Ecological Sanitation as a Water and Environmental Conservation Technology Option: The case of slum communities in Kampala

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Abbreviations

ATPS	Africa Technology Policy studies Network
BOD	Biological Oxygen Demand
COD	Carbon Oxygen Demand
DWD	Directorate of Water Development
EC	Electric Conductivity
EcoSan	Ecological Sanitation
EST	Environmental Sanitation Technology
FGD	Focus Group Discussions
GDP	Gross Domestic Product
GNP	Gross National Product
GoU	Government of Uganda
HH	House Hold
IDI	In-Depth Interviews
IRC	International Relief and Care
KCC	City Council of Kampala
KDS	Kampala Declaration on Sanitation
KIIIG	Key Informant In-depth Interview Guide
KSMP	Kampala Sanitation Master Plan
LVEP	Lake Victoria Environmental Program
MGD	Millennium Development Goals
MISR	Makerere Institute for Social Research
MoES	Ministry of Education and Sports
MoFPED	Ministry of Finance Planning and Economic Development
MoH	Ministry of Health
MoLG	Ministry of Local Government
MoWLE	Ministry of Water Lands and Environment
NARO	National Agricultural Research Organisation
NEMA	National Environment Management Authority
NGO	Non-Governmental Organisation
NPK	Nitrogen, Phosphorous and Potassium
NWSC	National Water and Sewerage Co-operation
PEAP	Poverty Eradication Action Plan
PMA	Plan for Modernisation of Agriculture

QAS	Qualitative Analysis Software
RWSS	Rural Water Supply and Sanitation
SIP	Strategic Investment Plans
SWAP	Sector Wide Approach
UGX	Uganda Shillings
WRM	Water Resources Management
WSC	Water and Sanitation Committees
WSP	Water and Sanitation Program
WSS	Water Supply and Sanitation
WUA	Water User Association
WUC	Water User Committees

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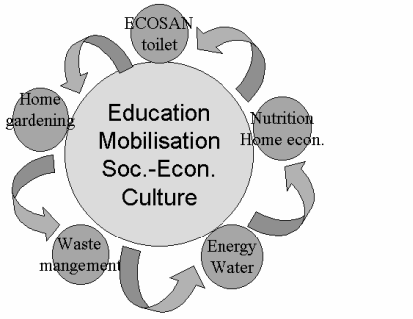
Abstract

This study explores Ecological Sanitation (EcoSan) as a Water and Environmental Conservation Technology (WECT) for slum communities in Kampala, Uganda. Information presented in this paper results from a research carried out in five slums of Kampala city in Uganda and was funded by the Africa Technology Policy Studies Network (ATPS). The major problem addressed by this study is that close to 800,000 persons in the urban slum of Kampala are facing deplorable water and environmental problems. This coupled with the increasing density of population in these slums and the swampy geological nature of Kampala, use of pit latrines and flush toilets alone cannot provide city dwellers with a clean and hygienic environment. Dry (EcoSan) toilets are then considered a viable option. Unfortunately, there are other hypothetical problems related to social-economic status and attitudes of the intended users. This study was therefore conceptualised with an aim of exploring the potential of EcoSan technologies as an alternative water and environment sanitation technology for the slum dwellers in Kampala.



A sample of 329 respondents selected through a mixture of cluster, simple random and purposive sampling from across all the five divisions of Kampala was used in this study. The results of the study point out strategies that are required to empower vulnerable poor communities with cost sharing skills to run communal water sources and waste management. Results also bring out how implicit attitudes and tacit knowledge must be translated into shared experiences and explicit knowledge, resulting into effective community slum structures for implementing EcoSan technologies. Specifically, results point out positive and negative effects of the current water and sanitation policies, management of water resources, domestic waste disposal and use, and enforcement of hygiene, among other factors.

Conclusions obtained from this study are that indeed EcoSan technologies are necessary, especially in Kampala if urban centres in Uganda are to achieve the set Millennium Development Goal Indicators for water and sanitation before the target year of 2015. This paper also concludes that for EcoSan technologies to effectively take root, there is need for sensitisation and education of masses regarding adoption of EcoSan technologies. The study recommends how EcoSan programmes can be implemented through community participation, considering gender perspectives, cultural background as well as the socio-economic situations of the vulnerable poor groups.

Chapter One

Introduction

1.1 Background

Ecological Sanitation (EcoSan) is a closed-loop system, which treats human excreta as a resource. Using the technique, faecal materials are separated from urine, and then the excreta are processed locally on site until they are free of pathogens. Thereafter the sanitized excreta may be recycled into the agricultural soils as fertilisers. By closing nutrient loops, environmental cleanliness, soil fertility and crop yield per unit space may be improved. The EcoSan technique, therefore, replenishes soil nutrients, and improves sanitation & health of communities while conserving the environment. In turn, EcoSan can contribute to poverty alleviation. Unfortunately, the technique is not popular and is likely to face resistance due to social cultural beliefs, knowledge and attitudes of the local communities.

1.2 The Research Problem

Water shortage and critical environmental degradation are affecting Kampala city just like many other developing world cities. It is well documented that only close to 60% of urban dwellers in Uganda can access safe clean water. This means that two out of five people in Kampala lack access to safe water (Kwagala, 2002). Slum communities of Kampala are the worst hit by the problem (Agarwall et. al., 1999). Water shortage, poor health, sanitation and hygiene problems in Kampala slums are thought to be associated with inadequate town planning, deficient political framework and absence of participatory planning among others (Kwagala, 2002).

To solve such problems, town planners (officials responsible for water, housing, sanitation and health) need to have innovative and integrated programs towards solving the water and environmental sanitation problem. One such innovative approach is ecological sanitation (EcoSan). EcoSan technologies take the principle of environmental sanitation a step further: according to Esrey (2000a), Ecological Sanitation (EcoSan) means keeping our surroundings (the environment) clean and safe and preventing pollution. It is a type of sanitation in which human waste is separated into its solid (faecal) and liquid (urine) parts. After this separation, the pathogens within the human waste can now be destroyed and the waste used as soil additives, due to their richness in crop nutrients. Therefore EcoSan has advantages over the traditional sanitation approaches of drop and keep (latrine) and the drop and flush (W C). The latter wastes water, while the former is known for spreading sanitation-related diseases like cholera and dysentery. A city like Kampala, that has the majority of its inhabitants

living in slum settlements, requires EcoSan type of sanitation because this system takes care of improved sanitation while conserving water. Unfortunately there is no clear data on which to base the establishment and successful implementation of EcoSan technologies. It is therefore against this background that this study was designed to establish the potential of EcoSan as a water conservation and cleaner sanitation option for Kampala slum communities.

1.3 Justification

The strength of this study lies in its focusing on identifying the issues that portrayed EcoSan as problematic. The study highlighted major obstacles related to coordination and cooperation among water and environmental sanitation stakeholders. The results of this study identified the complexity of acquiring information and implementing specific activities for adoption and use of ecological sanitation as a water saving and environmentally sound water technology and its associated practices. The recommendations of this study provide evidence-based information to water and sanitation stakeholders on enabling water and sanitation policies, which could lead to successful implementation of EcoSan technologies. This study was important since the results will contribute to better water and sanitation policies. The study has also contributed to the available knowledge pool about EcoSan technologies. In the long term, results of this study will contribute to the sustainable use of water and reduction of environmental pollution, and hence contribute to poverty alleviation, which is the overall goal of the government of Uganda.

1.4 Aims and Objectives

1.4.1 Aim

This study was aimed at assessing the potential for application of EcoSan technologies as a water and environmental sanitation option for slum communities of Kampala, Uganda.

1.5 Specific Objectives

The specific objectives of this study were to:

1. Document the current water and environmental sanitation problems in Kampala.
2. Explore the water and sanitation policies and planning framework within which the transfer and adoption of EcoSan technologies could be implemented.
3. Assess social, economic, cultural, and physical infrastructure issues that may affect the use of EcoSan technologies among slum communities of Kampala city.

1.6 Expected Outcome and Impact

This research has opened up fresh ground as far as research in developing countries is concerned. Therefore information gathered through this research will highlight the importance of ecological sanitation (EcoSan) as an environmentally sound technology, hence adding value to existing knowledge. The importance of EcoSan as an innovative philosophy based on an overall view of

material flows as part of ecologically and economically sustainable wastewater management systems tailored to local needs will be of great value to policy makers as they make policies on water and environmental sanitation.

This study will also provide water and sewerage service providers with information that is of assistance in negating the contamination of water bodies resulting from uncontrolled discharge of poorly treated wastewater. This is possible through nutrient loops closure, effective contaminant and pathogens destruction and reduction. The study will therefore make significant contribution to resolving the water crisis.

To the beneficiaries of the technology (communities in peri-urban areas), the study's contribution will be multi-sectoral, since it offers an opportunity for: preserving the fertility of our soils (agriculture); improving public health by minimizing introduction of pathogens from human excreta into the water cycle; promoting recycling by safe, hygienic recovery and use of nutrients, trace elements, water and energy; and conserving resources through lower water consumption, the substitution of chemical fertilisers, and the minimisation of water pollution. The savings achieved through healthy living cannot be over emphasised.

The majority of the urban poor live in slums and for the case of Kampala such areas are mainly in wetlands, which are prone to flooding and are characterised by poor sanitation. This means that the conventional pit latrines of drop and store contaminate the water sources and worsen the sanitation situation. EcoSan technology will therefore be beneficial to the communities since it will transfer knowledge to them regarding better handling and management of human wastes.

The results of this study will be useful to Kampala City Council and government as it contributes to clearer policies and guidelines regarding the promotion of EcoSan. Indeed, the government under the Ministry of Health and Kampala City Council have started on the promotion of EcoSan facilities. However, this was not based on research but rather on what they thought could work. Despite good health and sanitation objectives, it has not faired well. The need for this research is very essential in filling this gap.

In terms of policy linkage, the results contribute to an informed policy on the water and sanitation sub-sector. This will be based on recommendation of a bottom-up policy revision through community involvement. The results will also help in the design and formulation of informed health, water and education projects and programmes.

Chapter Two

Literature Review

2.1 Policy Perspective of Water and Environment in Uganda

Water, environmental sanitation and hygiene have been of high priority on Uganda's agenda. For example, since 1996, 10 years after the end of civil strife in the country, the government has been struggling to reform the water and sanitation sub-sector (WSP, 2003). In 1998, the government demonstrated its commitment to reaching the Poverty Eradication Action Plan (PEAP) targets by reforming the water and sanitation sector. According to Collignon et. al., 2000, the Directorate of Water Development (DWD) produced a strategy to ensure that the water supplies and sanitation services are provided with increased performance and cost effectiveness, and to reduce the government's financial burden without compromising the provision of equitable and sustainable services.

The reform process started with strengthening the regulatory framework, and provides a basis for cost recovery through the introduction of the 1999 Water Policy. Next was the development of a comprehensive sector strategy, based on sub-sector studies in the areas of: rural water supply and sanitation, urban water supply and sanitation, water for production and water resources management (Rural studies, 2000; Urban studies, 2001). The sub-sector studies provided recommendations for sector reform, and provided consensus on the importance of the Sector-Wide Approach (SWAP) (MoLWE, 2001).

Collignon et. al., (2002) reveal that in Africa, the water sector reforms mostly affect the urban water sub sector. This is true for Uganda. For example, by end of year 2003, there was consensus that private sector participation would increase the efficiency of water supply and sanitation (WSS) service delivery. It is less clear, however, whether the urban WSS management models selected are optimal, or whether the level of risks associated with these models is acceptable, given the limited scope for change once the management contracts are in place. Both Kahangire et. al., (2001) and Collignon et. al., (2002), highlight the specific concerns as including the potential for genuine competition in the narrow market that exists in Uganda, and the possibility that the reforms will have negative impacts on small-scale independent providers of urban WSS services, especially those serving the urban poor in the slums of Kampala (Moller, 2001; McGee et al., 2002)

2.2 Water and Environmental Sanitation in the Context of Millennium Development Goals (MDGs)

This research is within the framework of goal 7 of the Millennium Development Goals, the purpose of which is to ensure universal environmental sustainability (Allen et. al., 2002).

Figure 1 shows a schematic presentation of goal 7, targets 10 and 11, and their monitoring indicators 30, 31 and 32. Target 10 aims at halving the proportion of people without sustainable access to safe drinking water and sanitation by 2015. Its monitoring indicator 30, is the proportion of population with sustainable access to an improved water source, urban and rural. On the other hand, target 11 provides that by 2020 the world should have achieved a significant improvement in the lives of at least 100 million slum dwellers. This target, measured through indicator 32, includes the proportion of households with access to water (within 200 metres) and a connection to a sewer. Water access and sewerage connections are proxies of secure tenure, as otherwise no such investments would be made, and are an indication of better living conditions (IRC, 2004).

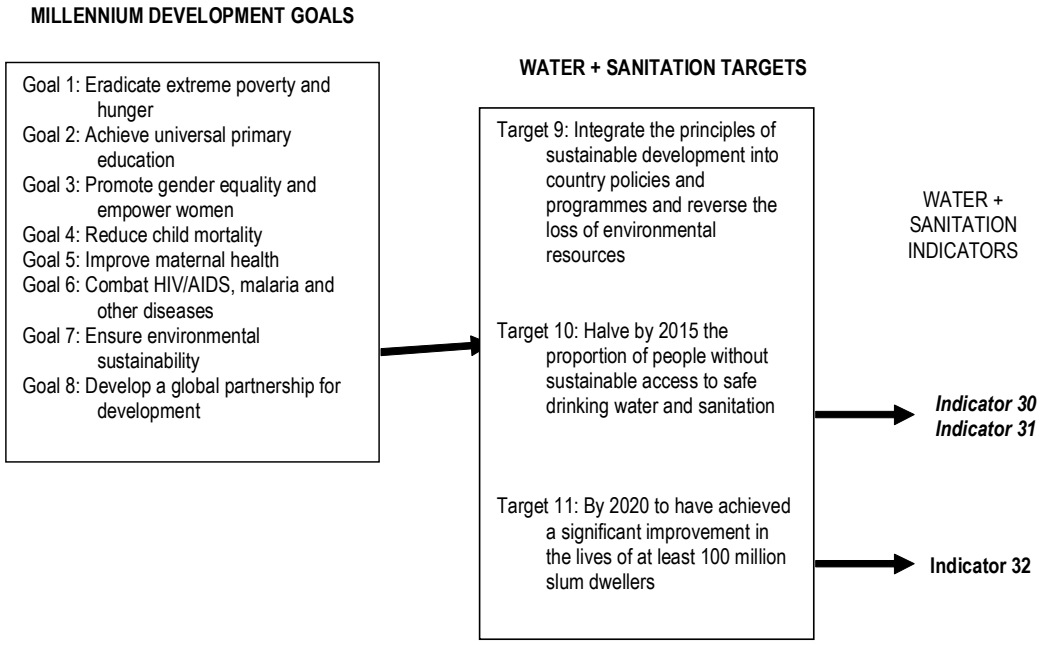


Figure 2.1: Schematic presentation of water and sanitation within the MDGs International Water and Sanitation Centre and KfW (2004)

Uganda's commitment to the MDGs is clear. For example, Uganda's plan sets out clear objectives to guide development policy in Uganda, such as the provision of universal primary education, safe **drinking water**, and the eradication of mass poverty by 2015. Thus, Uganda has been at the

forefront of the move by the international community to draw up strategies for tackling poverty (GoU, 2001). The fast approaching MDG deadlines for goal no. 7 implies that it cannot be the task of government alone but a collective effort between government, the private sector and the civil society. Further application of environmental sanitation technology (EST) for water and ecological sanitation can offer an opportunity for Uganda to achieve targets 10 and 11. It is from this context that we are reviewing the concept of ecological sanitation.

2.3 State of Water and Environmental Sanitation for Urban Kampala

Water shortage and critical environmental degradation are affecting Kampala city just like many other developing world cities. Only close to 60% of urban dwellers can access safe clean water. This means that two out of five people in Kampala lack access to safe water (Kwagala, 2002).

The slum areas of the City Council of Kampala (KCC) are the worst polluted and disease ridden habitats of Uganda (Agarwall et. al., 1999). A study carried out by WSP, 2000, revealed that sewage discharges from centralised waterborne collection systems pollute surface waters, and seepage from sewers, septic tanks and pit toilets pollute groundwater. Conventional sanitation technologies based on flush toilets, sewers, treatment and discharge cannot solve these problems in urban areas, which lack the necessary resources such as water, money and institutional capacity. The range of policy options in sanitation should be widened to include ecological alternatives (NEMA, 2000).

2.4 Ecological Sanitation as an Environmentally Sound Water Technology

Ecological sanitation (EcoSan) technologies take the principle of environmental sanitation a step further: According to Esrey (2000a), ecological sanitation means keeping our surroundings (the environment) clean and safe and preventing pollution. It includes wastewater treatment and disposal, vector control and other disease-prevention activities. Ecological sanitation, on the other hand, is structured on recycling principles. It means keeping the eco-cycle in the sanitation process closed. It is also a low-energy approach that uses natural processes (Esrey et. al., 2001).

Ecological sanitation is a cycle, or closed-loop system, which treats human excreta as a resource. In this system, excreta are processed on site until they are free of pathogenic (disease-causing) organisms. Thereafter the sanitized excreta are recycled by using them for agricultural purposes. Argawall (1999) defines four key features of EcoSan water-environment sanitation technologies:

- Low consumption of water – smaller volumes of water are used;
- Prevention of pollution and disease caused by human excreta;
- Treatment of human excreta as a resource rather than as a waste product; and
- Recovery and recycling of the nutrients.

Esrey (2000a), writing on conventional approaches to sanitation made a case that the nutrients in the human excreta once disposed, break the nutrient cycle. The very idea that excreta are a waste with no useful purpose is a modern misconception. It is at the root of pollution problems that result

from conventional approaches to sanitation. In nature there is no waste – all products of living things are used as raw materials by others for some products. Recycling sanitized human urine and faeces by returning them to the soil serves to restore the natural cycle of life-building materials that has been disrupted by our current sanitation practices (Hannan-Andersson, 1984).

EcoSan water and sanitation principles are not new. For example Esrey (1996) reports that in some cultures, like in parts of East Asia, ecological sanitation systems have been widely used for hundreds of years, and in the case of China, for a few thousand years. It is important, however, that these systems are not regarded merely as a second-rate solution for poor people especially those that live in slums. EcoSan principles may be applied across a range of socio-economic conditions.

The excellent fertiliser value of human excreta has been well established. Humans excrete, on average, sufficient plant nutrients in the forms of nitrogen, phosphorus and potassium (NPK) to grow the 230 kg of crops they need each year, with approximately 65 to 90% of the nutrients being found in urine. Furthermore, these nutrients are in chemical compounds easily accessible to plants (Esrey et al., 2001).

A study by Esrey (1999) further reveals that in most countries, use of human excreta as fertiliser has been implemented only to a very limited extent. Rather, they have been flushed out into the rivers with consequent growth of algae, etc., resulting in a lack of oxygen in the aquatic resources. These resources have also been polluted with pathogenic micro-organisms to the extent that many rivers have become virus-infected more or less permanently. It is thus better to create a closed system, with no pollution from bacteria or viruses and where human fertilisers are harvested and used to grow the following year's crops (Esrey et al., 2001). If ecological sanitation could be adopted on a large scale, it would protect our groundwater, streams, lakes and seas from faecal contamination. Less water would be consumed. Farmers would also require less commercial fertilisers, much of which washes out of the soil into water, thereby contributing to environmental degradation (Hannan-Andersson, 1984).

2.5 Ecological Sanitation Technologies for Africa

Where a population – rural or urban – is experiencing population density and environmental pressure, EcoSan seems an attractive alternative to other possibilities. The programme to introduce ecological sanitation in rural and slum areas in Niassa Province of northern Mozambique, conducted by Estamos and WaterAid, was formed along these postulations. EcoSan toilets are being introduced successfully as alternatives to standard pit toilets, despite initial scepticisms from public health officials about cultural acceptability. These are of two types, also used in Zimbabwe and Malawi: the 'fossa alterna' with two shallow pits, so that the faeces can compost in one while the other is in use; and the 'arborloo'. (In both cases, users apply a soil/ash mix to cover faeces, keep flies away and raise pH to improve pathogen destruction). The 'arborloo' is usually used at seasonal farming locations for growing orchards. From these trials, evidence suggests that growing fruit-trees over disused sanitation pits is becoming more widely practised. The programme also offers conventional pit toilets, but the

majority of people prefer the EcoSan toilets because they are easier to build (require less digging) and are odour-free. Thus, cultural reservations are far from insuperable and appear to be eroding (Esrey, S., 2000a).

Morgan (2001), reports that there are some interesting EcoSan insights in South Africa, where the Mvula Trust is starting to introduce urine-diverting EcoSan facilities in Johannesburg townships and low-income housing developments. Here, the crowdedness and insecurity of urban living space puts a premium on a facility, which is odour-free and therefore can be built indoors; does not take up much room; and is a permanent investment in that its life does not end when the pit is full. Further, Morgan (2001) noted that water shortage and the size of water bills is beginning to act as an EcoSan incentive.

2.5.1 Experiences with Ecological Sanitation in Uganda

The Directorate of Water Development (DWD) has been working on an EcoSan programme in Kisoro and other townships in south-western Uganda. The programme is intended to address different sanitation problems from those of Malawi, Zambia and South Africa (WSP, 2002). The locality is densely settled and needs a good sanitation system, but water is at a premium, the terrain is rocky, and owing to the nature of the geological formation, urban water supplies are easily contaminated by polluted wastewater discharge. Ecological sanitation was introduced in an attempt to solve this problem. Between 1999 and 2001, 140 compost toilets and 107 dehydration toilets were installed in households, as well as seven dehydration public/school toilets (Robinson, 2002).

Unfortunately, MoH (2001) has reported that EcoSan technologies in Uganda encountered some operational difficulties due to leakage, overuse, and lack of maintenance. However, most of these have been resolved. The public toilets, operated as a private business, are functioning well. But persuading some of the families to switch over to using their new facilities in place of their old pit latrines has not been easy. The difficulties surrounding the promotion of ecological sanitation in a faecophobic environment were seriously under-estimated. Despite these obstacles, a visionary plan has been developed to take EcoSan forward, with greater emphasis on awareness building and education (WSP, 2002).

From the above analysis, one can conclude that urine-diverting toilets are on the threshold of being accepted as a standard component in some low-cost housing developments. Reaching the world's 400+ million people currently without proper means of sanitation in Africa is certainly a major challenge. Commitment from government and the private sector is needed, and the growth of an institutional framework which is able to offer alternative technologies including EcoSan, while balancing environmental concerns with the demands of water consumers is long overdue.

Available literature on EcoSan technologies as an alternative to solving the current water and sanitation problems in Kampala city slums revealed the following gaps:

- Unexplained slow progress in achieving water and sanitation targets;

- EcoSan technologies introduced in Uganda without proper in-depth studies to highlight difficulties associated with EcoSan technologies;
- Lack of enabling policies and frameworks through which EcoSan environmental and sanitation technologies (EST) could be promoted

It was therefore the purpose of the study to bridge the observed gaps.

Chapter Three

Methodology

3.1 Study Design

A combination of non-participant case study and cross-sectional survey designs has been used for this study. This is because respondents to this study have varied education backgrounds. Survey and interview techniques were used for eliciting information. The hybrid design was found appropriate since it enables gathering information from different respondents (cross-sectional survey) who have not participated in EcoSan technologies (non-participant case study).

3.2 The Study Area and Selection

The study area comprised high population density areas of Kampala slums. The areas studied were purposively selected on the basis of water and environmental sanitation problems. The criteria for selecting the study area comprised: High population density, evidence of water pollution by the sewage system, wetland or swampy settlement. Five slum areas, one from each of the five (Central, Kawempe, Makindye, Rubaga and Nakawa) divisions of KCC were covered in this study. The areas studied are shown in table 1 below.

Table 3.1: Study areas

	Division	Slum area
1	Kampala Central Division	Kamwokya-Kifumbira
2	Kawempe Division	Kareirwe-Bwaise
3	Makindye Division	Katwe- Kinyoro
4	Nakawa Division	Naggulu
5	Lubaga Division	Nateete

3.3 Variables and Data Sources

Data were collected from: adult men and women living in the selected five Kampala slum residents; local councillors (village, parish and division): Kampala divisional technical staff (health inspectors, water officers, environmental officers and other extension staff); officials from the Ministry of Water, Lands and Environment (MoWLE) and all the nine parliamentarians from Kampala District. The major variables included the following:

- Demographic information (age, education, sex …);

- Social-cultural information (gender, perceptions and attitudes);
- Technologies for delivery of health education programmes (skills, knowledge, tools and equipment);
- Systems for water and sanitation technology transfer (environment, life skills, organ or individuals);
- Attitudes and practices (whether positive or negative towards development, use, paying for,, among others, EcoSan water and sanitation facilities;
- Water, sanitation and hygiene policy framework.

3.4 Research Question

1. What is the current state of the environment and sanitation conditions in slum areas of Kampala city?
2. What are the frameworks and policy options for sustainable development, transfer and adoption of 'EcoSan' technology in the Ugandan context?
3. What are the: social, economic, cultural and physical (-infrastructural) issues that influence use of EcoSan technologies among slum dwellers of Kampala city?

3.5 Study Sample and Sampling Procedure

The study was conducted in five purposively selected settlements, one from each of the five divisions of Kampala. From each slum area, 50 residents were randomly selected for interviewing. Additionally, 10 and four local council official and technical staff respectively from each of the five divisions were purposively identified for being responsible for and knowledgeable about water and environmental sanitation issues. The study also included the nine members of Parliament who represent the five divisions of Kampala. Another set of respondents was composed of 10 garbage collection staff. This research therefore had a total of 329 respondents.

3.6 Instruments and Data Collection Methods

3.6.1 Pre-Testing of Instruments

A set of five different instruments were developed as indicated below.

Table 3.2: Instruments used in data collection

	Instrument	Respondents
1	In-depth interview questionnaire	9 – members of parliament
2	Focus group discussion (FGD) guide	250 – local slum residents
3	Interview guide	250 – local slum residents
4	Interview guide	20 – technical personnel (water, environment, health, education)
5	Key informant in-depth interview guide (KIIIG)	50 – local councillors (local leaders)
6	Key informant in-depth interview guide (KIIIG)	10 – garbage collection staff

The FGD guides were tested on two focus groups. The pilot test participants were different but with similar experiences as the target respondents (local slum residents). The in-depth interview guides were pre-tested using six different individuals but with the same background like that of the target respondents, while the questionnaires were administered to 25 respondents, five from each of the five study areas of each division. Upon successful pre-testing, the instruments were then revised and edited.

3.6.2 Data Collection

Data were collected from the 250 slum residents and the 50 local councillors using questionnaires, interview guides and focus group discussion (FGD). guides Two single sex FGDs, one for men and another for women, were conducted for the slum residents in each of the five research sites, making a total of 10 FGDs conducted with the respondents. One FGD per division was also conducted with the local councillors, giving a total of 5 FDGs for the local councillors. A total of 15 FGDs were conducted. The rest of the 99 respondents i.e. MPs, technical staff and ministry officials were subjected to in-depth interviews.

Additional data were collected from policy documents, other publications from the divisions, KCC district headquarters, National Environment Management Authority (NEMA), Directorate of Water Development (DWD), MoWLE and online published and unpublished reports.

3.7 Data Analysis

Data collected using FGDs and in-depth interviews, were analysed qualitatively using the following steps: i) transcription, including translations from local languages to English; and ii) the transcribed information was then organised, indexed and coded using Nudist (N6) Qualitative Analysis Software (QAS). The coded data were interpreted using content analysis techniques. After content analysis, the information was summarised into this research report.

On the other hand, data collected from the 250 residents using survey questionnaires were analysed using simple descriptive univariate statistics. Results from both analyses (qualitative and quantitative) were triangulated to facilitate drawing of strong conclusions and making valid policy recommendations. Analysed information was presented in the form of illustrations, frequencies, percentages, tables and charts.

Chapter Four

Results

4.1 Introduction to Results

Literature survey and document analysis done indicate that the city of Kampala is growing at a fast rate of 4.9% (night rate), with a population of 1.2 million at night and about 2.5 million during the day. About 21% of Kampala is composed of slum areas, which house over 40% of the city population. Much of this area is located in low-lying swampy areas, with inadequate water and sanitation services. Evidence shows that only 64% of the population is served by sewers (Kampala Sanitation Master Plan - KSMP, 2004). Statistics also indicate that about 66% of the population use pit latrines for excreta disposal, and functional latrine coverage in many areas is below 50%. Many households are sharing toilet facilities, that is, 65%; while 30% have inadequate toilets facilities. Emptying these latrines becomes difficult, since access is often not possible or owners cannot afford the cost of vacuum tankers.

Kampala city is located on hills with valleys drained by streams and swamps. Most of the Kampala slums are located in these high water table areas, where drainage is poorly developed and maintained; and many of them experience floods. Toilets connect to the drainage channels especially during the rainy season. About 50% of solid waste is properly handled, either locally or as part of any systematic collection system. Treatment of sewage and septic tank sludge is found to be inadequate. This "sanitation gap" has resulted into prevalence of malaria and diarrhoeal diseases (43% of cases reporting to health centres in Kampala). There are frequent epidemic outbreaks of cholera and other sanitation-related diseases. In the slums unfortunately, major expansion of the sewer network is not deemed feasible due to high costs, yet the slum dwellers are the poorest in the country. Among the reasons for the low coverage of on-site sanitation is believed to be poverty, followed by lack of awareness, lack of space, and lack of appropriate technology for areas with a high water table.

4.2 Policy Issues and Ecological Sanitation (Ecosan)

4.2.1 Water and Environmental Sector Policies and Development Frameworks

One of the major issues this research set out to investigate was available water policies and planning frameworks within which the transfer and adoption of EcoSan technologies could be implemented. The exploration of policies and planning frameworks was done through review of available literature, policy documents and other water and sanitation documents, and from interviews with policy makers and technical personnel. Documents reviewed included the list in Box 1.

Box 4.1: Policy documents reviewed

1. Constitution of the Republic of Uganda (1995 amended 2005)
2. The Local Governments Act (1997 amended in 2005)
3. The Water Act, and accompanying regulations [Water Resources Regulations (1998), Wate Discharge Regulations (1998), the Water Supply Regulations (1999), Sewerage Regulations (1999)]
4. The National Environment Act
5. The National Water & Sewerage Corporation Act (2000)
6. Uganda Water Action Plan (1995)
7. National Water Policy (1999)
8. The National Environment Management Policy (1994)
9. Land Act (1998)
10. National Health Policy and Health Sector Strategic Plan (1999)
11. National Gender Policy (1997)
12. Environmental Impact Assessment Regulations (1998)
13. National Environment (standards of discharge of effluent into water or on land) Regulations (1999), National Environment (waste management) Regulations (1999)

Review of policy-related documents given in Box 1 revealed that the Government of Uganda has put in place a Poverty Eradication Action Plan (PEAP) as a national framework for poverty eradication. The PEAP was prepared in 1997 and was revised in 2000 and 2004 (MoFPED, 2004a). The action plan has adopted a multi-sectoral approach, recognizing the multidimensional nature of poverty and the links between influencing factors. The issues raised in the PEAP are being addressed through various programmes including water and sanitation as one of the major policies. In the revised PEAP (MFPED, 2004a), the water and sanitation sector falls under two pillars:

- Pillar 2: Enhancing production, competitiveness and incomes (includes water for production and water resources management); and
- Pillar 5: Human development (includes water supply and sanitation). The Government of Uganda has reformed the water and sanitation sector in order to ensure that services are provided and managed with improved performance and cost effectiveness.

In response to the move to provide clean and equitable water to all its citizens, the government has worked hard to increase the per capita provision of water. Figure 2 gives a comparison of the per capita water provision for selected African country nationals.

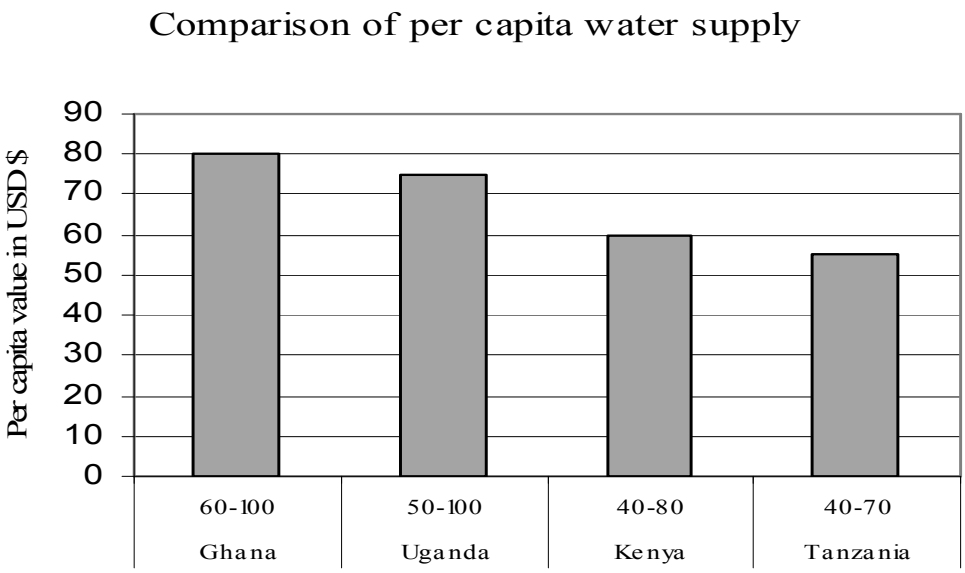


Figure 4.1: International per capita comparison of water supply (MLWE, 2005)

From the graph in Figure 4.1, there is a clear indication that the government of Uganda is maintaining her commitment to provision of equitable and sustainable provision of water and sanitation services in Uganda. For example, while Uganda may be doing worse in major economic indicators like GDP and GNP than the African countries indicated in the Figure 4.1, it is doing quite well as far as per capita water supply is concerned. Document review indicated that reforms required in-depth studies, situation analysis, and studies of African region experiences. Rural Water Supply and Sanitation (RWSS) and Urban Water Supply and Sanitation (UWSS) reform studies were completed in 2000 (Wardrop, 2000; Consult4, 2000). The Water for Production and the Water Resources Management Reform studies were completed in December 2003 and January 2005 (WSP, 2003, 2005) respectively. The reform studies included sector strategic investment plans (SIPs) with appropriate policies, strategies and action plans.

However the current per capita water provision and commitment needs to be beefed-up with water and environmental conservation technologies like EcoSan.

4.2.2 Policy Objectives

Review of the available policy documents and literature from the water and sanitation sector studies indicate that the overall policy objectives of the Government for water resources management, (domestic) water supply and sanitation, and water for production respectively are to:

> "*manage and develop water resources of Uganda in an integrated and sustainable manner, so as to secure and provide water of adequate quantity and quality for all social and economic needs of the present and future generations with the full participation of all stakeholders*" (MWLE, 1999a).

> "*provide sustainable provision of safe water within easy reach and hygienic sanitation facilities, based on management responsibility and ownership by the users, to 77% of the population in rural areas and 100% of the urban population by the year 2015 with an 80%-90% effective use and functionality of facilities*" (MWLE, 2004e).

'This is more ambitious than the Millennium Development Goal (MDG) which aims to halve the percentage of people without access to safe water by 2015. This corresponds to 72% access to safe water by 2015.

> "*Promote development of water supply for agricultural production in order to modernise agriculture and mitigate effects of climatic variations on rain fed agriculture*" (MWLE, 1999a).

A Sector Wide Approach to Planning (SWAP) for the Water and Sanitation Sector was adopted in September 2002. SWAP is a mechanism whereby the government and development partners support a single policy and expenditure programme, which is under government leadership and follows a common approach. The rural water and sanitation sub-sector is the most advanced in terms of SWAP implementation.

4.2.3 Policy and Regulatory Framework

Water and sanitation policy objectives have been developed. However, within these objectives, there is lack of indications as to how the set targets could be improved. Therefore, the results of this research can inform the process. If these objectives are to be considered complete, there would be need for the policy objectives to include practical ways of reaching the stated targets.

Water and sanitation sector policies and legal frameworks present a comprehensive regulatory framework for the management of the water sector. Evidence to this effect is presented in the policy and legal documents given in Box 1. The available policy documents reveal that the current policies reflect the socio-economic, development and financial fabric prevailing in present day Uganda with foresight to the future. However, the policy measures are not fully implemented, especially at the local government and community levels. There is need to review some provisions of the laws in order to incorporate regulatory functions and allow greater participation of all stakeholders, including the private sector.

In line with this EcoSan study, policy documents 3 (Box 1) – The Water Act, and accompanying regulations: Water Resources Regulations (1998); Waste Discharge Regulations (1998; the Water Supply Regulations (1999); Sewerage Regulations (1999) and 13 – National Environment Standards for Discharge of Effluent into Water or on Land Regulations (1999), and National Environment Waste Management Regulations (1999) apply. In this respect, if well implemented, there is no doubt the situation of sanitation in the City Council of Kampala (KCC) would improve. Most especially, the policies would take into account provision of EcoSan services to the slum areas of Kampala.

4.2.4 EcoSan Technologies and Policy Performance

There are more differences in access to latrines around Uganda than in access to improved water supplies. Sanitation access in schools is below target while in rural areas sanitation in not doing so badly. Also, evidence collected so far suggests that hygiene practices in households are inadequate. The performance as measured against the hand-washing indicator is the most worrying of all the water and sanitation indicators.

A review of the national Water Policy, 1999; the National Water and Sewerage Co-corporation and the Uganda Water Action Plan, 1995 revealed that there is increasing recognition in the sector that sanitation and hygiene has been given insufficient emphasis in the past. If maximum impacts of improved water supplies are to be attained, then more emphasis on sanitation and hygiene activities and investment is required. To improve latrine coverage and hand washing it is necessary to revitalize the Kampala Declaration on Sanitation (KDS), which spells out the roles of all stakeholders from household, community, leaders and institutions with regard to water and sanitation. Analysis of available policy documents reveal that when fully revitalised, the KDS would cater for EcoSan technologies as they are found to be effective for high population density communities like the Kampala slums where this study was carried out.

4.2.5 Gender Policies and EcoSan Technologies

One of the six critical requirements set out in the water sector framework (MWLE, 2002) focuses on the meaningful involvement of women. The water and sanitation sector framework stipulates that before any water technology is implemented, community mobilisation should have achieved the following minimum requirements:

- That the composition of Water User Committees (WUC) and Water and Sanitation Committees (WSCs) shall include at least 50% women; election of women as chair and treasurer of the WUA/WSC is encouraged; half of the water point attendants and hand pump mechanics shall be women;
- Training shall target women and their male colleagues;
- The entire community shall be involved in discussing the siting of water sources with men and women initially consulted separately;
- All communications to communities shall be to both men and women.

Regarding the use of EcoSan technologies in slum areas of Kampala, the involvement of both male and female users is even more critical. For EcoSan, the role of women would be very critical as they would be more efficient at ensuring cleanliness of the EcoSan toilets and would ensure efficient collection of the separated urine.

4.2.6 Urban Water Supply and Quality in Towns

The quality of water supplied in the towns varies greatly depending on the type of source water and the private operator. Where water is pumped from boreholes, the quality generally is good regardless of the operator. However, where the source is surface water and requires treatment, this becomes a problem mainly due to lack of sustainable supply of water treatment chemicals. Generally,

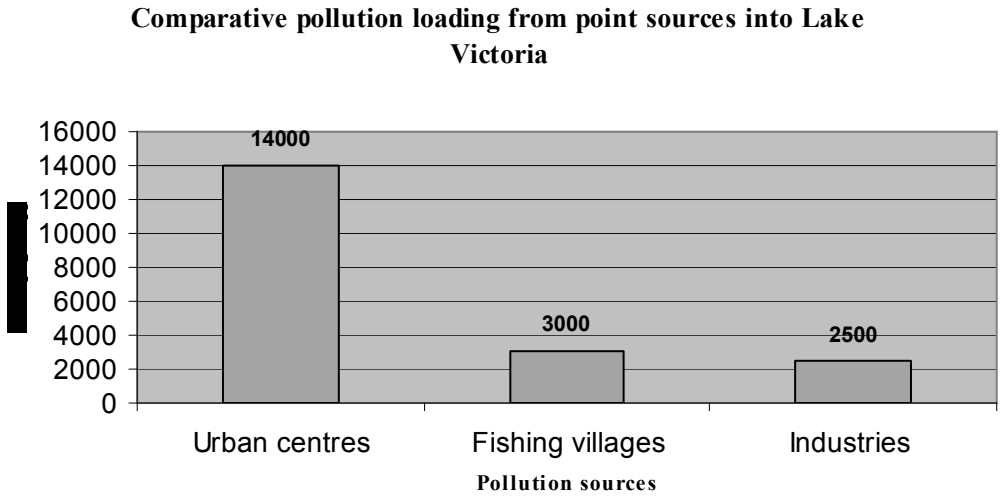


Figure 4.3: Sources of pollution

Figure 4.3 shows that the major pollution concentration centres are the urban centres. Further analysis indicates that over 70% of the worst pollutants are the high population density slums of Kampala. On a positive note, however, a number of large town water supplies under NWSC usually provide water of good quality. NWSC is well equipped in all the big towns of Uganda with both personnel and equipment. Water supplies under water authorities and other private operators lack testing equipment. Information gathered from technical officers indicated that DWD is now planning to provide essential water quality testing equipment to the water authorities for routine water quality monitoring. In addition, the water authorities and private operators will be trained in water quality testing and monitoring as part of the implementation of the National Water Quality Monitoring Strategy.

This would be a very good opportunity to integrate EcoSan technology development skills training with the general training on monitoring of water quality. Therefore, there is an enabling environment for EcoSan technologies and user capacity to be developed.

4.2.8 Golden Indicators, Targets and Combative Achievement

Table 4.1: Water and sanitation global indicators – Uganda's achievement

	Indicator	Target areas	Targets			Achievement
			2004/2005	2006/2007	2014/2015	2004/2005
1	Percentage of people within 1.5 km (urban) and 0.2 km (rural)	Rural Urban Small towns	58 70	62 75	77 100	61.3 67 36
2	Percentage of improved water sources that are functional at time of spot check	Rural Large town WFP	82 83	85 90	90 95	82 no data no data
3	Average cost per beneficiary of new water and sanitation schemes (USD)	Rural RGCs Small towns	45 58 80	40 55 75	40 50 75	31 56 72
4	Percentage pf people with improved sanitation (household and schools)	Rural HH Urban HH Schools	57 no data no data	58 77 82	62 92 100	77 100 100
5	Percentage of persons with access to and using hand washing sanitation	Households Schools	not measured not measured	14 to be set	23 to be set	50 to be set

From the analysis of the water and sanitation golden indicators given in Table 4.1, the realisation is that Uganda will find it very difficult to meet the MDG deadline of 2015, with the exception of percentage of persons with improved sanitation.

One way of speeding-up the rate at which the Government of Uganda can achieve water and sanitation MDG targets is more application of EcoSan technology,

4.2.9 Problems Faced by Urban Water Supply Operators

Interviews with the water providers and garbage (human waste) collectors in Kampala indicated that while the privatisation sector in Uganda offers private investors with opportunities to invest at a profit, they face a numerous problems. Private operators with the exception of NWSC cited the following as being the main problems affecting the quality of their services:

- Assets handed over by DWD have become old or have broken down. Examples are rusty pipes and broken down pumps.
- High operating costs implying low profits.
- Lack of capacity for efficient operation of the treatment plants. Personnel do not have the necessary technical background or training.
- Revenue collection. Customers delay payment and few are willing to pay. Some still go for traditional water sources.

- Lack of facilities; mainly office space, in-house laboratories and transport.
- Poor quality works associated with poor designs, poor quality construction and poor supervision.

Although EcoSan technology would be desirable, such problems, if not addressed could greatly affect its development and sustainability.

4.2.10 Technologies

Although very few persons are aware of the existence of EcoSan toilets, EcoSan is one of the technologies being promoted in Uganda through a coalition between DWD, MoH, Makerere University, NARO, Kampala City Council, MoES, local governments, NGOs and the private sector. This technology is particularly relevant for the urban poor living in high density areas because of limited space and prevention of contamination of groundwater. EcoSan is also very appropriate for difficult environments like rocky, waterlogged and sandy collapsing soil areas, where digging pits is cumbersome. Awareness of the technology has been increased through posters, workshops, drama and leaflets. Research into pathogen die-off and agronomic value is being undertaken. The Directorate of Water Development (DWD) reports a total of 3,348 EcoSan toilets that have been constructed throughout Uganda. This, although true, is hard to believe. For example, out of 250 respondents, only 15 (4.4%) knew about the existence of EcoSan toilets in Uganda.

4.3 Sanitation Problems among Slum Dwellers in Kampala

4.3.1 Living Conditions of Respondents and its Implication for Ecological Sanitation

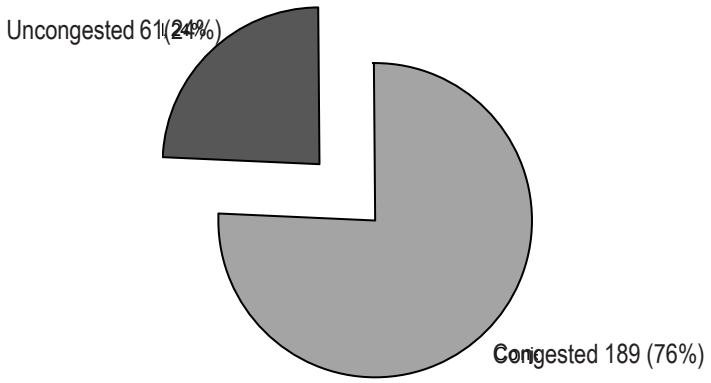


Figure 4.4: Living conditions of slum dwellers

One of the interests in this study was to understand water and sanitation problems associated with the slum settlements. The study therefore investigated water and sanitation problems that could hinder or support EcoSan technologies as a way of improving water and sanitation problems among slum dwellers.

Results obtained from this study indicate that 189 (75.6 %) slum dwellers lived in congested houses (see Figure 4.4). The dwelling units were found to be less than 500 metres from water sources such as springs, wells, wetlands, rivers or streams. Households in which the slum dwellers live are generally small units of one to two rooms of average size of 6x5 feet (30 sq. ft). These units are normally congested with literally no space from one dwelling unit to another.

The five slums in which the study was carried out were mainly situated in illegal swampy settlements characterised by water logging at the slightest drizzle. On average the number of persons living in an average living unit of 6x5 feet was found to be four. This means that on average the per-capita space for one person is calculated to be 30/4 (7.5 sq ft per person). This is indeed a very small space for an individual. Furthermore, these slum dwellers have to use either raised toilets that are very close to the dwelling units or resort to 'flying toilets'. Flying toilets refer to a practice of passing out human waste into temporary storage (in most cases Kavera), and at an opportune time, the Kavera and its contents are thrown away through the air (hence the code name 'flying toilet'). This kind of disposal is one of the causes of diseases like dysentery and cholera, which are so common among these slum communities. This situation indicates that unless innovative approaches to water and sanitation are applied, the conventional approaches do not offer enough options to solve the sanitation problems of the slum dwellers. EcoSan therefore has the potential of solving to some extent, the problem of sanitation among slum dwellers. The nature of housing in these slums offers an opportunity for development of EcoSan technologies.

4.3.2 Access to Water and Sanitation and Their Implication for Ecosan Technologies

Another issue investigated in this research was access to safe clean water by the slum dwellers. Results presented in this section indicate the access situation. An open ended question to slum dweller respondents regarding their water sources indicated two major responses: i) shared and private sources; and ii) springs and natural wells (see Figure 4.5).

Results of the study regarding access to water and sanitation indicated that there were 163 (65.2%) slum dwellers with access to tap water from both private and shared sources and 90 (36 %) households who depended on natural water sources such as springs, rivers and wells. Further investigation into the matter indicated that both categories (those that access water from NWSC taps and natural sources) face pollution problems. For example, Figure 4.5 indicates comparative data on pollution of water sources from different urban centres. Pollution data from Lake Victoria Environmental Program (LVEP, 2005) indicate that Kampala city has an outstanding pollution level of BOD 9153 kg/day. This is an indication that there is wide spread pollution, possibly affecting piped water. EcoSan toilets, if well handled, would reduce on pollution from pit latrines and poorly handled flush toilets.