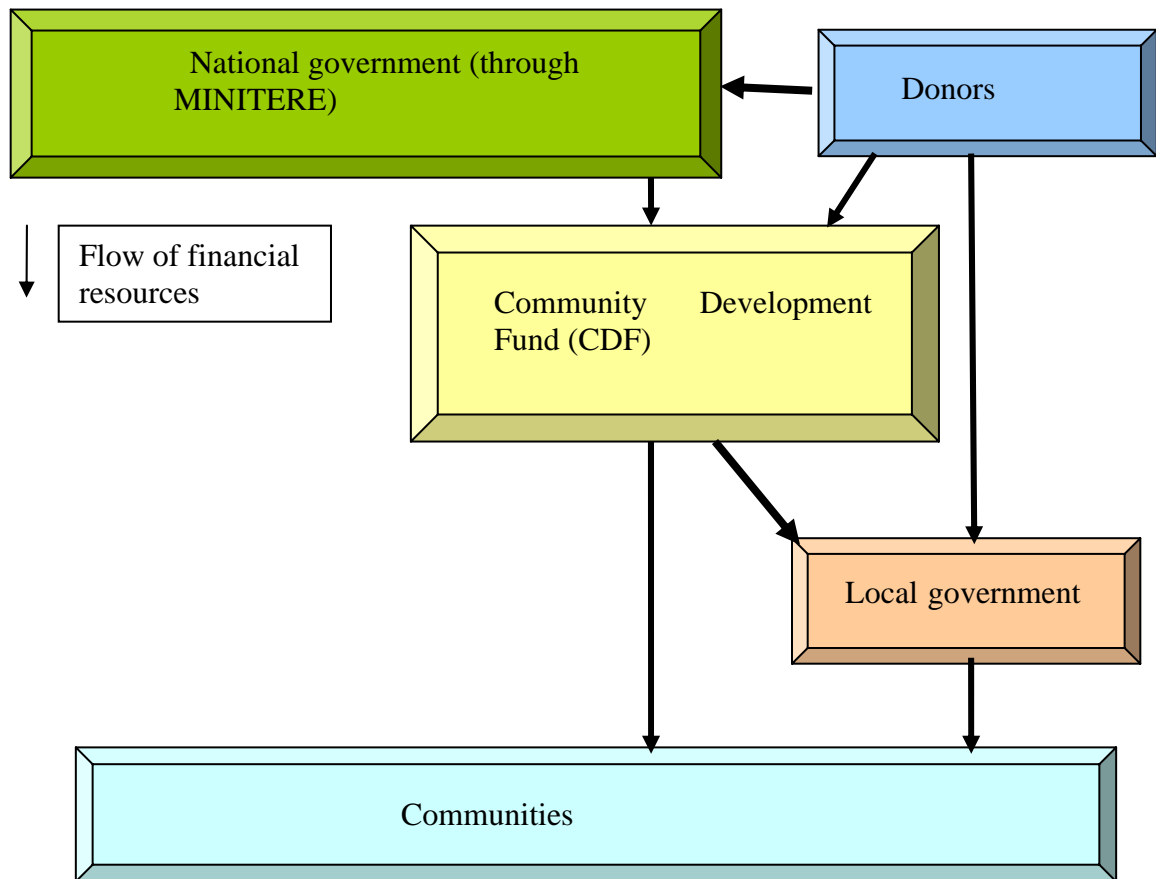


Figure 6-2: Financing mechanism in water and sanitation sector (MINITERE, 2004)

Figure 6-2 above shows:

Funds for implementation of the project come from the donors or national budget. The funds for the project of water and sanitation are controlled by the Ministry of Finance and Planning Economic (MINECOFIN) together with the donors. MINITERE also has finance department to control funds allocated to water and sanitation. From the national document and discussion interviews it seems unclear who has the power to take decision on the funds and who set the priorities.

Furthermore, the local government has the power to manage and monitor their own projects, so donors can also directly channel the money to districts only if the districts have a water and sanitation plan. The National government can also provide funds to the local government (district) through the Community Development Funds (CDF) for financing small project. The Local government is also encouraged to generate their own revenues and finance the small projects.

The financing mechanism in place for water and sanitation in Rwanda also did not give priority to sanitation. The Table 6-2 shows a need of 10MillionUSD/year for a period of 15years, however, the actual disbursement were equivalent to one tenth (1/10) of the total amount required.

Table 6-2: Coverage targets and investment requirements for Water and Sanitation sector in Rwanda (UNDP, 2006)

		1990 Access (%)	2005 Access (%)	2015 Target Access (%)	Total investment required (M\$/year)	Actual M\$/year	% actual
Water	Rural	48	55	85	23	10	43%
	Urban	70	69	85	7	0	0%
	Total	49	57	85	30	10	43%
Sanitation	Rural	6	10	65	5	1	20%
	Urban	6	10	65	5	0	0%
	Total	6	10	65	10	1	10%

These figures show that this sector is getting low priority financially at national level. The central government could revise the budget in sanitation sector, not only to increase the coverage rate in order to meet the target of 65%, but also in order to attract private sector for investing in the sector.

6.2.2 Competing needs and priorities

6.2.2.1 Water versus sanitation

At a global level, in 1990's, a big difference between the investment spending on water supply and sanitation has been observed. The figures indicate that a higher priority has been given to water supply compared to sanitation, both through national government and by international community (Osinde, 2006). Table 6-3 shows how much sanitation provision lags behind that of water supply where for example in Africa water supply got 88% of the total budgets while the sanitation sector is getting only 12%.

Table 6-3: Annual investment in water supply and sanitation (WSP-AF and GTZ, 2006)

Region	WATER		SANITATION	
	Water supply (US\$ billion)	Percentage of the total	Sanitation (US\$ billion)	Percentage of the total
Africa	4.091	88%	0.542	12%
Asia	6.063	85%	1.104	15%
LA&C	2.41	62%	1.503	38%
Total	12.564	80%	3.148	20%

Rwanda is no exception. Table 6-4 shows how much inputs spend on water supply compared to other sub-sectors namely sanitation and water resources management system between 2003 and 2005.

Table 6-4: Water and Sanitation Sector Expenditure by sub program (million Rwf) 2003-2005((MINITERE, 2006)

	2003			2004			2005		
	Planned	Actual	%	Planned	Actual	%	Planned	Actual	%
Management support	95	54	56%	76	49	64%	31	12	38%
Sanitation	485	536	110%	1779	262	14%	2767	1349	48%
Potable water	6589	4795	72%	11082	6902	62%	18456	18167	98%
Water resources Management	138	24	17%	576	36	6%	533	276	51%
TOTAL	7307	5409	74%	13513	7249	53%	21787	19804	90%

The Table 6-4 highlights that:

- In 2005, a higher priority for drinking potable water with a percentage of 98% for what is planned; sanitation got a percentage of 48%, water resources management with 51% and lastly management support with 38%.
- Actual disbursement into the sector increased in 2004 but tripled in 2005 (from 7.2 billion to 19 billion). However, for sanitation sector the actual disbursement halved during the period of 2003-2004.
- Despite the fact that there is a portion of funds allocated to sanitation, there is a big problem of knowing what has been achieved with the funds, in other words lack of information on implementation in sanitation.
- This sector is supposed to be for water and sanitation but we observe a need of explanation why sanitation is getting less money according to the planning budget. It can be assumed that access and use of improved sanitation are low on the list of government priorities.

6.2.2.2 Focus in rural areas

Sanitation facilities are few in urban areas but virtually nonexistent in the rural areas. (MINITERE, 2004a) argues that the people in rural areas are the most affected by lack of adequate water supply and improved sanitation. In this context, Rwanda has put a lot effort in rural development projects. Donors are dominant in the sector and seem to be less interested in investing in Kigali city giving the reason that it can generate their own revenues as a commercial city¹⁸.

Appendix 5 shows that 20 activities concerning water supply and eight for sanitation are found in rural areas. However, Kigali has 2 activities of water supply and zero activity for sanitation. With the data observed on the Appendix 5, one could assume that Kigali does not have sanitation problems. But if we look the ground, the situation is different. Kigali city has also its own problem as explained in chapter 4 of this report, therefore Kigali requires more attention in financial investment, especially in the unplanned areas.

¹⁸ Interview with Ruben Ahimbisibwe, Director of inspection in Kigali city council

6.3 Opportunities and barriers of improved latrines (e.g.: UDD toilets) in unplanned areas of Kigali

6.3.1 Opportunities

In Rwanda and especially in Kigali, a good number of opportunities exist to contribute to the improvement of sanitation facilities to increase the coverage rate and meeting the MDGs.

- Upgrading slums: Kigali city council has a plan of clearing and upgrading some of the slums. Upgrading program involves the improvement of the existing infrastructures including sanitation. It is hoped from the upgrading program planners would use this opportunity to consider alternative sanitation solutions including ecological sanitation.
- Ecological sanitation could be introduced in the Water and Sanitation Policy. Besides this policy, the Vision 2020 document as an important document in Rwanda, could make attention on the importance of improved sanitation including ecological sanitation
- There is now local experience with different appropriate technologies (biogas toilet, UDD toilet) in Rwanda and some pilot projects are conducted on them as explained in chapter 4. Local experience with biogas toilets¹⁹ (e.g. KIST); further biogas project could easily be implemented
- The design of pit latrines and condition of sanitation facilities (maintenance, odor) shows that the current methods are unsuitable and that there is demand for adequate sanitation facilities.

6.3.2 Barriers for improved latrines facilities (e.g. UDD toilets)

Besides the financial and institutional barriers to improved latrines, this section is split into two groups general barriers for sanitation and barriers specific to ecosan summarizes the important points as follow:

General barriers to improved sanitation:

- The re-use and recycling system of human excreta is not included in the Water and Sanitation policy
- Lack of consistent data on available technology
- Insufficient financial resources at local government to enhance the new project in slums areas
- Lack of basic infrastructures in slums areas
- Sanitation facilities are considered as private need while water supply is a public need

The ecosan toilet (UDD toilet) has its specific barriers (details are also provided in section 2.4.4)

- Social-cultural beliefs against handling human excreta could be a barrier to ecological sanitation
- Ecosan requires intensive education on management before implementation
- As any kind of technology if it is misused resulting into bad odor. For instance if the urine is mixed with faeces it becomes a big problem since is constructed upper ground level.

¹⁹ Biogas toilet can also fall under an ecosan approach

7 CONCLUSIONS AND RECOMMENDATION

Rwanda has committed to meet the Millennium Development Goal 7 targets 10 and 11, by 2015. To achieve this, a comprehensive institutional and policy framework has been introduced for water supply and sanitation. However, following the global trend, sanitation is given far less attention than water supply. With the current pace of progress for increasing access to improved sanitation in the country and in particular to the slums areas of Kigali city, achieving the MDGs by 2015 will be very challenging.

It is this challenge that inspired this research project which aimed at assessing the level of priority given towards sanitation by various stakeholders involved in the sanitation sector, focusing on the institutional framework, policies that incorporate sanitation and finally the funds allocated to the sanitation sector. In addition, opportunities and barriers for Ecological Sanitation in slums areas of Kigali have also been evaluated. The following conclusions can therefore be presented.

The first section of this chapter presents each research question and its answer. This is followed by the discussion of the more remarkable findings. Finally a few recommendations are given to contribute to achieving the Millennium Development Goal 7, target 10 and 11.

7.1 Research questions and their answers

7.1.1. Research question 1: roles and responsibilities of the stakeholders

RQ1: Who are key actors /stakeholders in provision of sanitation in urban areas of Rwanda and Kigali in particular and what are their roles and responsibilities?

There is a formal institutional framework for water and sanitation composed of seven ministries, two regulators, local government and the local community as well. At national level, the Ministry of Lands, Environment, Forestry, Water and Mines (MINITERE) is the main actor among these stakeholders and is in charge of formulation of the national policies, laws and strategies for the water and sanitation sector. REMA falls under MINITERE and is responsible for making laws and regulations with regard to environment where sanitation is incorporated.

The main ministries that MINITERE cooperates with on sanitation are: Ministry of Health (MOH), Ministry in charge of finance and planning (MINECOFIN), Ministry of Education (MINEDUC), Ministry of local government (MINALOC) and MININFRA. RURA is a regulatory agency falls under MININFRA and is responsible for regulating telecommunications, electricity, gas, water, sanitation and transport.

Similarly at national level, there are donors that provide financial and technical support to the government. According to (MINITERE, 2006) donors can be divided into two parties:

i) Bilateral donors such as Germany, Austria, Belgium and Japan

ii) Multilateral donors include World Bank, FIDA, African Development Bank (ADB), Arab Bank for Economic Development in Africa (ADEBA), UNICEF and European Union (EU).

At the district level, the local government works with NGOs to support the local community in implementation and participation in their project.

However, though these institutions are in place, it is not easy to define the specific roles and responsibilities of each stakeholder. This is because the policy related to sanitation does not clearly delineate the boundaries of roles and responsibilities of each stakeholder involved in sanitation. Besides, there is quite some overlap that complicates the coordination and the evaluation of activities related to sanitation in Rwanda. For instance, even if there are three regulators for formulating laws and standards, there are no standards for wastewater effluents or any faecal sludge. The problem of accountability comes in when there is harmful discharge to the environment. However, according to a REMA employee of inspection department, the lack of country's standards in regard with wastewater monitoring is a major constraint.

The lack of clarity affects the sanitation sector in such a way that some necessary activities are not assigned to any stakeholder for implementation. For example, operation and maintenance (O&M) sub-activities such as emptying the septic tanks or pit latrines are left to the community yet there is no institution dealing with issues of O&M. When the septic tank or pit latrines are full, the communities hire private individuals to empty the pits. There is no common way known of emptying the septic tanks and pit latrines.

Some important stakeholders such as the private sector and Community Based Organizations (CBOs) are hardly recognised as formal stakeholders in the provision of sanitation. CBOs as grassroots organizations could play a constructive role when involved in the project (Otiso, 2003). They can help create a sense of project ownership and this may lead to the sustainability of the project. In Kigali, CBOs seem to be more involved in solid waste management than in human excreta management.

7.1.2 Research question 2: policy framework

RQ2: What is the policy framework that is currently governing water and sanitation in Rwanda?

The Water and Sanitation Policy of Rwanda (2004) is supported by several other national documents that include a focus on sanitation such as:

- Vision2020 (2000)
- The Economic Development and Poverty Reduction Strategy Paper (EDPRS) 2006
- Decentralisation Policy (2001)
- National Investment Strategy (2002)
- National Human Settlement Policy (2004)

All the documents recognize the serious lack of adequate sanitation facilities and the need for action to improve the current situation. Currently a National Strategy on Sanitation and Promotion of Hygiene which is being formulated by MINITERE in order to complement and implement the Water and Sanitation Policy of Rwanda.

Nevertheless, specific strategies towards sanitation in Water and Sanitation Policy are not determined in the policy. For example, the strategy for implementing the polluter pays principle is missing though the polluter pays principle is defined in the Water and Sanitation Policy. It is also seen that the notion of re-use and recycling is not addressed in the policies that focus sanitation in Rwanda. In sum, there is a comprehensive policy framework without a strategy for implementation.

7.1.3 Research Question 3: financial resources

RQ3: What is the financial mechanism (annual budget) allocated to sanitation within the water and sanitation sector in Rwanda?

The financial resources for the water and sanitation sector are managed by MINITERE which depends strongly on external sources. In 2004, for example, 98% of the total budget for rural water and sanitation project was from external donors (MINITERE, 2004a).

Financially, sanitation has been given low attention compared to water supply on a global level (WSP-AF and GTZ, 2006). This is also true for the Rwandan Water Supply and Sanitation sector, where sanitation is getting 10% of the total required investment every year compared to water supply which is getting 43 % (UNDP, 2006). There is also a need to of explanation why sanitation is getting less money according to the planning budget (see table 6.4, section6.2.2.1 on page 45).

Moreover, with the policy of decentralisation in place, the local government is expected to generate the funds and consequently finance sanitation projects independently. However, even though the responsibilities have been transferred to the district, the necessary transfer of financial resources has not. Districts of Kigali such as Nyarugenge do not have the capacity to mobilise funds and therefore still rely on the central government's budget.

7.1.4 Research question 4 and 5: Sanitation demand and service provision

RQ4: What is the level of sanitation demand in Kigali, particularly in slums areas of Kigali?

The sanitation systems on the ground are far from adequate as seen from Figure 4-3 (chapter 4.3.1, pg 23). As the report from (MINITERE, 2004b) shows, though 80% of Rwandese people have access to some form of sanitation facility, only 8% have improved sanitation. This implies that while the physical infrastructures may exist they are far from adequate. Furthermore, the residents who participated in the research felt strongly that sharing of sanitation facilities among many housing units (which is common in unplanned areas of Gitega sector) bring with it several problems, such as bad maintenance resulting into sanitation related diseases).

In view of the above therefore the necessity to upgrade and provide the right facilities immediately becomes evident, and it could be argued that great demand for improved sanitation exists: first, to improve existing facilities and, second, to increase access so as to minimize the sharing. Since the unplanned areas of Kigali continue growing the need to extent these facilities is therefore inevitable.

RQ5: What is the current level of service provision of sanitation in Kigali, particularly in slums areas of Kigali?

This question was not answered adequately by this study mostly because of lack of reliable data (different reports have quoted different values on coverage as explained in section 4.2.3). However for the whole Rwanda, as mentioned above, MINITERE has estimated that 80% of population has access to sanitation of some kind, though only 8% is according to standards of adequacy. There is no established service provision mechanism for collection of refuse since there are negligible facilities (both physical and institutional arrangement).

Despite the above, it was observed that the current service provision of sanitation in unplanned areas of Kigali has been made difficult due to mainly the limited space (where to build the sanitation facilities) and inadequate basic infrastructures like roads making it difficult to access septic tank or pit latrines for the removal of any faecal sludge.

7.1.5 Answer of Research question 6: Ecological Sanitation

RQ6: What are opportunities and challenges in planning and implementation of improved sanitation facilities including ecosan in slums areas of Kigali?

a) Opportunities

- The institutional framework is in place and provides a good basis for discussing the issues of the system of reuse and recycling in slums areas.
- the government commitment and will to improve the living conditions of the population is shown in the existing policies,
- The existence of different improved technologies creates a room of choosing the appropriate technology in the country, which can then be adopted in the unplanned areas of Kigali.

b) Barriers

- Generally the condition of sanitation facilities seem not to be considered in the action plan of the local government as other things (e.g. water supply) are prioritised more.
- Sanitation is always considered as private need while the water supply is a public need.
- Ecosan has its own disadvantages as every technology; incorrect operation of it would result to the failure of the technology. For instance if the urine is mixed with faeces, this will result in bad odour.
- Ecosan requires exhaustive education before implementation because it is not self-evident
- Cultural and religious beliefs concerning handling human excreta is identified as a barrier to ecosan

In summary, a formal institutional framework in Rwanda and policies that focus on sanitation recognize the lack of improved sanitation facilities in the country. However,

beside the lack of clarity within institutional framework which resulting into overlap of responsibilities, there is absence of specific strategies towards sanitation in the policies.

Even with a sanitation decade in the 1980s and the current year of sanitation, the sanitation sector is still globally receiving lower priority compared to water supply in terms of financial resources and project planning. This is also true for Rwanda. Though a high demand of sanitation is observed in unplanned areas of Kigali, not enough is being done to improve the situation. Several reasons could be identified for this. First that sanitation is far more costly than water supply. Second, that water supply is politically a more attractive investment and thirdly and perhaps most importantly, one could argue that sanitation remains to be considered as a private issue riddled with taboos instead of a common need that is intimately linked to public health and general development. Finally, this study shows that there is an urgent need to act on the current situation of the sanitation sector in Rwanda if MDG7, target 10 and 11 are to be achieved.

7.2 Recommendations

Based on the findings of this study, the following recommendations may be formulated:

- Identification and clarity of the roles and responsibilities for the stakeholders needs to be included in the Water and Sanitation Policy or in the National Strategy on Sanitation involved so as to overcome current gaps and overlaps.
- Inclusion of CBOs in sanitation policy formulation and implementation.
- The specific strategies such as standards (for example wastewater effluent standards in favour of monitoring for effluent discharge into the environment) and technologies (the ones aims of reuse and recycling of nutrients) to be adopted in Rwanda should be included in the National Strategy on Sanitation under study.
- The current condition of existing sanitation facilities in poor urban areas calls for alternative solutions to the existing sanitation facilities (flush toilets, pit latrines and biogas toilets) that are found in Kigali. Inspired by the development in ecosan technologies and the experience in rural areas of Rwanda, this study puts ecosan forth as an alternative solution. Nevertheless the barriers of ecosan such as cultural beliefs of handling human excreta and intensive education need to be taken seriously when implementing it. Therefore, it is recommended to conduct a research on the perception of the community towards ecosan technology and use and develop educational material before the construction of ecosan toilets.
- Further research is needed to assess the sanitation demand since sanitation proves to be business (for example it is possible to make money from pit emptying and faecal sludge). The assessment could be done by use of a household survey taking the aspects of willingness and ability to pay for sanitation and also the user's preferences since it has not been addressed in this study.
- This research was limited to the management of human excreta. Research on grey water management, solid waste management and drainage is recommended for slums areas of Kigali, in relation to the impact of lack of adequate sanitation on the environment.

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9 APPENDICES

APPENDIX 1: Interview questions

A. COMMON QUESTIONNAIRE FOR ALL STAKEHOLDERS

A.1 Stakeholders: Roles and responsibilities

- 1) Do you have any activities related to sanitation in urban areas of Kigali specifically in poor urban areas?
 - If yes, explain (What are the project are going on related to sanitation)?
 - If no why?

A.2 Priority given towards sanitation (financial issues, policy, demand, health)

➤ *Financial issues*

- 2) Do you provide any budget towards sanitation activities in poor urban of Kigali?
 - 2 .a) If yes, what are the sources of investment for sanitation project?
 - Have towns (particularly Kigali city council) or other organizations received grants or loans for sanitation from your institution?
 - If there is any existing project financed through those sources, how has it been financed?
 2. b) If no why not your institution is not investing in sanitation sector?
- 3) Do you have any difficulties to get financial resources for sanitation activities in poor urban areas? Explain?
- 4) If yes, what are your plans to overcome the financial difficulties in order to address the problem of sanitation in poor urban areas of Kigali?

➤ *Policy*

- 5) Are you aware about the policy that governs sanitation in Rwanda?
 - If yes, how do you incorporate your activities with the policy that is currently governing sanitation in Rwanda?
 - Are there the standards of constructing the sanitation facilities in Kigali? If those standards are not met, what are measures are taken?
 - Are there any regulations related to the management of sanitation facilities?

A.3 Opportunities and barriers of planning and implementation of existing sanitation facilities

- 8) Does the institution have sanitation activities in rural areas?
 - If yes explain
 - Is there any difference of working in rural areas than urban areas in Rwanda? If so what are the reasons?
 - If no why?

- Is there any sanitation problem in rural areas? If yes explain? If no why not?

9) Do you have any program to address sanitation problems in unplanned areas of Kigali city? If yes explain

-What are the barriers do experience in planning and implementation of sanitation facilities in urban areas? And what are the opportunities?

10) Have you considered the use of ecological sanitation (UDD toilet) as an option to tackle sanitation problems?

-If yes, what are the projects already implemented or envisaged to be implemented in Rwanda?

11) Are there any ecological sanitation projects that have been realized in both rural and urban areas in Rwanda?

- What are the barriers faced by implementing ecological sanitation? And what are the opportunities?

12) Are you aware that the government of Rwanda has committed to meet the assumption of Millennium development Goal by 2015?

-If yes, what could be your suggestions to improve the sanitation coverage and reduce health problems related to poor sanitation in unplanned areas of Kigali in order to meet the assumption on Millennium development goal by 2015?

13) How do you collaborate with other stakeholders in order to address sanitation problem in poor urban areas of Kigali?

B. Open ended interview guidelines at household level

1) How many people in your family?

2) What is your family income per month?

3) Where do you spend a lot of money? Explain why?

4) If you have any extra 10 euro to spend, how would you divide in terms of :

- Education
- Improved water
- Improved sanitation
- Food
- Others specify

5) Do you have a latrine at your home?

If yes, which type of toilet?

- Who has constructed your latrine?

6) If no why? And what do you use as a latrine?

- Do you have a public latrine near by your home?
- Do you use it regularly?
- If yes, how good are they (in terms of cleanliness and odour?)
- Do you pay for that public latrine?
- If yes how much do you pay?
- If no why?

- What is the problem that stops you from having a latrine at your home?
- 7) Do you know that some diseases are related to poor sanitation?
 - If yes, explain? and how do you know these?
- 8) Are you willing to contribute some amount of money to improve the current sanitation facilities at your household?
 - If yes, explain the reasons?
 - If no, why ?
- 9) If there could be a system of system of installing a toilet that separate human faeces and urine from your toilet, would you accept this system of toilet?
 - If yes explain?
 - If no, why?
- 10) Could you use human faeces or urine from your toilet as fertilizer in your land plot?
 - If yes explain
 - If no why?
- 11) What could you suggest to improve the current condition of your toilet at your home?

Note 3: Sanitation has a broad definition but in the focus of this research is concerning on **excreta management**. Other aspects of sanitation (grey water management, solid waste management and drainage) are not in the main scope of this research.

APPENDIX 2: Stakeholder sheet

Stakeholders	Name	Position	Emails
Central government institution level			
MINITERE	J.Marie Mushimiyimana	Director of water & sanitation Unit.	
	James Gasarasi	In charge of hygiene & sanitation (PEAMR project).	jgasarasi@yahoo.fr
MININFRA	Emile Baganizi	Engineer in infrastructures department.	Bepem1@yahoo.fr
MINISANTE	Philbert Cyiza	In charge of hygiene & epidemiology.	
Public institutions			
REMA	Remy Duhuzumuremyi		dunoremy@yahoo.fr
RURA	Anita Gaju	Director of water sanitation.	anitagaju@yahoo.com
Local government			
Kigali city council	Kalim Zirimwabagabo	Engineer in inspection department	-----
	Ruben Ahimbisibwe	Director of Inspection Department.	-----
	Ephrem Rusurabeza	Engineer.	
Nyarugenge district	J.de Dieu Nyagahinga	In charge of Health Public & hygiene.	jdnyagahungu@yahoo.fr
	Fiston Ndikumana	In charge of Environment & Natural Resources.	ndikumanafiston@yahoo.com
Gitega Sector	Dalius Kankiriho	Coordinator of the Sector.	
International			

organizations/Donors			
WB	Mwanafunzi Bruno	Water sanitation specialist.	& bmwanafunzi@worldbank.org
	Nzamura baho Fernand	Consultant.	
EU	Arnaud DEMOOR	2 nd Secretary (Rural Development & Decentralisation)	Arnaud.demoor@ec.europa.eu
UNICEF	Phocus Ntayombya	Project Officer	pntayombya@unicef.org
	Charles Kubwayo		kubwayocharles@yahoo.com
Non governmental organizational/Civil society			
SNV	Dr. Shirley Randell AM	Senior Advisor.	srandell@snvworld.org
	Julienne Uwamariya	Portfolio Coordinator.	juwamariya@snvworld.org
RCVP	J. Claude Mugunga	V/ce President.	-----
FEA	Sylvain Uwwamahoro	Sociologist of the Project	-----
Local community			
Households	Nyirangurube Cecile Karumba Bakende Mukanyarwaya Marie Therese Havugimana J. Claude		-----

APPENDIX 3: Roles and responsibilities of stakeholders involved in Water and Sanitation Sector

ORGANIZATIONS	ROLES AND RESPONSIBILITIES
Central government	
MINITERE	<ul style="list-style-type: none"> - Policies, laws and strategies formulation in water and sanitation sector -Organize, planning and monitoring of activities of water supply and sanitation
MININFRA	<ul style="list-style-type: none"> - Policy making process - Development of sanitation guidelines and inspection for buildings in construction
MOH	<ul style="list-style-type: none"> - Codification of health standards in the area of water and sanitation -Implementation of Hygiene programme
MINECOFIN	<ul style="list-style-type: none"> - Looking for the funds - Allocate National budget to the sector - Monitoring and evaluation of the use of public funds
MINALOC	<ul style="list-style-type: none"> - Regular inspection of sanitation infrastructures - Decentralization and mobilization of participation of the population in grassroots communities during the implementation of water and sanitation sector especially in rural areas
MINEDUC	<ul style="list-style-type: none"> - Promotion of sanitation and hygiene in the schools
MIGEPROF	<ul style="list-style-type: none"> - Promote woman in participation of decision making in water and sanitation - Encourage woman to participate in water and sanitation committees
RURA	<ul style="list-style-type: none"> - To ensure services are provided according to required standards - The agency is charged with regulating water and sanitation sector, through regulating tariff levels to prevent monopolistic exploitation by utilities and tariff structures to promote equity objectives. - Monitor performance in the sector and advice government on matters pertaining to the sector
REMA	<ul style="list-style-type: none"> - Set up environmental laws and regulations - Monitoring and Compliance - Define and implementation of standards for latrines

NGO's	
RCVP	<ul style="list-style-type: none"> - Improve the knowledge of the community through different training of local leaders - Strengthening the existing development structures and facilities such as sanitation facilities
SNV	<ul style="list-style-type: none"> - Capacity building by training local authorities and local NGOs - Participate in planning, implementation and evaluation of water and sanitation project
FEA	<ul style="list-style-type: none"> - Provision of water and sanitation for improving living standards in rural areas - To finance sub projects in rural areas for water and sanitation - Promotion and construction of ecosan toilet in public institutions
Local government	
KIGALI CITY COUNCIL	<ul style="list-style-type: none"> - Inspection of sanitation systems and hygiene for hotels and big buildings - Participation in policy making process - Provides technical support to the district on municipal sanitation
NYARUGENGE DISTRICT & GITEGA SECTOR	<ul style="list-style-type: none"> - Ensure that everybody has access to clean water and sanitation facilities - Implementing the requirement of the policy at the lowest level²⁰ - Mobilization, sensibilisation of the behavior change programme and on how to use sanitation facilities ; this is done in collaboration with Gitega sector
Donors	
WORLD BANK UNICEF	<ul style="list-style-type: none"> - Support government in implementation of sanitation facilities - Mobilizing funds and contributing in financing - Support decentralized entities in management and training
Community	
Households community	<ul style="list-style-type: none"> - Construction of latrines - Management of facilities through WS&S committees or cooperative Construction of latrines - Management of facilities in committees or cooperative

²⁰ Darius Kankiriho, the coordinator of Gitega sector

APPENDIX 3: Roles and responsibilities of stakeholders involved in Water and Sanitation Sector (continuous)

MINITERE

- The water and sanitation sector is under the Ministry of lands, Environment, Forestry, Water and Mines (MINITERE) which is responsible in the development and formulation of policies concerning the sector. The department of water and sanitation in MINITERE is assigned with the following duties²¹:
 - To organize the activities of the sector;
 - Planning and implementing of water and sanitation projects;
 - Carrying out of inventory of the existing water and sanitation infrastructure,
 - Implementing of government policies related to the sector

According to the unpublished proposal of National strategy on sanitation and promotion of hygiene, MINITERE should provide funds to rural and urban in the water and sanitation sector. MINITERE has been recognized that sanitation is lagging behind other sector that is why National strategy on sanitation and promotion of hygiene has been put in place. MINITERE should identify appropriate technology and construct public latrines where it is necessary. In addition to that MINITERE should construct a pilot house with ecosan latrine²² inside the house.

MININFRA

This is the Ministry of Infrastructures in charge of public infrastructures like roads, housing and energy provision as well as telecommunication. Ministry of infrastructures have only responsibilities on estate building (Big house of the government) said by Ir Emile Baganizi, director of Infrastructures Department.

Currently they do not have any waste water treatment plant in estate house but there is a plan of construction a central sewage system for all estate houses. The Ministry of Infrastructures does not have any project in poor urban areas because their responsibilities are limited to national level; the other responsibilities are mandated to the Kigali city said Baganizi. However in the unpublished national strategy on sanitation and promotion hygiene on May 2007, Ministry of Infrastructures should provide funds to construct public latrines in Kigali and the source of the funds is coming from the government budget. Ministry of Infrastructures should also participate in the development of sanitation guidelines for buildings in construction and the MININFRA should set the standards for latrines.

²¹ James Gasarasi, in charge of sanitation in MINITERE

²² UD latrine

MOH

This is the ministry of health in charge of public health. It has different responsibilities related to water resources management such as: ensure the quality of drinking water and to promote hygiene methods in the community in order to fight with diseases related to sanitation. Apart from those responsibilities, it has to provide environment health service to every citizen. The main priority of MOH towards sanitation sector is to make sure that every citizen has sanitation facilities that meet hygienic condition said Mr Cyiza, in charge of Hygiene in MOH. MOH defines these facilities as pit of at least 10m, aesthetically constructed, clean and with well roofing. In Rwanda especially in slums areas there found different type of toilet especially unlined pit latrines shared with 3 to 4 houses, bad smell, without a roof nor a proper construction house. This is why in different reports we found that 80% with latrines but only 8% meet hygienic condition²³.

MINALOC

It is the ministry in charge of local governance and social affairs. This Ministry has to implement the decentralization policy that aims to make sure that the local government is closer to the community in decision making process of the project. It has to ensure a good collaboration between local government and community in development of different projects. In Minaloc, it is found different programme that takes into account water and sanitation such as:

-HIMO is a labour intensive infrastructure development programme that has been developed in 2003, and this has water and sanitation component. This programme is very active in rural areas.

-UBUDEHE : This is local Collective action sometimes called Area Based Initiatives (ABI) and is a Rwandan tradition action since pre- colonial period. It has been institutionalized in 2001 by the government of Rwanda. It is based on working together as a community in order to resolve the problems of rural dwellers. This Rwandan tradition action consolidate the unity amongst the community because with joining forces and working together they solve the problems that could not solve by one family even those vulnerable families are also targeted like old and widow. This program has the mandate to build human and financial capacity at the lowest level and is based in MINALOC as said above.

Donors supports UBUDEHE like construction of latrines units, where by groups of beneficiaries are involved in doing the work.

MINECOFIN

This is the ministry in charge of finance and planning. MINECOFIN has to allocate national budget among different sectors. Water and sanitation has been also taken into account. Monitoring and evaluation the rational use of public funds is under MINECOFIN. The budget is given to the local government and managed by them. Water and sanitation has been given priority due to their advantages.

²³ CYIZA Philbert, in charge epidemiology

MINEDUC

This is the ministry in charge of public education. It has to make sure that water and sanitation lesson is integrated in curricula of the school from the primary schools to higher learning institutions. The provision of sanitation facilities like toilets and hand washing facilities should be in place and be maintained. It is believed that if the children are aware on the importance of having adequate latrines and the role of hand washing as a tool of prevent sanitation and water related diseases, those children could vehicle the message to their home. Monitoring and evaluation of the use of latrines must be done by the MINEDUC.

MIGEPROF

This is the ministry of gender and family promotion. MIGEPROF has women representatives from ministry level up to grassroots. This is in line with MDGs of woman promotion at decision making at different levels. This Ministry establishes policies, guidelines, regulations, promotion programs, monitoring and evaluation, capacity building around gender and women's promotion. This ministry has also to ensure that men and women have equal rights to promote education of water and sanitation together with the Ministry of education.

REMA

Rwanda Environment Management Authority (REMA) which was established in 2005 to enforce the law is also still young with few staff who are themselves new to the task of enforcing environmental standards. REMA is the new institution and it is in charge of making laws and regulations. The environmental impact assessment should be approved by REMA before implementing any project. However inspection is very difficult to the team in this institution due to insufficient staff. Normally inspection is done before and after constructing the buildings. Another problem is that before there was no any sanitation plan for Kigali city and REMA have not published standards and guidelines for discharging wastewater in the environment, which means, they do not have legal instruments for law enforcement said by Ir Duhuzumuremyi, R, in charge of inspection. They are enforcement but they do not have the law. Sometimes they give instructions to be followed without any regulation in place.

SNV, Netherlands Development Organization, is dealing with hygiene and sanitation in Rwanda. SNV is involved in social mobilization and is giving support in education training on hygiene awareness. SNV do not provide funds for construction of infrastructure; however SNV provides human resources to support local government in hygiene awareness. In addition to that SNV should play a role of mediator between local government and local community said by Mrs Uwamariya Julienne, in charge of project.

The main activities are concentrated in rural areas especially in South Province of Rwanda. At the district level they form a Joint action forum with other stakeholders and they elaborate strategic plan of district n line with the action plan of every district. SNV support local NGO and associations to develop their project before being presented to - the donors .SNV give advices to those local NGOs and associations how to help local community to have good hygiene behavior and proper latrines at their household. The

main stream issues should be addressed in each project such as gender, protection of environment and awareness on hygiene and proper sanitation with emphasis on ownership of the infrastructures.

RCVP –Rwanda Village Concept Project

This is local association of student of National University of Butare. The RCVP has its main mandate of improving live standards of the vulnerable community in different sector such as health, hygiene and sanitation said by Mugunga Jean claude, Vice president of RCVP. This association is involved in construction of improved latrines (VIP) in rural areas especially in South Province of the country and awareness on hygiene and how to use those improved latrines, recycling of solid waste and awareness on how to use solid waste as fertilizer .VIP latrines are constructed in rural areas in Mpungwe village (Huye sector) and they are public (or shared latrines) and one latrines can be used by 2 household. RCVP has the responsibility of empowering women by helping them to form women associations to effectively manage their own and the natural resources of their environment.

RCVP has the main duties in Huye district:

- * Construction Ecological sanitation and Ventilated improved pits for vulnerable groups in the Villages

- *Training of local leaders.

- *Interactive sessions in target community including games and quizzes.

- *Placement of hygiene promotion posters in the area

Improving general sanitation situation through the construction improved latrines(UD latrine and VIP)

FEA-Water and Sanitation Fund(Fond de l' Eau et Assainissement)

This water and sanitation fund (Fond de l'Eau at d' Assainissement). FEA has been approved by the government of Rwanda in 2005. The main objective of this project is to reduce poverty, increase the productivity by providing adequate water supply and sanitation to the population of South Province (Ex Gikongoro and Ex Kibuye). FEA is financed by Austria government through ADA (Agence Autrichienne de Development).

KIGALI CITY CONCIL

Kigali city council is the one that is in charge of making a plan of sanitation facilities of Kigali city and should make it available to different districts. The city strategic plan should have priorities on different aspects such as: environmental and health service especially sanitation facilities in order to preserve and protect natural water resources. In order to comply with environmental protection law, the Kigali city council should set the standards and guidelines of wastes disposal. The city mission is to keep city clean and healthy by ensuring efficient and effective removal and safe disposal of solid and liquid wastes from all premises and public spaces so as to create an enabling environmental and recreation said by Karim (MVK).

After recognition of the importance of sanitation issues which related directly to the health of people in collaboration with the government, Kigali city council has a new master plan under study which must be finished at the end of year 2008.

This master plan will be divided into two parties; one part for sanitation and the other part for urban drainage. It is believable that this master plan will be a foundation to build on because since Kigali has been known or discovered as capital city by 1907 there do not have any sanitation master plan.

With regards to the high demand of sanitation facilities from different institutions and household, the Kigali city has now adopted two approaches to address that problem:

- ✓ Awareness on hygiene and sanitation by giving different workshop on the need of participation of the public in waste management.
- ✓ To allot service delivery role to the private sector especially the informal sector.

By using these two different approaches it has been seen an improvement on sanitation issues such as:

- Formation of different associations for waste management at household level,
- Some big institutions have been asked to build themselves a micro sewage treatment plant.
- New developed estate is required to show a sanitation plan which has a sewage treatment system that is managed locally by the beneficiaries.

It has been seen that Kigali city is not yet involved in searching the solutions of poor urban areas of this city now it is concentrated on the developed new estate and big institutions²⁴.

RURA

The Rwanda Utilities Regulatory Agency is a multisector one with the mission to regulate the following utilities sectors telecommunications, electricity, water, the removal of waste products from residential or business premises; etc. RURA has been established on 30th October 2002 according to Law no 039/11.02/01 of 13th September 2001. RURA is a regulatory body for public utilities as well as sanitation is one of the departments of this Regulatory Body. According to Mrs Gaju, director of water and sanitation department sanitation, sanitation has been recognized as a sector always behind the other sector especially in Kigali city in terms of infrastructures, management of sanitation (who is managing sanitation in Kigali), specialist or experts in the sector and the most difficult problem is to find data on sanitation in Kigali. RURA a regulatory body have main responsibilities of

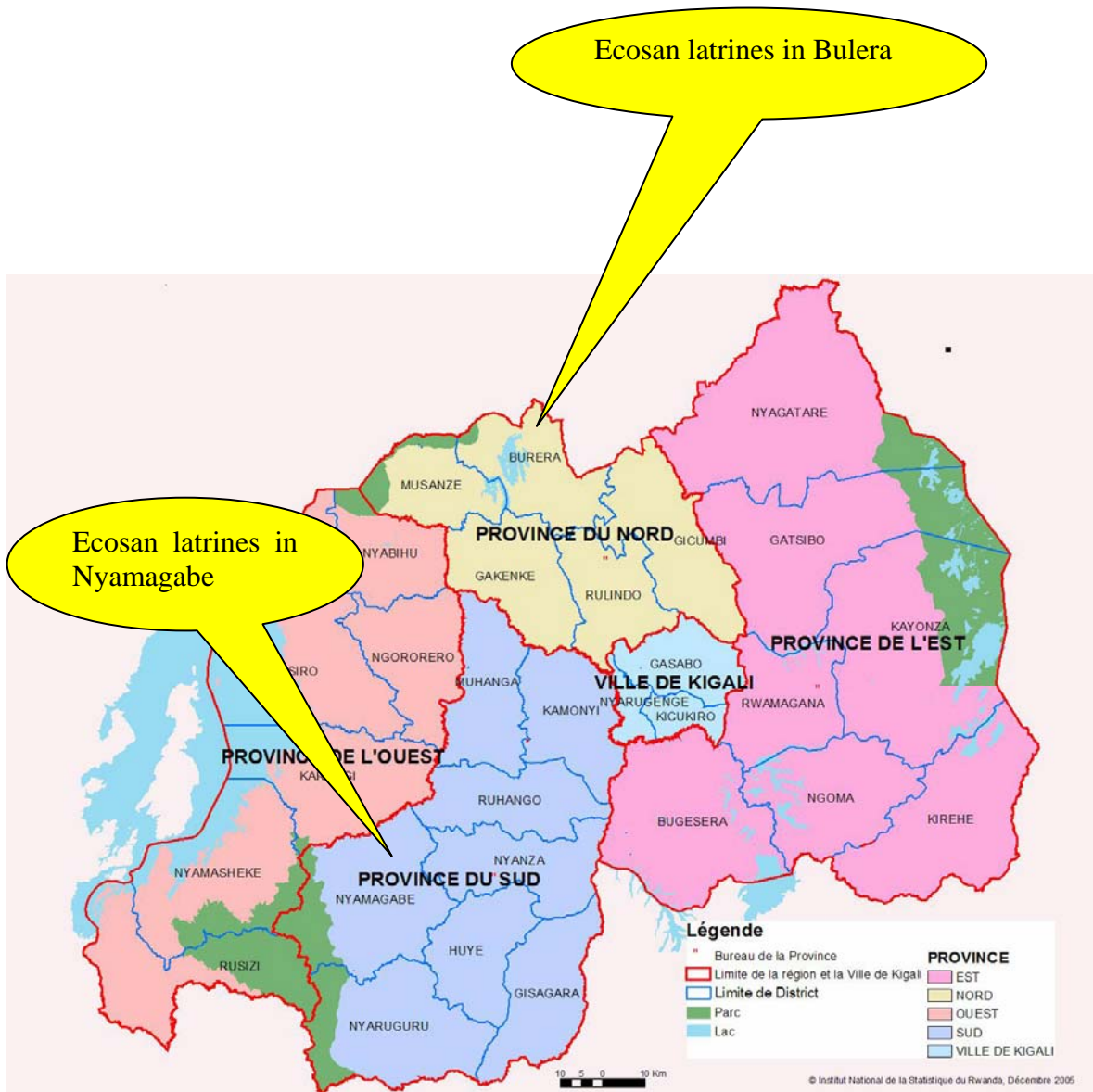
- ensuring that services provided meet the required standards;
- ensure that compliance by public utilities with the laws

RURA is a National Public institution endowed with a legal status and management autonomy.

As a Regulatory Agency at National level, it is not easy to define their responsibilities in sanitation sector because Kigali city council is the one that has the main responsibility in sanitation sector said by Mrs Gaju. It has been recognized by the author that RURA has a very low influence in sanitation sector as long as sanitation sector do not have a specific law unless a strategic plan of sanitation under study. In its article 5 of the law establishing this regulatory Agency, there is no specific responsibility in sanitation sector. However this Regulatory Agency participates in formulation of any policy at National level.

²⁴ Interview with Mr Karim, engineer in inspection department

APPENDIX 4 : Ecosan toilets(UDD toilets) visited in Rwanda



APPENDIX 5: Population served by Water and Sanitation Programme in Rwanda

PROVINCE	PROJECT	DISTRICT	INFRASTRUCTURES BUILT	POPULATION SERVED			
				2006	2007	Total	
1. North Province	PNEAR	Musanze	AEP mutobo base		70066	70 066	
		Bulera	AEP Mutera	38 562		38 562	
		Gicumbi	AEP Giti		18637	18637	
			1 Biogas		680	680	
			1 water tank		680	680	
			1 public latrine		680	680	
		Rulindo	AEP Tumba		8320	8302	
		MINITERE	Musanze	AEP Mutobo haute	60000		60000
		UNICEF	Bulera				
		2. West Province	PNEAR	Karongi	100 amenaged sources	87000	
Rutsiro	2000 household latrines				10000	10000	
Ngororero	1 water tank				430	430	
	2 public latrines				480	480	
Rubavu	2 water tank				7220	7220	
	1 public latrine				430	430	
	1 Compostage				240	240	
CICR	Rutsira			AEP Gasasa	2100		2100
	Ngororero			AEP Kabaya	3000		3000
3. East Province	PNEAR			Rwamagana	AEP Muhazi		14879
			AEP Rwamagana		22416	22416	
			2 water tanks		1110	1110	
			2 public latrines		870	870	
			1 compostage		240	240	
		CICR	Rwamagana	AEP Bunogonogo	7000		7000
			Ngoma	AEP Kigarama	15000		15000
		Fondation Cliton	Kirehe	AEP Rwinkwavu	4000		4000
		4. South Province	FEA	Nyamagabe		105000	105000
			CICR	Muhanga	Ndiza sources	3600	3600
	Huye		AEP Maraba	20000	20000		
5. City of Kigali	Rwanda	MVK	AEP Nyabarongo		500000	500000	
	CICR	MVK	5 sources	3500		3500	
				344762	661360	1006122	

Source: (WSP, 2007)

APPENDIX 6: Donor interventions in drinking water supply and sanitation sub-sector for rural areas of Rwanda

N°	Project Title	Donor	Type of funding	Amount Frw (10 ³)	Amount in Euro (€)(10 ³)
1	Rural Water Supply and Sanitation	IDA	Loan	8 240 000	11413
2	Rural Water Supply and Sanitation	FIDA	Loan	4 600 000	6371
3	DWS to 8 Communes around Kigali	RFA	Grant	1 104 000	1529
4	DWS to Bugesera-East	UE	Grant	6 845 860	9482
5	DWS Gikongoro and Kibuye centers	Autriche	Grant	1 320 500	1829
6	Water, Environmental Sanitation & Hygiene Education	UNICEF	Grant	2 060 000	2853
7	Strengthening DWS to Bugesera-South/Karenge	UE	Grant	10 450 000	14474
8	Institutionnel Support to DEA	BADEA	Grant	132 000	183
9	Rural DWSS Programme – Launching Phase	BAD	Grant	6 757 830	9360
9	Rural DWSS Programme – Launching Phase	BAD	Loan	3 003 480	4160
10	WSS Gabiro	Rwanda	Internal	211 000	292
11	Installation des Réfugiés	PNUD	Grant	480 000	665
12	Water rainfall Collection	Rwanda	Grant	30 000	42
TOTAL				45 234 670	62652

Source: (MINITERE, 2004a)

Additional information (www.bnr.rw/accessed on 6th April 2008)

Exchange rate in 2004: 1euro=721.95RWF

Inflation rate=14.5% (2004)

DWS: Drinking Water Supply

DWSS: Drinking Water Supply and Sanitation

DEA: Direction de l'Eau et de l'Assainissement (Water Supply and Sanitation Department)