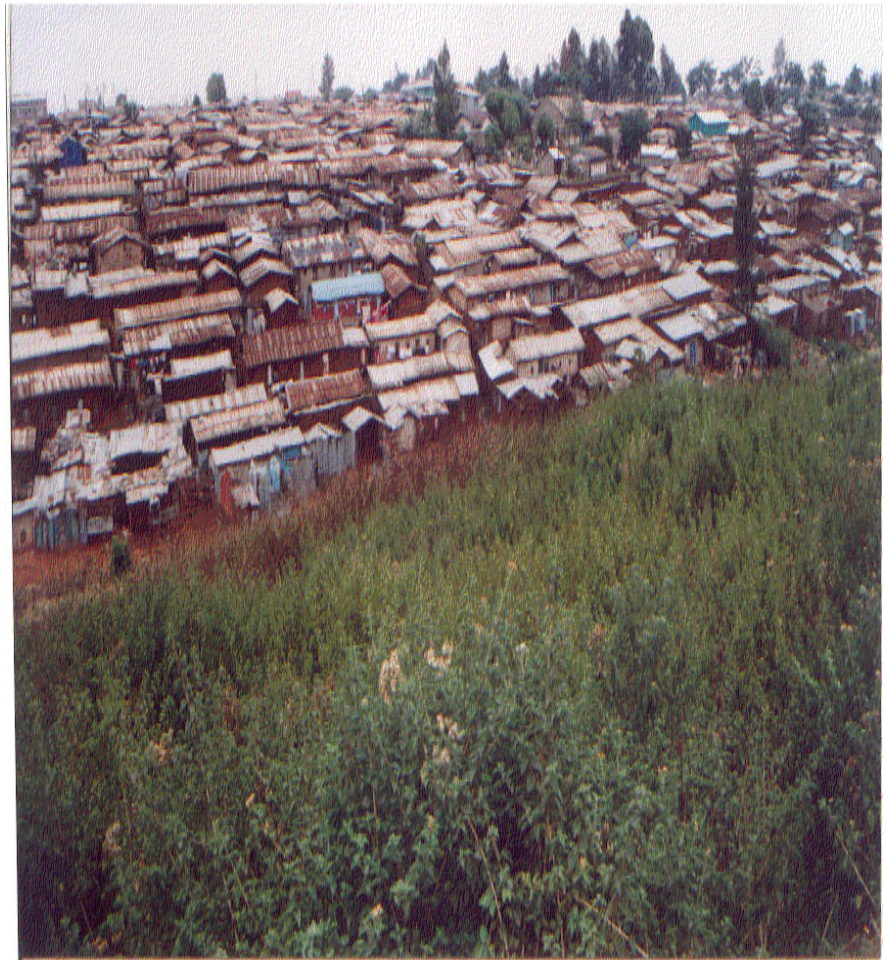




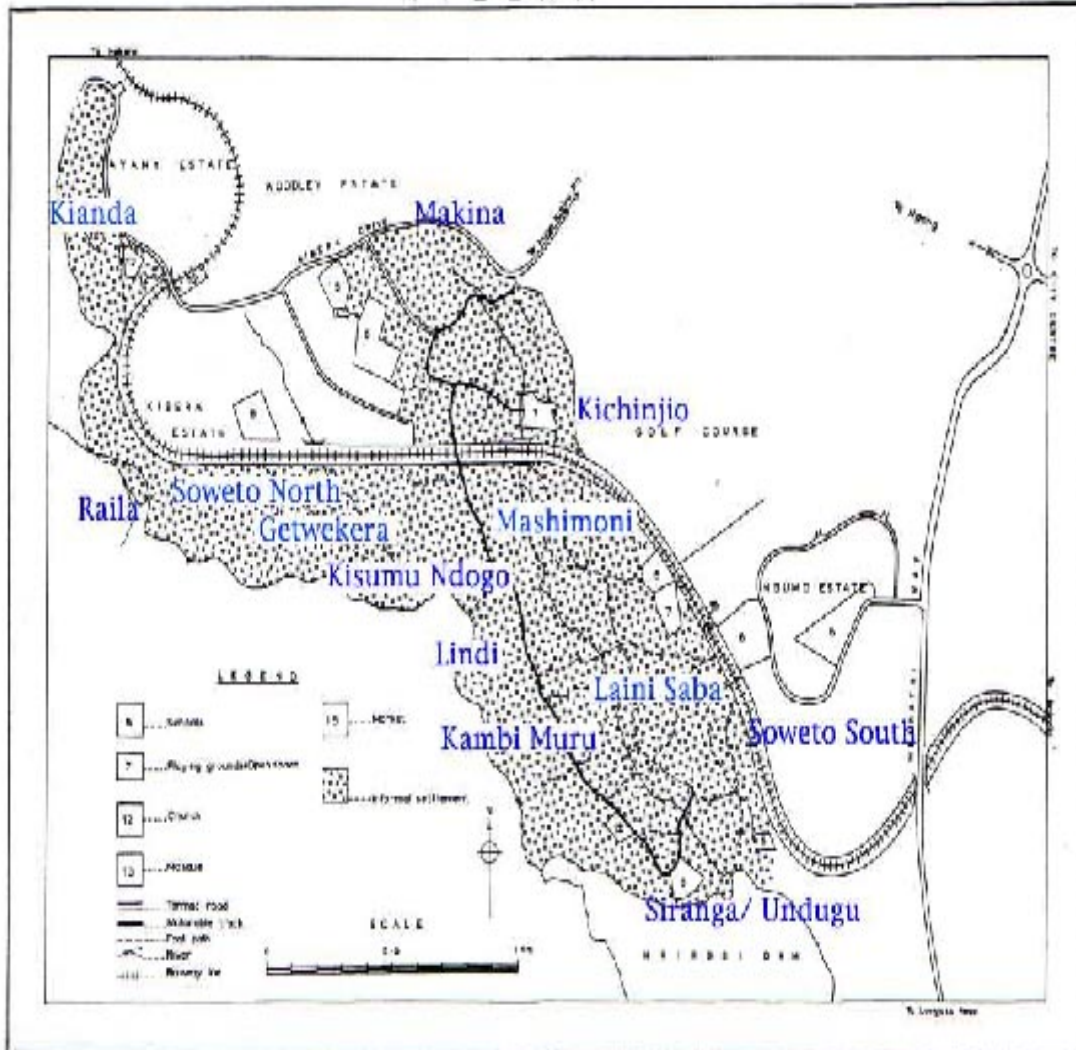
IMPACT ASSESSMENT REPORT

**IMPACT ASSESSMENT REPORT
ON
THE PEEPOO BAG, SILANGA VILLAGE,
KIBERA, NAIROBI-KENYA**



January, 2009

K I B E R A



This Impact Assessment was conducted by:

Thomas H. M. Ondieki & Maurice Mbegera
JEAN AFRICA CONSULTANTS (JAC)
P.O. Box 14347-00100 Nairobi, Kenya
E-mail Address: africajean@gmail.com
Phone: + 254(020) 2371356
Cell: + 254 (0) 725102819, 0733759744

Edited by:

Prof. Elijah K. Biamah,
Department of Environmental and Biosystems
Engineering
University of Nairobi
P.O.Box30197 – 00100, Nairobi, Kenya
Email Address: biamahek@yahoo.com
Cell Phone: + 254 722723485

Benjamin K. Kogo
Department of Environmental and Biosystems
Engineering
University of Nairobi
P.O.Box30197 – 00100, Nairobi, Kenya
Email Address: benkipsuon@yahoo.com
Cell Phone: + 254 726 528 862

PREFACE

This initiative of Peepoople in Kenya started when Ms Camilla Virsen, a founder partner of Peepoople visited Mrs Ingrid Munro, Managing Trustee of Jamii Bora Trust (JBT) – a micro-finance institution based in Nairobi, Kenya. The visit by the Peepoople partner was due to the fact that they had heard about the remarkable accomplishments of JBT in transforming the lives of the poor people of Nairobi’s slum areas of Kibera, Soweto and Mathare. During the visit to JBT, Mrs Ingrid Munro gave the Peepoople partner more insights of the day to day living conditions in these areas. As Camilla introduced her very innovative technology of the Peepoo bag, Mrs Ingrid Munro immediately saw it as a major breakthrough and replacement of the “flying toilets” of Kibera Slums. Thus Mrs Ingrid Munro strongly recommended to Ms Camilla that she visits and talks to me at the Department of Environmental and Biosystems Engineering, University of Nairobi, Nairobi, Kenya. Mrs Ingrid Munro had done so with a view to enabling Ms Camilla introduce the same technology and seek my professional contribution as an authority on Environmental Management in Kenya. During this courtesy visit to my Office at the University of Nairobi, Camilla explained all the history and practical elements of the Peepoo bag. We discussed in detail as to what contribution my department could make towards this very noble cause. Indeed, I floated some good ideas on what I envisaged as the best way forward in marketing the Peepoo bag. One of the first steps in doing so was the idea of conducting an impact assessment study in Kibera so as to have a feel of the views of the slum dwellers in accepting and using the Peepoo bag.

When Ms Camilla was ready to undertake this impact assessment study, she sought my support in identifying the right environmental expert to carry out the study. Thus I strongly recommended Mr. Maurice Mbegera, the immediate retired Director of Compliance and Enforcement Department at the National Environmental Management Authority (NEMA) as the best placed environmental expert to conduct this study. Camilla went ahead and contacted Mr. Mbegera and agreed on the logistical requirements for undertaking this impact assessment study. Mr. Mbegera was commissioned to provide consultancy services and sought the support of Jean Africa Consultants (JAC) in carrying out this study. Prior to contracting the services of Mr. Mbegera and by extension Jean Africa Consultants (JAC), Ms Camilla and Mr. Emery Sindani of Peepoople had selected Silanga Village, Kibera as the pilot study area. It is in this Village that Camilla’s expectations were realized. Indeed, as expressed in the Executive Summary of this report, “this study report is intended to be an information tool that will help project designers understand better the problems encountered in improving sanitation in Kibera Slums, Nairobi, Kenya and provide sustainable sanitation solutions. However, it is not meant to be a technical design manual nor is it a

comprehensive reference document on existing technologies". To this extent, Peepoople has achieved its primary objective of finding out if the Peepoo bag meets the expectations and perceptions of beneficiaries/end users in meeting their sanitation needs and demands, and if the product is designed in such a way that it is not only biodegradable but economically viable in terms of generating organic manure for sale.

All of us feel proud to have contributed in one way or another to the successful completion of this worthwhile study. To Ms Camilla and the Peepoople fraternity, I commend you for a job well done. Certainly the future of Peepoo bags usage worldwide is very bright. Thus the journey to improved sanitation in the slum villages of the world has just begun. Peepoople therefore needs all the financial support it can get to realize this noble cause.

Prof. Elijah K. Biamah
Environmental and Water Systems Engineer,
Nairobi, Kenya.

EXECUTIVE SUMMARY

An estimated 600 million people in urban areas of developing countries now live in life and health-threatening homes and neighborhoods, primarily in peri-urban settlements. Peri-urban areas are characterized by uncertain land tenure, inferior infrastructure, low incomes, and lack of recognition by formal governments. The rapid growth and informal status of these high-density population areas have resulted in low levels of sanitation services.

These communities tend to be ignored by municipal authorities, who find themselves overwhelmed by the informal sectors sheer numbers and needs, which far outstrip the capacity of the local planners and government. A lack of basic services and in particular, the lack of adequate excreta management threatens the public health and the environment of peri-urban settlements and urban areas as a whole. This segment of the urban population, therefore, should be a focus of concern, but even the few institutions that recognize the problem and want to do something about it find that there exists little knowledge or experience about how to address this problem.

This study report is intended to be an informational tool that help project designers understand better the problems encountered in improving sanitation in Kibera Slums, Nairobi, Kenya and provide sustainable solutions. It is not meant to be a technical design manual, nor is it a comprehensive reference document on existing technologies.

The primary objective of this study is to find out if the Peepoo bag meets the objectives, expectations and perceptions of beneficiaries/end users in meeting their sanitation needs and demands, and if the product is designed in such a way that it not only biodegradable but economically viable in terms of generating organic manure for sale.

There were many women interviewed during this study and thus showing the overall high number of women to men who participated in the use of the Peepoo bag. This ratio indicates that the peepoo bag would greatly assist women and children's sanitation in Silanga Village, Kibera, Nairobi, Kenya.

About 40% of the respondents live on less than a dollar a day as indicated by the monthly income distribution while the high monthly rent further explains the high poverty levels thus exerting pressure on the already strained sanitation services.

At least 90% of the users of the Peepoo bag strongly recommended it as the absolute sanitation solution within Kibera and the same percentage also felt that the Peepoo bag is safe and clean to handle. More than 80% of the respondents were of the opinion that the Peepoo bag be sold for less than Ksh.5 (USD 0.0625) to make it affordable to the majority of the slum dwellers.

There was a significant need for peepoo bag usage in Silanga Village because more than 50% of the respondents admitted that they throw their waste using the flying toilet approach. On the distribution of the Peepoo bag, the majority of the respondents were of the opinion that group

leaders, community based organizers, church leaders, youth and village elders be used in coordinating the distribution process.

The size of the Peepoo bag elicited concern among the respondents. Over 60% suggested a bigger bag to fit both urine and feces at the same time. The use of the Peepoo bag would save valued time that is otherwise spent queuing to access toilet facilities. It was noted that the fertilizer benefit seemed most valuable for the majority of respondents because of the implied financial benefits that such a venture would bring to the community.

The Kibera Slum areas present unique challenges to sanitation improvement. Most challenging are the characteristics that set these areas apart from the urban and rural sectors: poor site conditions, unreliable water availability, high population density, the heterogeneous nature of the population, and the lack of legal land tenure.

These characteristics are much more complex than those typifying rural and formal urban areas. The standard technical and social solutions for low-cost sanitation currently used in rural communities are not necessarily appropriate for improving community sanitation in slum areas.

Conventionally, most community sanitation problem assessments and project design efforts focus primarily on the technical feasibility of the various technical options. Experience to date suggests that these technology-driven projects often fail to meet their objectives.

This report suggests that the complexities of peri-urban settlements require that a more comprehensive interdisciplinary approach be used to understand the problem before attempting to design a project that will address peri-urban community sanitation needs.

This report reviews the key public health, environmental, social, financial, economic, legal, and institutional issues that many of these settlements face which must be understood before developing a program designed to improve a peri-urban community sanitation service.

To address these problems, the project designer must deal not only with engineers but also with legal experts, financial analysts, social scientists, urban planners, and a wide range of institutions, such as the water and sanitation utility, the Ministry of Health, urban development authorities and the municipalities.

This report should also be of help to technical specialists who assist in project development, particularly in ensuring that they become aware of issues in a wide range of subject areas other than their speciality.

The sanitation challenges peri-urban areas present are unique, and they demand that difficulties in providing appropriate excreta disposal systems be dealt with head-on. In some impossible situations, no technical solution will prove viable. In order to create new solutions, project leaders must challenge the status quo at the municipal and national levels, which continue to deal with urban sanitation in a conventional way. By necessity or choice, in the foreseeable future, government institutions, bilateral and multilateral aid organizations, the engineering sector, and NGOs, all will be compelled to shift more of their attention and resources to the sanitation needs of slum dwellers.

ACKNOWLEDGEMENT

Jean Africa Consultants would like to thank the JAC Work group, for the efforts they put in the design and development of this Impact Assessment Report. This group worked tirelessly to ensure that this Report became a reality so that the dreams and aspirations of the people of Kibera may be realized.

We would like to thank the participants: The Silanga Community leaders, Youth leaders, the Residents for their tireless efforts in organizing meetings and attending the training/discussion sessions and helping to empower the people in meetings preceding this study.

Special thanks and appreciation goes to all (MES, Peepoople) who participated in the field test that was conducted before this Impact Assessment Study.

Our gratitude also goes to all who contributed, assisted and provided guidance in this study.

We would like to appreciate the team of five young men who dedicated their time and effort in the distribution of peepoo bags and collection of the data during the study and in maintaining records of the daily occurrences during the field test.

We greatly appreciate the respondents who voluntarily and willingly participated in the interview sessions conducted by our enumerators during this study.

Special gratitude goes to Maurice Mbegera and Michael Odongo for the time they spent improving on analysis and interpretation of data.

Finally, it is worth recognizing the contributions of Prof. Elijah K. Biamah and Mr. Benjamin K. Kogo of the Department of Environmental and Bio-systems Engineering, University of Nairobi, Nairobi, Kenya for the time they spent editing and formatting this report. Indeed their effort was worthwhile and truly added value to the quality and in improving the readership of this report.

TABLE OF CONTENTS

PREFACE.....	iv
EXECUTIVE SUMMARY	vi
ACKNOWLEDGEMENT	viii
LIST OF PICTURES	xi
ACRONYMS AND ABBREVIATIONS	xii
I.0 INTRODUCTION.....	1
1.1 Background.....	1
1.2 Objectives of the Study.....	3
1.2.1 Overall objective.....	3
1.2.2 Specific objectives	3
2.0 Literature Review.....	5
2.1 Hygiene and Sanitation.....	5
2.1.1 Hygiene.....	5
2.1.2 Sanitation	5
3.0 APPROACH AND METHODOLOGY	7
3.1 Description of the Study Area.....	7
3.2 Gathering of Information and Data.....	8
3.2.1 Sampling	9
3.2.2 Distribution and Collection of Peepoo Bags.....	9
3.2.3 Data collection, analysis and interpretation.....	10
4.0 MAJOR FINDINGS AND EMERGING ISSUES	11
4.1 Prevailing challenges in the slums.....	11
4.1.2 Policy issues.....	11
4.1.3 Institutional and Legal Arrangements.....	12
4.1.4 Environmental Challenges.....	12
4.1.5 Sanitation, Water Supply and Public Health.....	12
4.1.6 Human Settlements	13
4.1.7 Poor Infrastructure	14
4.1.8 Social Aspects.....	15
4.1.9 Uncertain Legal Status of Slum Areas.....	15
4.2 Monthly Income and House Rent	16
4.2.1 Monthly Income.....	16
4.2.2 Monthly House Rent.....	17
4.3 Occupation Profile	17
4.5 Emerging attitudes towards the Peepoo bag.....	18
4.5.1 Information on Peepoo Bag Usage	18
4.5.2 Who Used/Did not Use Peepoo Bags	20
4.5.3 Price to set for the Peepoo bag.....	21
4.5.4 Waste disposal from the Peepoo bag.....	23
4.5.5 How to distribute the Peepoo bag	24
4.5.6 Products aspects valued	25
4.5.7 Peepoo Bag Design.....	26
4.5.8 Mechanisms used to hold Peepoo bags.....	28
4.5.9 Time spent going to toilet.....	29
4.5.9 Location and time the product was used.....	31

4.5.10 Impact of Bag On Everyday life	33
5.0 KEY CONCERNS ON HYGIENE AND SANITATION IN KIBERA SLUMS	34
5.1 Indicators of poor Sanitation and Hygiene	34
5.1.1 Toileting.....	34
5.1. 2 Water.....	35
5.1.3 Poverty	36
5.1.4 Insecurity.....	37
5.1.3 Gender inequality.....	38
5.2 Impacts of Poor Sanitation in Kibera.....	40
5.2.1 General overview	40
5.2.2 Poor planning	40
5.2.3 Poor waste management	40
5.2.3.1 Lack of proper liquid waste management.....	41
5.2.3.2 Solid waste disposal.....	42
5.2.4 Communicable and water borne diseases	43
5.2.4.1 Diarrhea.....	44
5.2.4.2 Cholera.....	45
5.2.4.3 Malaria	46
6.0 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES.....	48
6.1 Sewerage and Effluent	48
6.2 Surface Drainage.....	48
6.3 Segregation of Waste and Recycling as Fertilizer	48
6.5 Insecurity.....	49
6.6 Spread of Communicable Diseases.....	49
6.7 Solid Waste Disposal	49
8.0 PROMOTION OF PEEPOO BAG USAGE.....	51
9.0 EVALUATION OF ALTERNATIVES TO IMPROVING SANITATION IN KIBERA	54
Option No. 1: Full municipal services to be provided for Kibera	54
Option No. 2: Every dwelling unit to construct a pit latrine.....	55
Option No.3: Maintaining the status quo.....	55
Option No.4: Promoting the usage of the peepoo bags	56
10.0 THE WAY FORWARD: RECOMMENDATIONS	57
11.0 CONCLUSION.....	58
REFERENCES	59
APPENDICES	61
APPENDIX 1: TERMS OF REFERENCE (TOR).....	62
APPENDIX 2: QUESTIONNAIRE.....	69
APPENDIX 3: IN-DEPTH QUESTIONNAIRE	78
APPENDIX 4: :LIST OF RESPONDENTS.....	82
APPENDIX 5: SUMMARY OF DATA COLLECTED BY MILLENIUM ENVIRONMENTAL SOLUTIONS.....	83

LIST OF FIGURES

Figure 1: A map showing the location Silanga Village of Kibera.....	8
Figure 2: Monthly Incomes.....	16
Figure 3: Monthly House Rent	17
Figure 4: Occupation profile.....	17
Figure 5: Gender	18
Figure 6: Age Distribution.....	18
Figure 7: Usage of Peepoo bag.....	20
Figure 10: Response on bag being handed out for free	23
Figure 11: Excreta Disposal.....	24
Figure 12: Peepoo bag Distribution	24
Figure 13: Product Value	25
Figure 14: Fertilizer Usage	26
Figure 15: Price of fertilizer/organic manure.....	26
Figure 16: Suggestions for improving Peepoo bag Design	27
Figure 17: Improvement on design suggested by respondents	28
Figure 18: Mechanism used to hold the bag	29
Figure 19: Times wasted at the Toilet.....	30
Figure 20: Time Saved by use of Peepoo bag.....	30
Figure 21: Time spend standing in the line.....	31
Figure 22: Sharing of the toilets.....	31
Figure 25: Time going to toilet.....	32
Figure 26: Impact of bag on everyday life.....	33

LIST OF PICTURES

Picture 1: Human waste thrown into a flowing river.....	5
Picture 2: Focus group discussion on the use of the Peepoo bag.....	Fehler! Textmarke nicht definiert.
Picture 3: A question and answer session on the use Peepoo bag	10
Picture 4: Polluted water in Kibera.....	36
Picture 5: Manual way of emptying human waste from a pit latrine.....	42
Picture 6: River covered by Solid waste	42
Picture 7: Fish exposed to unhygienic conditions.....	46

LIST OF TABLES

Table 1: Defining hygiene and sanitation	6
Table 2: Information on Peepoo Bag Usage.....	19
Table 3: Comments by those who did not use the bag.....	21
Table 4: Suggested prices to set for the peepoo bag.....	22
Table 5: Response on fertilizer usage	25
Table 6: How to improve peepoo bag design	27
Table 7: Human insecurity in Kibera Slums.....	38
Table 8: Summary of environmental aspects, impacts and mitigation measures	50
Table 9. Summary of Peepoo bag distribution.....	87

ACRONYMS AND ABBREVIATIONS

UNEP	United Nations Environmental programme
NEAP	National Environmental Action Plan
UNDP	United Nations Development Programme
CHF	Cooperative Housing Foundation
JAC	Jean Africa Consultants
UN-ECOSOC	United Nations Economic & Social Council
DVC	Dual vault composting latrine
ESA	External support agencies
NGO	Nongovernmental organization
PF	Pour-flush toilet
USAID	United States Agency for International Development
VIP	Ventilated improved pit latrine
WASH	Water and Sanitation for Health Project
WS&S	Water supply and sanitation
FAWE	Forum for African Women Educationists
NEMA	National Environmental Management Authority
GoK	Government of Kenya
UNICEF	United Nations Children's Fund
MES	Millennium Environmental Solutions

I.0 INTRODUCTION

1.1 Background

In the world today, 2.6 billion people have no access to basic sanitation. Lack of toilets has affected both society and individuals through the contamination of fresh water and ground water. The sanitation situation could be described as an ongoing emergency.

The UN Millennium Development Goal no. 7, target 10 was established in 2002, with the aim of halving the number of people without sustainable access to drinking water and sanitation by 2015. Unfortunately, the progress needed is slow or even negative.

Water is one of the most vital natural resources for all life on Earth, and it is a basic need. Health and safety are associated with water in daily living. Secondly, the availability of clean water and sanitation prevent diseases. Each year, 4 billion cases of diarrhea are reported, and 2.2 million people die from it. Clean water prevents infection from many diseases. Due to poverty and poor living conditions in the slums, water availability is a huge problem. Poor women bear the burden of unpaid chore of fetching water and are excluded from many opportunities to create wealth from water. Kibera slum dwellers face the problem of inadequate water supplies to clean the home, prepare the food, wash the utensils, do the laundry and bathe.

According to UN-ECOSOC (1997), the deprivation of water and sanitary facilities resulting in severe water-borne diseases is one main concern for slum dwellers. It is time consuming and the laborer's efforts to provide domestic household with water is imposed on women. UN-ecosoc further notes that water has never been a free good for poor women; however, it notes that improved access to safe drinking water and poverty alleviation is well established in slum areas. Comprehensive approach to water is needed to address the water concerns in slums because just having clean drinking water is not enough.

Third world cities are divided into two distinct sectors: formal and informal, or urban and peri-urban. Peri-urban and informal sector settlements are also commonly referred to as squatter settlements, marginal settlements, shantytowns, urban slums, or illegal settlements. A consensus definition of peri-urban areas or urban informal sectors has been difficult to achieve among practitioners and researchers; however, there is general agreement to include settlements that are marginal to the physical and regulatory

boundaries of the formal city. In other words, local and national governments consider the urban formal sector legitimate, but do not approve of peri-urban/informal sector settlements.

Peri-urban settlements largely develop outside of government control and do not follow strictly formal and traditional urban planning and development processes. It is important to note, though, that the peri-urban sector is not monolithic and, more often than not, informal settlement development is a hybrid of formal and informal systems.

Slum areas are characterized by uncertain or illegal land tenure, minimal or no infrastructure, low incomes, and lack of recognition by government. Families who live in informal settlements build on the cheaper land outside city limits, on land within city limits that is not zoned for housing, on land that has not been urbanized with infrastructure, or on land considered dangerous or environmentally fragile.

Many informal settlements begin as land invasions with families illegally squatting on the land. Other informal settlements begin with the legal landowner illegally subdividing and selling the land without formal land registration or basic service provisions. Families often pay the former owner or occupant the full purchase price, but receive in return no registered title to the land. They generally do not participate in local government and are unconnected to the municipal service network. Finally, they tend to be ignored by municipal authorities, who find themselves overwhelmed by the informal sectors sheer numbers and needs, which far outstrip the capacity of the local planners and government.

The slum population should, therefore, be a focus of concern. Spatially, peri-urban areas are growing much more rapidly than formal urban districts; in many cities, the peri-urban sections are already bigger than the formal areas. Their rapid growth and informal status have resulted in low levels of sanitation services. The lack of these services in particular, inadequate excreta (human waste) management threatens the public health and environment of the peri-urban settlement, as well as the urban area as a whole. Nevertheless the few institutions that recognize the problem and want to do something about it find that little knowledge or experience exists about how to address this problem constructively.

Peepoople does not believe that simply providing latrines in high-density urban areas will achieve sustainable sanitation. Those who need sanitation the most are often the ones who cannot afford it. Therefore, they have no other alternative other than to use

what is available to them. It is a very innovative idea to introduce a low cost product such as the Peepoo bag, which rapidly can change the demand patterns among the poor. The Peepoo bag has been designed to help or cater for extreme situation by moving away from hard structures into a soft approach to sanitation and excreta management giving an individual inhabitant a choice to hygienic and sustainable personal sanitation.

1.2 Objectives of the Study

1.2.1 Overall objective

The overall objective of this study was to find out if the Peepoo bag meets the objectives, expectations and perceptions of beneficiaries/end users in meeting their sanitation needs and demands, and if the product is designed in such a way that it is not only bio-degradable but economically viable in terms of generating organic manure for sale, user friendliness and sustainability

1.2.2 Specific objectives

- 1) To understand the beneficiaries/end users needs and demands for the Peepoo bag in both socio-cultural and socio-economic terms.
- 2) To understand how the product is perceived by the potential users and/or what is necessary to improve on its quality in order to meet the expectations.
- 3) To understand how the by-product (manure or organic fertilizer) is perceived by the beneficiaries/end users.
- 4) To estimate the price of Peepoo bags and the market value of organic manure generated from used bags.

Thus at a bare minimum, this report is meant to answer the frequently asked questions in such a way that conclusions can be drawn regarding the products cash value both in terms of usage and as fertilizer, product development and emotional or health related aspects. This report is

also expected to provide requisite information to project designers when they begin to understand and confront the problems in bringing better sanitation to Kibera.

2.0 Literature Review

2.1 Hygiene and Sanitation

2.1.1 Hygiene

Hygiene is commonly known as cleanliness or conditions and practices that serve to promote or preserve health. A population that does not take into consideration hygiene is at risk of infection and illness. Improved housing, improved nutrition and improved hygiene are the essential components for the war against infectious diseases.



Picture 1: Human waste thrown into a flowing river

2.1.2 Sanitation

There are various ways of maintaining cleanliness and hygiene conditions that prevent diseases and infections; for example, garbage collections. Poor surrounding conditions lead to low quality of health.

Current definitions have commonly established that access to a latrine or a toilet does not automatically mean good hygiene. Access to a toilet is neither the same as its

hygiene practices. Studies of health-related conditions have detected that lack of latrines can be made less by adapting improved and hygiene behaviours.

A successful sanitation program improves health in a community, is sustainable at community and institutional levels, is cost effective and does not cause negative environmental impacts.

Table 1: Defining hygiene and sanitation

Hygiene	<ul style="list-style-type: none"> ⇒ Safe water storage ⇒ Safe hand-washing practices ⇒ Safe treatment of foodstuffs
Sanitation	<ul style="list-style-type: none"> ⇒ Safe collection, storage, treatment and disposal/re-use/recycling of human excreta (faeces and urine) ⇒ Management/re-use/recycling of solid waste (rubbish) ⇒ Collection and management of industrial waste products ⇒ Management of hazardous wastes (including hospital wastes, chemical/ radio-active and other dangerous substances)
Water management	<ul style="list-style-type: none"> ⇒ Drainage and disposal/re-use/recycling of household waste water ⇒ (also referred to as 'grey water') ⇒ Drainage of storm water ⇒ Treatment and disposal/re-use/recycling of sewage effluents

3.0 APPROACH AND METHODOLOGY

3.1 Description of the Study Area

Kibera lies at an altitude of 1,670 meters above sea level, latitude 36 degrees, 50 degrees east and longitude 1 degree, 17 degrees south about 140 km south of the equator. Kibera slum is the largest informal settlement in Africa, situated 5 kilometers south of Nairobi. Kibera started as a privileged settlement for ex-African soldiers (mainly of Nubian and Boran origin) who served under the British Army during the First and Second World Wars. At independence, most of these former soldiers were assimilated and naturalized as Kenyan citizens. They became the first landlords of Kibera as Nairobi started to grow as the Capital City of Kenya. Due to acceleration of rural-urban migration in search of better-paying jobs and improved livelihoods, increasing pressure for low-cost housing in the city made Kibera settlement an automatic target for development of informal temporary structures. As this trend continued over the years, Kibera has grown to become the largest slum in East and Central Africa housing more than a quarter of Nairobi's population.

Kibera is divided into eight official villages: Kianda, Soweto, Kisumu Ndogo, Lindi, Laini Saba, Silanga, Makini and Mashimoni. There are no residences greater or bigger than a single storey. The average home size is 9 m² with an average household population of five. The housing units in Kibera have become so congested that very little space exist in-between them. There are no spaces wide enough for vehicular movement, making it impossible even for exhauster service to access interior parts of the slums to empty toilets. Initially, any one plot with several residential units in Kibera shared one pit latrine. As demand for cheap housing increased in Nairobi, construction of rental houses was given preference, and toilets were seen as non-income generating structures occupying valuable space. While more housing units were built, fewer toilets were constructed, thus increasing the ratio of people sharing one toilet. For instance, there is one pit latrine for every fifty to five hundred people hence leading to the so- called 'flying toilets'. Because several pit latrines inside the slums cannot be accessed, when they get full they are closed, abandoned or demolished. The situation has been made worse by lack of solid waste collection, and many residents have resorted to using abandoned toilet sites as garbage dumpsites. All uncollected refuse unfortunately ends up in the drainage trenches, river valleys, and eventually into the Nairobi Dam.

This impact assessment was conducted in Silanga Village, Kibera which that covers an area of approximately 22.445 acres with an estimated population of 43,250 people.

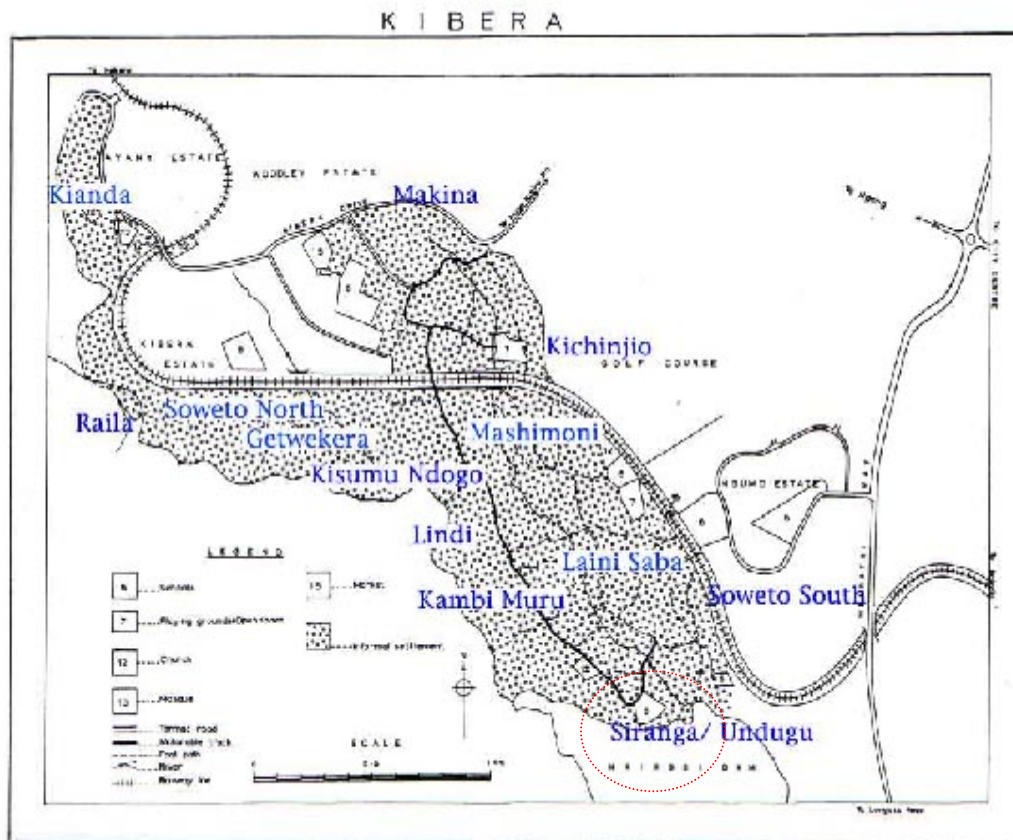


Figure 1: A map showing the location Silanga Village of Kibera

3.2 Gathering of Information and Data

The field test done at the beginning of this study involved a combination of quantitative and qualitative approaches. The study team collected the views on different aspects of the product from the selected households in the study area during the four-week field test. After the field test period was completed, key informant interviews and focus group discussions were used to collect additional information from the residents of Silanga Village.

3.2.1 Sampling

During the inception stage, stakeholder meetings were held in preparation for this impact assessment study. For the field test, 53 families of at least 5-7 individuals were randomly sampled. These 53 families were considered as a representative sample of Silanga Village population of 6,200 families. Out of the 53 families, some participated in focus group discussions or in-depth interviews. At least 5 focus groups with 10-13 participants were selected in each group.

The consultants chose and designed appropriate recruitment questionnaire, instructions/information sheet and user test diary. Before the start of the field test, meetings were held with community leaders and the selected participants.

3.2.2 Distribution and Collection of Peepoo Bags

During the field test, MES was responsible for delivering and coordinating the collection of the Peepoo bags. Five enumerators were recruited under the supervision of MES to distribute and collect the bags on a daily basis. Each enumerator was assigned a wheelbarrow to collect the used peepoo bags. A place was identified next to Udungu Centre where the used bags were disposed and later buried in the soil. A total number of 3,354 peepoo bags were distributed to 278 family members over a period of 28 days. Thus, on average each family member received 12 peepoo bags during the study period.



Picture 2: A question and answer session on the use Peepoo bag

3.2.3 Data collection, analysis and interpretation

During the field test, a diary was used to record the natural occurring behavior according to the specific categories of the Peepoo bag users. The diary consisted of a checklist which had items that sought information on the extent of the effects of the Peepoo bags and the possible strategies of improvements in the life of the slum dwellers. Data collected was analyzed using the MS Excel statistical package. The results thus obtained were presented using bar graphs, pie charts and trend lines.

4.0 MAJOR FINDINGS AND EMERGING ISSUES

4.1 Prevailing challenges in the slums

4.1.2 Policy issues

In pursuit of human welfare, development in Kenya has over years been fairly rapid. This coupled with high rate of population growth, has exerted excessive demands for the available natural resources, thus increasingly subjecting them to degradation and in some cases total destruction. It is therefore necessary to adopt development strategies that use nature's resources sustainably. Since independence, the government has been advocating for proper environmental management. This has been articulated in various policy statements, government directives and denouncements, sessional papers, and developments plans. The government position was articulated in the earth summit in Rio de Janeiro in 1992 by H.E. President Daniel Tororitich Arap Moi when he said "...the integration of development and environment is the only viable path to a sustainable future."

The government's commitment to proper environmental management is demonstrated by the adoption of the National Environmental Action Plan (NEAP) and the establishment of public environmental institutions.

The government recognizes the roles played by both non-governmental organizations and the private sector and has provided support and encouragement to their environmental efforts. The government also values the support of the United Nations and its agencies as well as foreign governments and organizations. In this regard, the government participated in the first United Nations conference on human environment in Stockholm, Sweden in June 1972. The conference established the United Nations environmental program (UNEP). UNEP, with its headquarters' in Nairobi, is charged with the take of spearheading, catalyzing, and coordinating sound global environmental practices to enhance a healthy and quality environment for humankind.

Concern for environmental planning has long a history in Kenya. Reference to integrating environment and economic issues was made in the country's development plan as far back as 1974. The 1974-78 plans noted that competition and conflicts between land use interests were growing and that there was need for greater co-ordination between the various agencies of government in order to address these effectively. The subsequent development plan (1979-83) stressed the needs for environmental inputs in the national planning process pointing out that environmental considerations must pervade development decisions at every level.

4.1.3 Institutional and Legal Arrangements

Currently there is no comprehensive policy and legislation on waste management. However, there are various pieces of legislation dealing with the management of wastes. The implementation is however not effectively harmonized and thus they do not provide for efficient management.

4.1.4 Environmental Challenges

The Environment Sector is faced with numerous challenges that require urgent attention.

These include:

- ⇒ Weak enforcement of existing laws and regulations, unrealistic penalties, inadequate human resources to monitor and enforce regulations, and cumbersome procedures
- ⇒ Absence of discharge standards and methods for measuring the quality and quantity of effluents
- ⇒ Inadequate incentives to encourage adoption of efficient waste management technologies
- ⇒ Insensitivity of industry to the legal requirements for health and safety in the workplace
- ⇒ Low priority and status given to waste management and sanitation
- ⇒ Inadequate training facilities for occupational health and safety services

4.1.5 Sanitation, Water Supply and Public Health

a) Sanitation

Due to the informal nature of the Kibera settlement, infrastructure is not planned and services are provided in an ad-hoc manner. Since the 1960s the Nairobi City Council (NCC) Water and Sewer Department's (WSD) have declined to plan for Kibera slums to be connected to the water system despite the willingness of residents to pay. The traditional view has been that provision of water to unauthorised settlements would legitimise an otherwise non-permanent occupation.

Lack of a regular planning framework for sanitation services in informal settlements has meant that structure owners are at liberty to ignore provisions of sanitation facilities to their tenants. For this reason, latrines in Kibera are in shortage, a situation brought about by preference by landlords to construct income-generating housing units instead of "economically unproductive" toilets. Not being a priority has made pit latrines to be constructed using scrap building materials, temporary structures that easily collapse. In spite of the increasing population, Kibera has continued to lack adequate toilet facilities resulting into up to 150 people sharing one latrine in some places. Toilets in areas of high water table flood and overflow into drainage trenches during rainy seasons and eventually into the Nairobi Dam.

Lack of space in-between housing units in Kibera has denied exhauster services access to filled toilets causing a serious sanitation problem. Whereas many latrines are emptied manually into drainage channels, few others are covered and abandoned upon filling up. Insufficient availability of latrines has led to alternative methods of excreta disposal such as the use of “flying toilets” (wrap and throw method – with polythene bags). These are mostly used at night especially when residents consider it insecure to use the few latrines located on the outside.

b) Water Supply

A rapid need assessment carried out in 1997 for the preparation and implementation of the Kibera Water Distribution Infilling Component (KWDIC) illustrated the water supply situation in Kibera as inadequate, irregular and limited in accessibility. Despite improvement of Nairobi’s water supply including commissioning of the Ndakaine Dam in 1996, water supply situation in Kibera has not improved much. Access and availability of water is limited and frequent shortages contribute to an increase in costs, the time spent and distance walked.

c) Public Health

Most health problems suffered by Kibera residents are directly or indirectly associated with the quality of water and environmental sanitation. The Rapid Needs Assessment indicated that Malaria, diarrhoea (typhoid), intestinal worms and vomiting are the major ailments by the community. These diseases are potential water-borne public health hazards.

There are no adequate public health services available in the Kibera settlement. Medical services and facilities in Kibera are mainly offered by NGOs through clinics and dispensaries. Occasionally, there are mobile health clinics conducted by the Public Health Department (PHD). Other than these, the nearest medical facilities are the Woodley Clinic, Kenyatta National Hospital, IDH Mbagathi and the Prison’s Clinic along Lang’ata Road.

4.1.6 Human Settlements

The pattern of human settlement in the country is influenced by natural resources endowments which include availability and accessibility to land, shelter, water, food, sources of energy, as well as social amenities such as communication, health facilities, resources and the population pressure has led to serious environmental problems in human settlements.

Although urbanization has grown rapidly, Kenya is still largely a rural society. By 1989, about 80% per cent of the population lived in dispersed rural settlements. These settlements have continued to receive minimal attention because the rural people have always provided their own forms of shelter using locally available materials. Some low-density rural settlements have

been seen to cause little damage to the environment, funds and professionals that can be used to manage the expansive rural areas are extremely inadequate.

At the same time, the once well-planned urban centers have experienced high concentration of population with inadequately provided and maintained physical infrastructure such as housing, social facilities, utilities and amenities. Consequently, the urban environment has been seriously degraded, prone to a wide variety of health hazards, pollution, floods, fires, overcrowding, unplanned settlements, and traffic congestion.

Notwithstanding all these problems, urban centers continue to attract increasing numbers of emigrants from rural areas searching for employment opportunities and better living conditions, thereby exacerbating the deterioration of the urban environment.

To compound these problems the local authorities have been unable to address the ever-increasing demands made on them by the swelling populations due to budgetary and manpower constraints. The local authorities are barely able to provide for even their recurrent expenditure; hence environmental problems hardly get addressed.

Local communities lack the necessary awareness and organization capabilities needed to address environmental problems. Even the private sector, which could contribute resources towards initiatives aimed at addressing environmental problems, is not sourced.

The fact that commercial and industrial enterprises are urban based continues to encourage rural-urban migration. Once in the urban centers problems of housing, sanitary facilities and other social amenities are exacerbated by the influx of population, which was not catered for in the initial urban planning. This leads to a crippling of the financial and administrative capacity of local authorities to cope with the demands for services, eventually leading to the mushrooming of unsanitary slums and shanties, garbage accumulation, and fire risks.

Other problems associated with rural-urban migration are high unemployment leading to crime, juvenile delinquency, poverty, poor health, and generally a lower quality of life for urban dwellers.

4.1.7 Poor Infrastructure

The United Nation Habitat (2006) have described the sanitation challenges in slums in terms of poor basic services which results in lack of access to sanitation facilities or safe water sources. This is due to the lack of waste collection services, poor rainwater drainage system, poor infrastructure and absence of electricity supply.

Substandard and inadequate houses have been built in slums with temporary materials, which are unsuitable for conditions such as straw roofs, mud, earthen floors and plaster.

Overcrowding and congestion result to too little space per person, expensive housing rates. There is cohabitation of different families and more single rooms. One room-unit in slums is often shared by five people whom they use for cooking, sleeping and living.

The lack of basic services, visible and open sewers, the lack of pathways, the uncontrolled dumping of waste and polluted environments, result to unhealthy living and hazardous living conditions. Houses may be built in dangerous locations, which are unsuitable for a human settlement; for example, near waste disposal sites.

Poverty or financial status is considered with some exceptions, as major features of slums. Some socially excluded areas are thought to have increased risks of crime and other forms of social dislocation.

The impact of proper sanitation and hygiene explains how improved quality of life is achieved through various ways. Awareness and access to sanitation and hygiene leads to the reduction of child mortality and combats diseases of maternal health as well as increases in the economic output and, hence, eradicates poverty.

As a result of poverty eradication, women's empowerment as well as gender equality is achieved. In addition, universal primary education is attained and quality of life is improved which combats diseases.

4.1.8 Social Aspects

Kibera slum dwellers consist of different ethnic communities. Most of them have come to the city to look for sustainable livelihoods. In the event of social conflicts in the area, ethnic reactions tend to flare up especially between the original Nubian community on one hand and other local ethnic groups. Kenya's water resources crisis carries significant social risks. Growing demand over limited endowment of water generates competition and causes conflicts over water use within the village, posing considerable social risks to the poor and the communities without adequate representation in the location in decision-making.

In terms of family pattern, households consist of either single person with an average family size of seven (7). Most households are female-headed households as the village is a big source of day domestic workers who work in the middle and high class estates around Nairobi.

4.1.9 Uncertain Legal Status of Slum Areas

The underlying legal issue for peri-urban settlements is that they lack official recognition as legal residential areas because the land they occupy usually has not been zoned for housing or is considered dangerous or environmentally protected. Either the residents occupy the site without legal land tenure or they buy it from the landowner, who in turn has not legally urbanized the land (that is, legally registered the land or plots and installed or brought in municipal services such as electricity and water).

In Kibera, households also may be reluctant to invest time and money in infrastructure improvements that may not benefit them in the long run. Because unstable land tenure means residents can eventually lose the land, they often are less willing make home improvements.

The challenge to developers and local authorities, who likely have different though equally legitimate interests, is to find a mutually acceptable resolution of their conflicts. Recognition of these inherent conflicts is important, and facilitated meetings often can help smooth the way for a continuation of the design and implementation process.

Specific legal issues that may need to be assessed when designing a sanitation improvement project include land tenure, plot registration with municipal authorities, and the applicability and appropriateness of building codes, design and construction standards, and environmental regulations. Indeed, sanitation improvement projects can help to accelerate the natural transformation of peri-urban areas into formally recognized communities.

4.2 Monthly Income and House Rent

4.2.1 Monthly Income

About 40% of the respondent live on less than KShs 1000(12 US Dollars) per month, which translates to less than one dollar a day as indicated by the monthly income distribution pie chart in figure 2.The other respondents were categorised as 20% who earn between Kshs 1000 and Kshs 2500, while the rest earn up to amaximum of Kshs 4500 per month.This level of income cannot sustain a family of six members in a month considering high prices of basic necessities in the country.

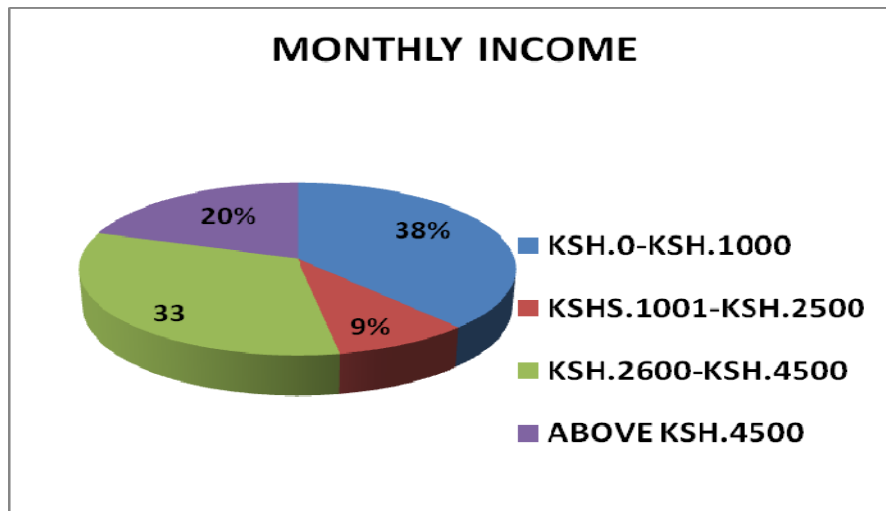
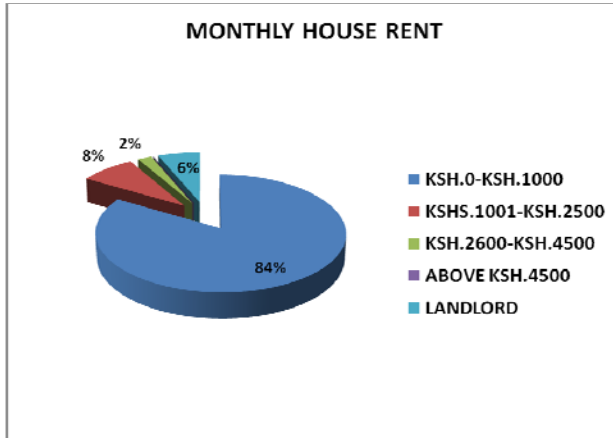


Figure 2: Monthly Incomes

4.2.2 Monthly House Rent

A remarkable 80% of the residents of Silanga village pay about Ksh.1000 per month as their house rent which virtually wipes out all they earn in a month leaving them with nothing to spend on food, transport clothes and other basic requirements.



The monthly rent as shown in figure 3 demonstrates the high cost of housing compared to the level of income the respondents earn.

Figure 3: Monthly House Rent

4.3 Occupation Profile

According to the respondents the occupants /of Silanga Village earn their livelihoods from different occupations, but the majority do not have a particular type of occupation or are unemployed as shown in figure 4. The rest of the villagers sell vegetables, clothes, food, water, shop merchandise, play football, are shopkeepers, drycleaners, watchmen and security guards, just to mention but a few. All these income earning opportunities are not only available in Kibera, but also in Nairobi as a whole.

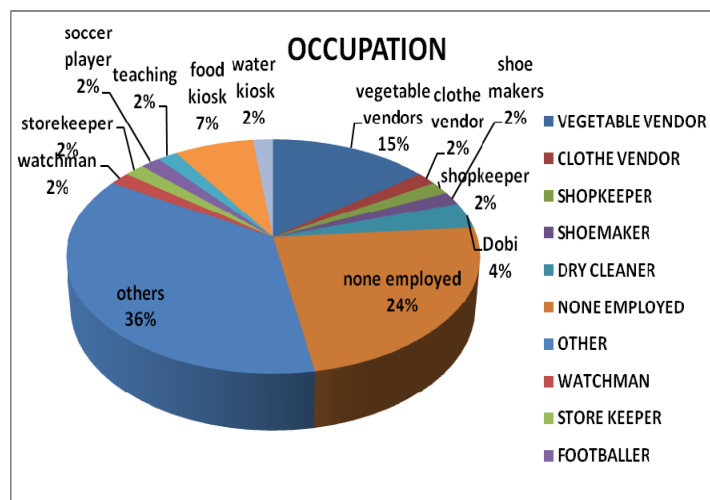


Figure 4: Occupation profile

4.4 Information on Gender and Ages of Respondents

The information obtained from respondents covered both male and female, while the ages of the respondents catered the young and old. The age groups and their proportionate distribution among those interviewed were as shown in figure 6.

The number of women interviewed during the exercise was higher than the men as shown in figure 5. A large number of young people of ages between 21-30 years and parents aged between 31-40 years were also interviewed. This indicates that the Peepoo bag would greatly assist women and children in Silanga village. What was important to note was the fact that the interviews captured a wide spectrum of the villagers who participated in the field testing of the Peepoo bag.

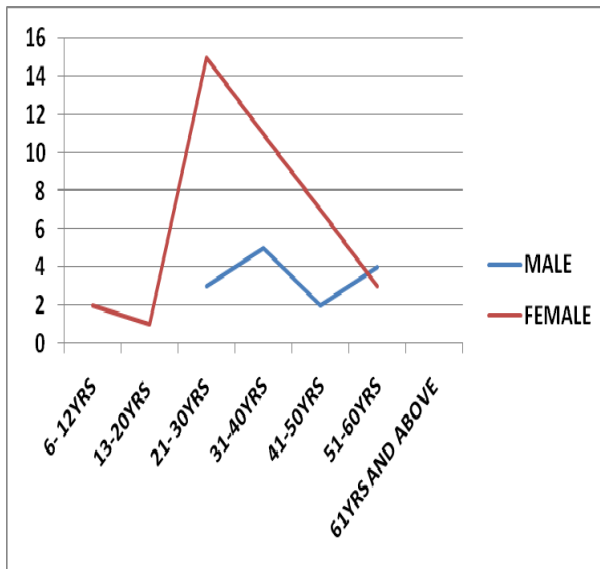


Figure 5: Gender

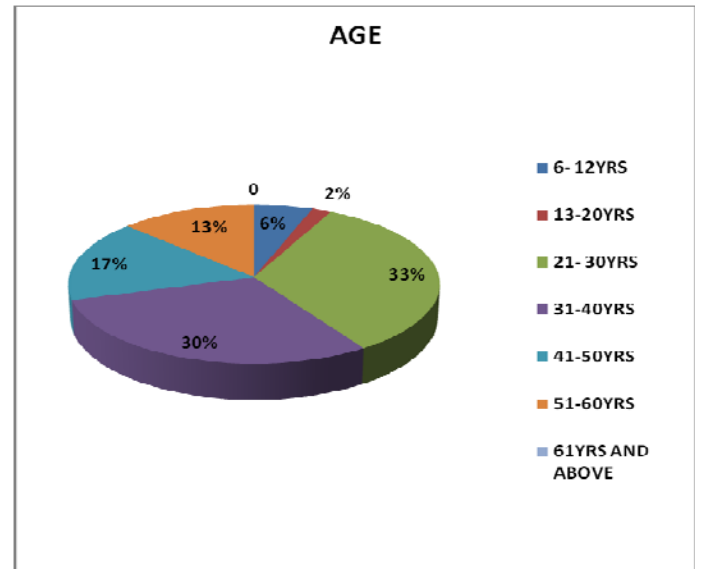


Figure 6: Age Distribution

4.5 Emerging attitudes towards the Peepoo bag

4.5.1 Information on Peepoo Bag Usage

The breakdown of the answers given by respondents with regard to Peepoo bag usage is contained in Table 2. Thirty-four respondents found it hard to understand how to use the Peepoo bag while nineteen respondents found it easy to understand how to use the Peepoo bag. Fifty respondents said that they feel safe i.e. feels clean when handling Peepoo bag because they do not have to use shared toilet facilities whose hygiene conditions are wanting and three respondents said they do not feel safe using the Peepoo bag. Twenty-four respondents said the size of bag is good while twenty-nine complained of bag's small size. This represents those

users who could use both pee and poo and the users who could not use both pee and poo at the same time.

Table 2: Information on Peepoo Bag Usage

Factors considered	Number of respondents			
	Yes	No	A little	Maybe
Is it hard to understand peepoo bag use	19	34		
Safe feeling when using, clean	50	3		
Good size of bag	24	29		
Human waste enter bag easily	42	11		
Used with both pee and poo	36	17		
Is it easy to close the peepoo bag	47	6		
Human waste come outside thin inner bag	7	46		
Human waste never come into the knot	13	40		
Bag smell after usage	3	32	18	
Consider bag for everyday use	46	1		6
Consider bag as sanitation solution for Kibera	53			

At least 90% of the users highly recommended the Peepoo bag as an absolute sanitation solution within Kibera and 94% percentage felt that the Peepoo bag was safe and clean to handle. It was important to note that more than 85% of the respondents would agree to consider Peepoo bag for everyday use. Many users found it easy to use the Peepoo bag though they complained of the small size of the bag. This means that the adults were not able to use both pee and poo at the same time. A large number, however, admitted that the human waste entered the bag easily and did not come outside the thin inner bag into the tie knot. The majority of users said that no smell was noticed after using the bag. This was true for those who opened the bag immediately during usage, whereas those who used the bag sometime after opening it realized a little smell being brought forth. All the afore said is illustrated in Figure 7 below.

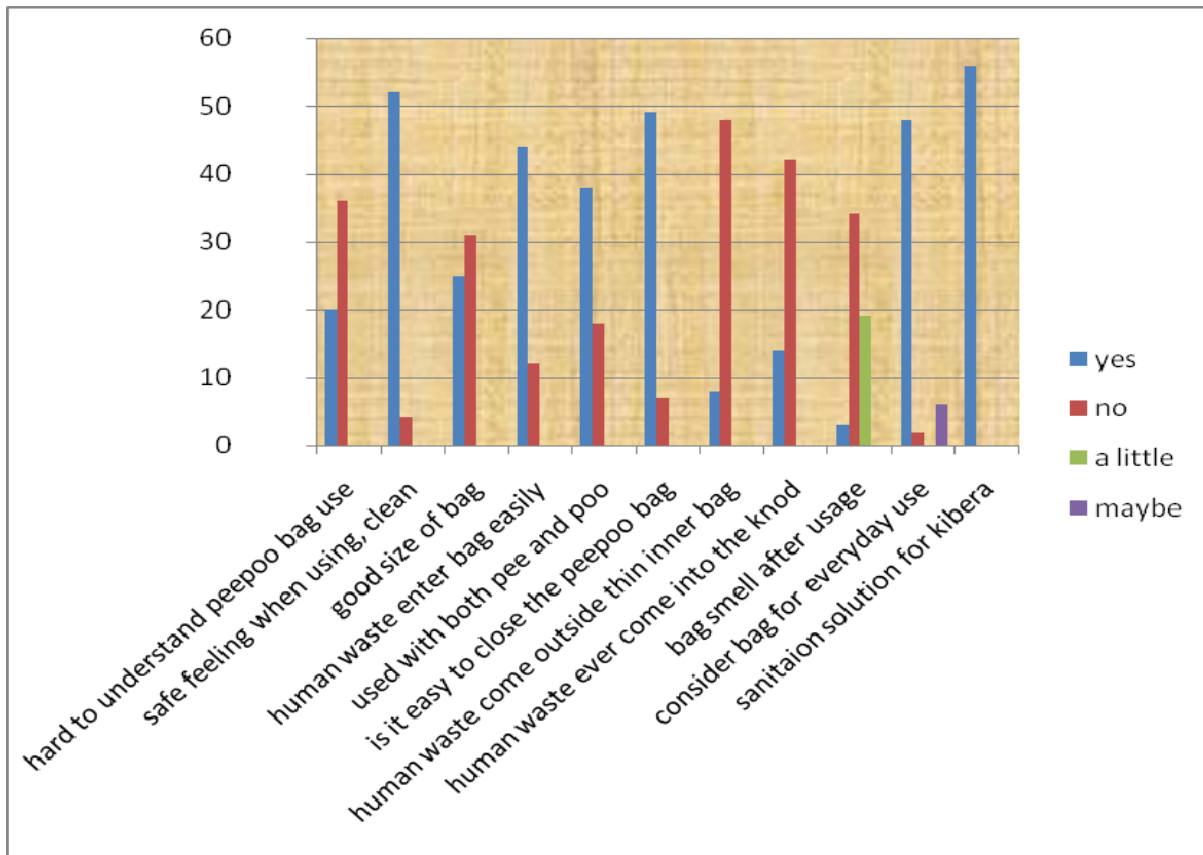


Figure 7: Usage of Peepoo bag

4.5.2 Who Used/Did not Use Peepoo Bags

It was observed that the bags were mainly used by the mothers (20) and children (25) followed by whole family (12), fathers (6) and youths (1). The low number of male adult users was due to emotional, social and cultural perceptions. It was also noted lack of privacy at home was a reason for not using it. Table 3 shows the comments given by the families who were interviewed. It was observed that whereas the mothers and children used the bag the fathers refused to use the bags due to the above-mentioned reasons. Figure 8 illustrate how lack of information and understanding of such innovations as the Peepoo bag would influence the behaviour of some members of the community in terms of improving sanitation in Kibera.



Figure 8: who used /did not use the peepoo bag

Table 3: Comments by those who did not use the bag

Reason for not using	Number of Respondents
Emotional concern, men cannot use	1
Culture prohibits going to the toilet in the house (kikuyu)	2
Bag suitable for children	1
Found it funny to have human waste in the same room where I stay	1
Have a personal toilet	1
Room is small and felt embarrassing to use	1
Could not chase children outside to use especially daytime	1
Taboo and not suitable for grown ups	1
Felt shy	1
Bag too small	3
Too childish for adults	3

4.5.3 Price to set for the Peepoo bag

More than 80% of the respondents were of the opinion that Peepoo bag be sold for less than Ksh.5 to favour the majority of the inhabitants. The rest of the respondents suggested price range between ksh.6 and ksh.20 as shown in figure 9 . However, it should be noted that any

price above Ksh.5.00 will be expensive for families with many children who often use the toilet frequently.

The prices suggested by the respondents were abstract because the Peepoo bags were provided free of charge and therefore their views on the affordable price were merely based on their economic status. In addition, the villagers pay Kshs.2.00 per visit to the CDF toilets hence the high percentage of those who suggested a price of less than Kshs.5.00. However, two respondents suggested a price of Kshs.5 for a pack of 10 Peepoo bags.

It is important to note that the respondents also said that they do not incur any cost on the plastic bags used as ‘flying toilets’. The plastic bags are packaging waste from shops and kiosks. Other families use old newspapers borrowed from friends and relatives.

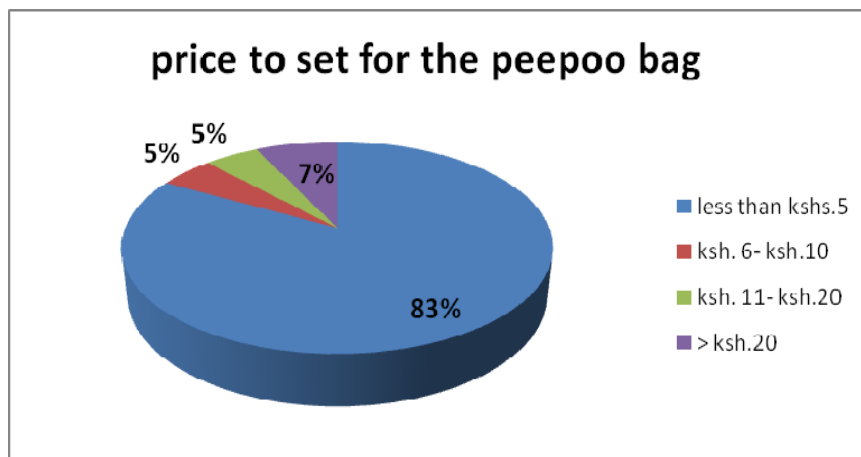


Figure 9: Suggested Peepoo bag Prices

Table 4: Suggested prices to set for the peepoo bag

Suggested price	Number of respondents
For less than Kshs.5.00 per bag	34
Ksh.6.00-ksh.10.00	2
Ksh. 11.00- Ksh.20.00	2
>Ksh.20.00	3
other	12

When the respondents were asked whether the Peepoo bag should be handed out for free or not, more than 60% of the respondents were of the opinion that the bags be given out for free as shown in Figure 10. They argued that majority of the villagers would not afford any price because of poverty. The rest of the respondents suggested that handing out the bag for free would cause misuse among the users. Others: Suggested broad range of prices such as 10 Peepoo bags for Ksh.5 and 100 bags for Ksh.50.00. These two happen to be the lowest prices suggested.

When the respondents were asked whether the bag should be issued for free to Silanga families the majority (63%) said yes while the remaining (37%) said no as shown in Figure 10. The reason given by those who said no was that it would discourage the dependency syndrome. They had rather spend something small than depend on a bag given free with inconsistencies and inavailability.

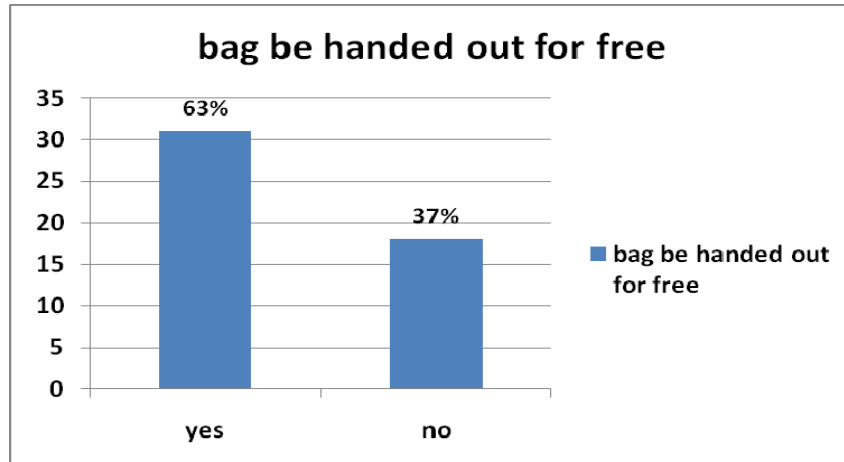


Figure 10: Response on bag being handed out for free

4.5.4 Waste disposal from the Peepoo bag.

The field test showed that there is a desperate need for the Peepoo bag usage in Silanga village. According to the survey illustrated in Figure 11, more than 50% of the respondents admitted that they throw away waste. The respondents indicated that during the field test period they did not throw away waste especially from children due to the use of the Peepoo bag. This implies that children would greatly benefit from this venture for the majority of parents who lack funds to access proper sanitation facilities in Silanga.

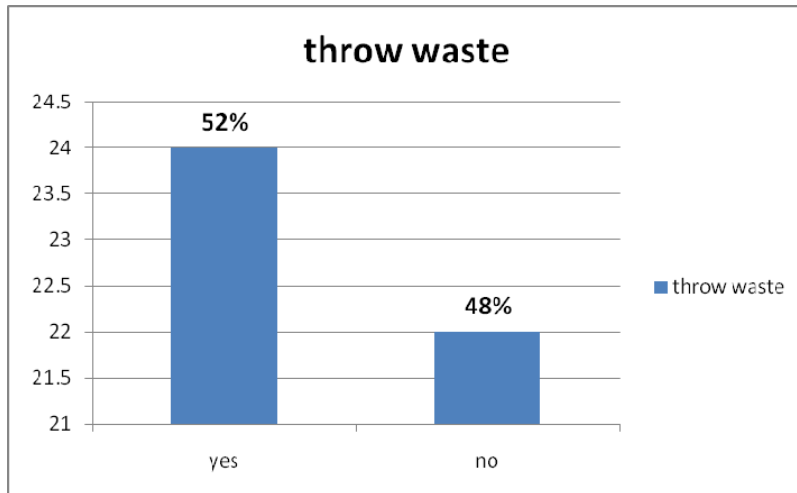


Figure 11: Excreta Disposal

4.5.5 How to distribute the Peepoo bag

The respondents were of the view that distribution of the Peepoo bag should involve the opinion leaders, group leaders, community based organizers, church leaders, youth leaders and village elders in coordinating the process. Figure 12, below illustrates the survey findings.

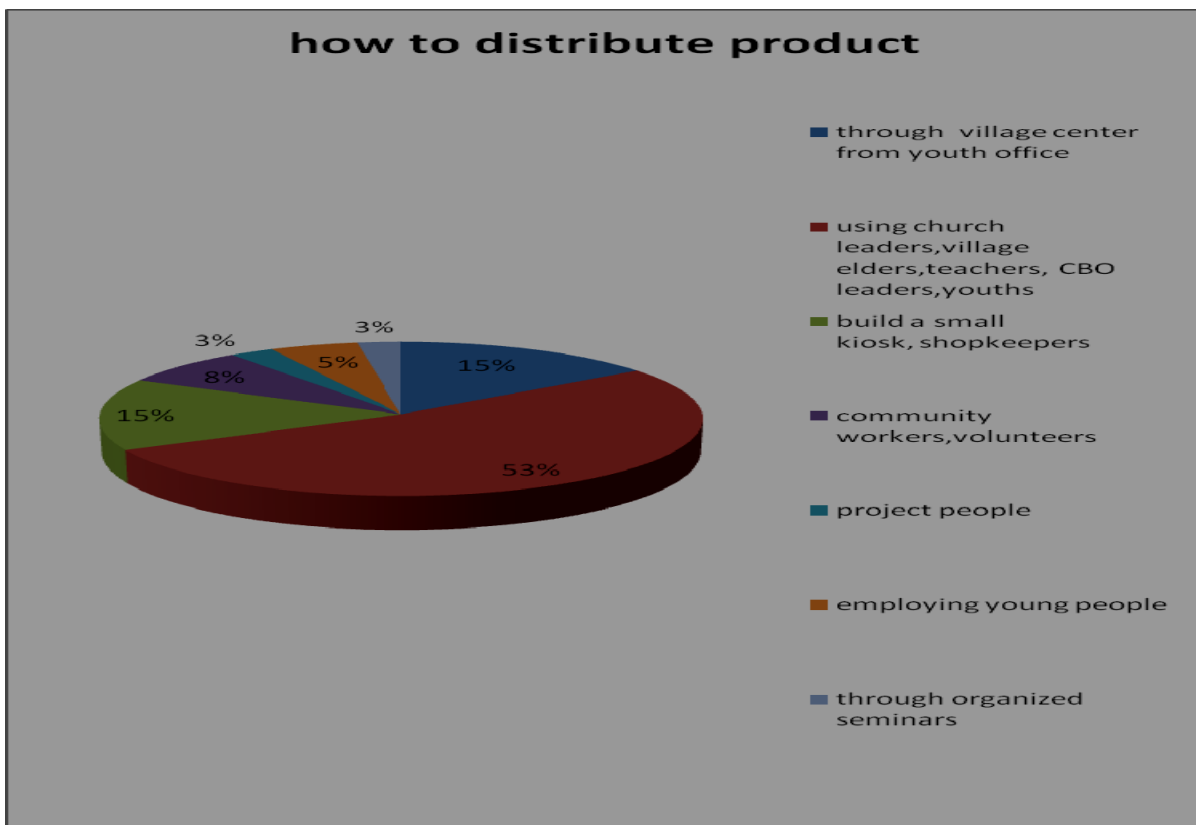


Figure 12: Peepoo bag Distribution

4.5.6 Products aspects valued

It was noted that the fertilizer aspect was the most valuable because of the implied economic benefits. The toilet aspect was cited by about 37% of the respondents as most valuable. Figure 13 also shows respondents views with regard to health and social aspects.

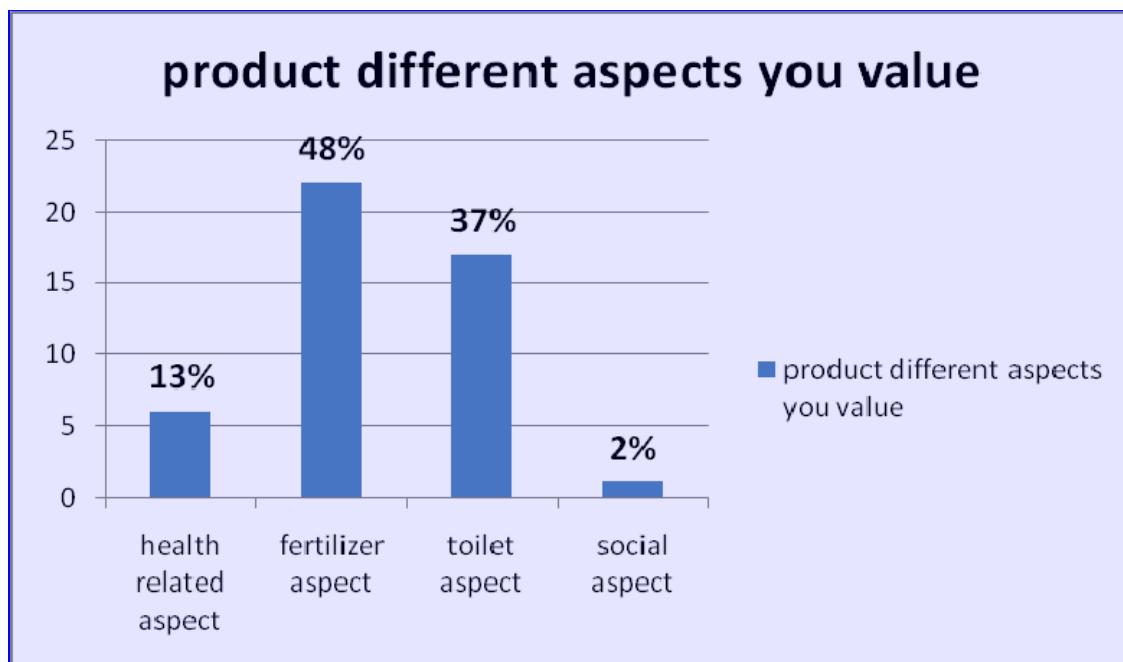


Figure 13: Product Value

An overwhelming 84% of the users admitted that they would use the fertilizer themselves. It can also be seen from Figure 14 that 8% said they could not use the fertilizer, 4% said they do not know how to use the fertilizer whereas 2% said that someone else should use the fertilizer. Most of the respondents do not have gardens in Silanga however; they are willing to take the fertilizer to the rural homes.

Table 5: Response on fertilizer usage

Response (quiz: would you use fertilizer yourself)	Number of respondents
Yes	41
No	4
Don't know how to use fertilizer	2
Someone else	1
No answer given	5

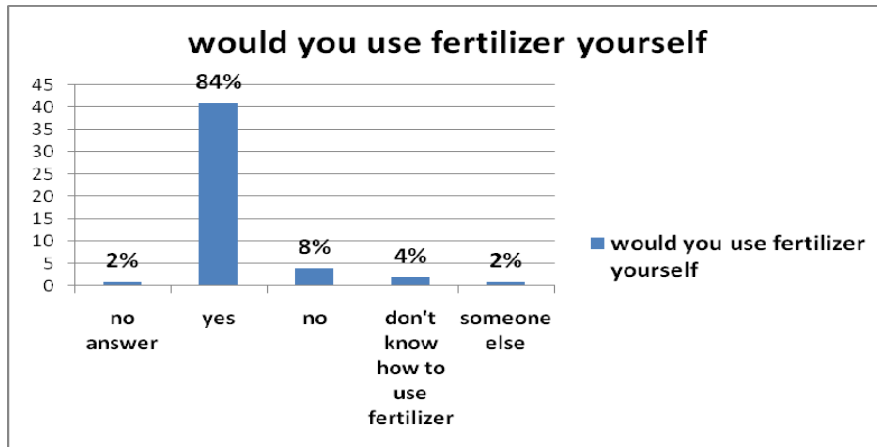


Figure 14: Fertilizer Usage

4.5.7 Price of Fertilizer / Organic manure

The respondents merely estimated the price of fertilizer/organic manure because they do not have experience on use of faecal matter from human beings. However, the villagers are aware of use of effluent for irrigation of vegetables around Kibera. When asked to explain further on this issue, the respondents said that in order for Kenyan people to appreciate the value of human manure in improving soil fertility and subsequently grow vegetables for their use, a lot of awareness creation should be done. Figure 15 illustrates the suggested prices for the manure.

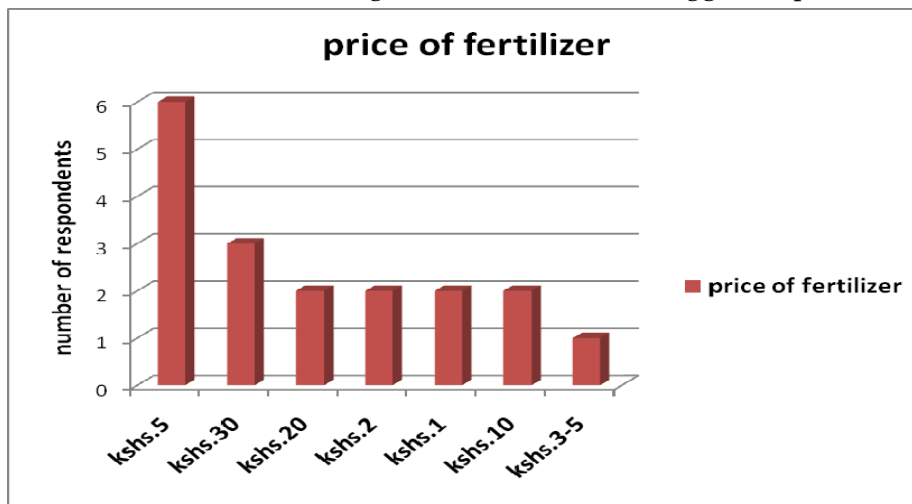


Figure 15: Price of fertilizer/organic manure

4.5.7 Peepoo Bag Design

The size of the Peepoo bag elicited such concern among the respondents with over 64% suggesting a bigger bag. More than 23% expressed a desire to have a stand introduced during the Peepoo bag usage to enhance comfort. Some suggested the introduction of “ a holding

mechanism” such as “Kasuku” tin for the Peepoo bag usage ; this will greatly facilitate easier, safer and clean handling of the bag. These views are as illustrated in Figure 16. The number of respondents who gave answers on this aspect were as shown in table 6.

Table 6: How to improve Peepoo bag

Suggestions	Number of respondents
Enlarge the size, increase length	28
Design like a baby's "potty"	5
Stand be introduced to ensure comfortable sitting	10
Introduce "holding mechanism"	1
Other	9

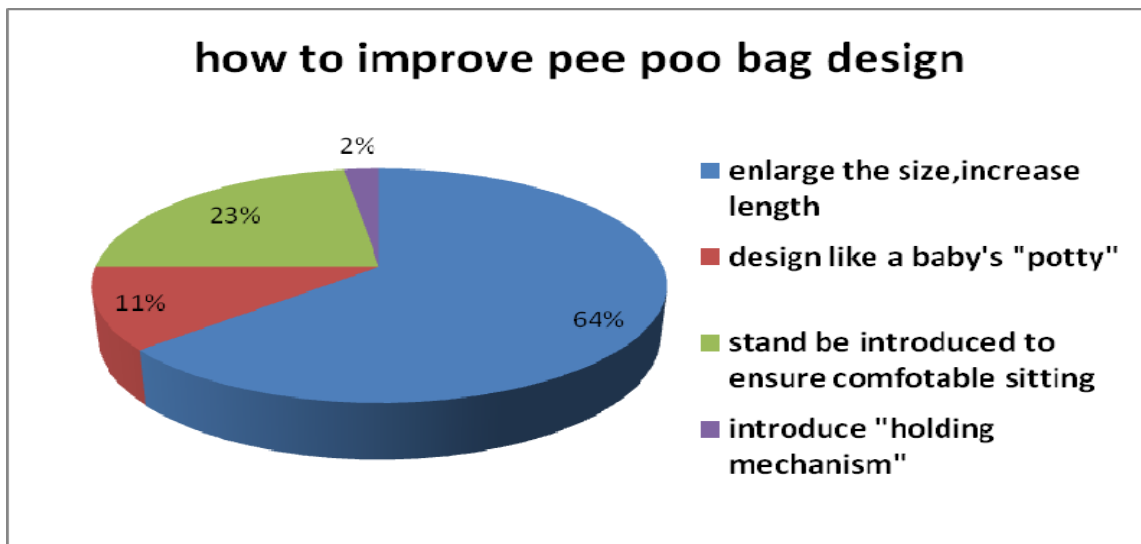


Figure 16: Suggestions for improving Peepoo bag Design

Great concern was expressed by the respondents with regard to the size of the Peepoo bag. Many said that the bag could not accommodate usage for both pee and poo at the same time. Figure 16 shows the many respondents who said that they want the Peepoo bag be made bigger so as to accommodate both pee and poo. One respondent also commented that the current size of the Peepoo bag was not large enough for him as a man. Other respondents said that although it is easy to make a knod after usage of the Peepoo bag they want the bag be made longer. It is also important to note that the respondents do not want the green gauze be taken away or removed.

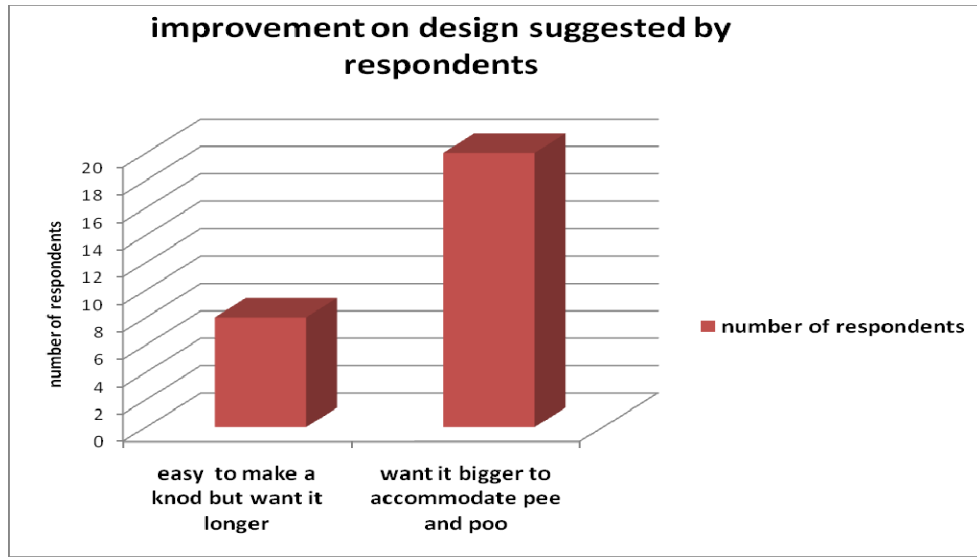


Figure 17: Improvement on design suggested by respondents

Some of the respondents recommended a separate design for men because of small size of the bag and that it cannot hold urine for long. The others said they gave the bags to some visitors to use but they declined. Another respondent cited taboo, ignorance, negligence as some of the functional obstacles against using the Peepoo bag

4.5.8 Mechanisms used to hold Peepoo bags

Respondents said that they found it necessary to use 2 kg Kasuku container (i.e used cooking fat container) for easy handling of the Peepoo bag. The use of a Kasuku container was improvised by the participants. They said that after trying to use the bag by hand was inconvenient and uncomfortable to the adults. However, the use of the Kasuku container by inserting the bag into the container and holding it inside out at the container's edge. This encouraged the participants to embrace the use of the bag. As illustrated in figure 6, the rest of the respondents indicated that they used a PET- bottle.

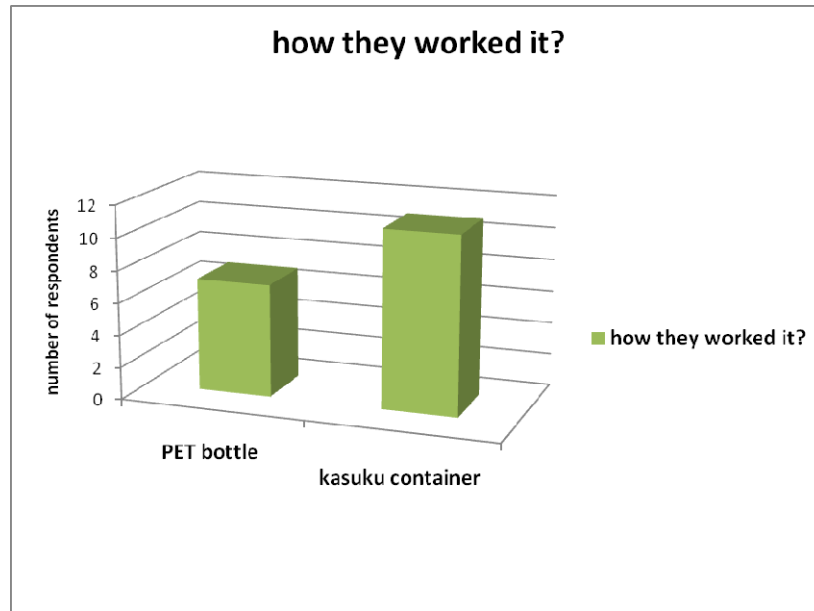


Figure 18: Mechanism used to hold the bag

4.5.9 Time spent going to toilet

Due to the congestions in the available toilets, the respondents indicated that 36% spend less than 5 minutes going to the toilet while 40% of the respondents spend at least 15 minutes per visit. About 22% said they spend between 16 and 30 minutes going to the toilet per visit. It was noted that 2% spend about 1 hour per visit as shown in Figure 19.

On the issue of time saved with the use of the Peepoo bag, 33% indicated less than 5 minutes, 24% indicated 6 minutes-15 minutes, 27% indicated 16-30 minutes whereas 16% indicated about 1 hour per visit as shown in Figure 20. The explanation given by the respondents on the varying time spent going to the toilet depends on the distance of the toilet from the house and the congestion by users of the toilets.

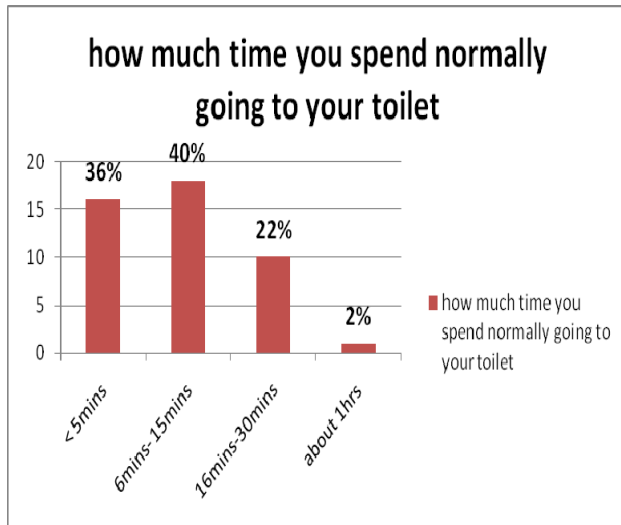


Figure 19: Times wasted at the Toilet

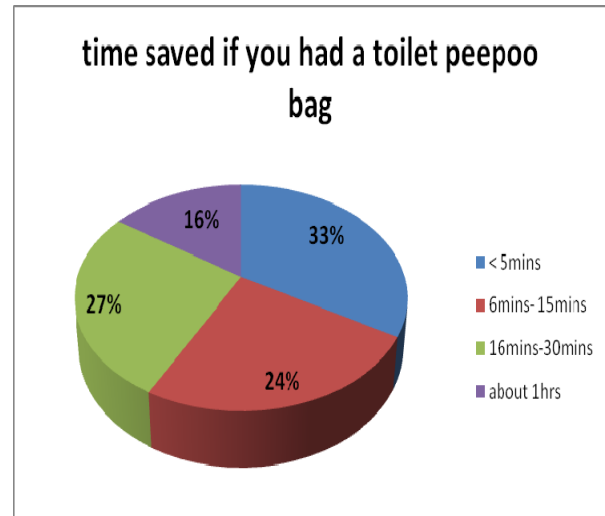


Figure 20: Time Saved by use of Peepoo bag

From the afore mentioned, the number of people who will save time through the use of Peepoo bag comprises of women and children. These categories are involved in daily activities such as selling vegetables, food, clothes and running of kiosks of which time is of great importance, while the children need to get to school in time.

In relation to the question of time spent going to the toilet, the respondents were asked whether they stand in line or not when accessing the toilets, of which 78% said yes and the rest No (Figure 21). This implies that the few available toilets are congested and one cannot easily walk in without waiting in long lines for his/her turn.

Many users share the few available toilet facilities with their neighbours. The respondents indicated that 98% share toilets while the rest use family toilets or “flying” toilets (Figure 22). The respondents also said that the dangers posed by sharing of toilets is one of the major sanitation concerns in Kibera because the toilets are usually dirty. This makes it difficult for the children particularly to avoid contracting diseases.

There are two categories of villagers who share toilet facilities. The first are those who have been provided toilet facility by their landlords and do not pay any cost. The second category represents users who access communal toilets such as C.D.F toilets and group managed toilets. Payment made for C.D.F toilets are kshs.2 per visit whereas group toilets charge members kshs. 60 p.m non-members kshs.2 per visit. The only example of group toilets in Silanga area is Undugu Youth Project toilets.

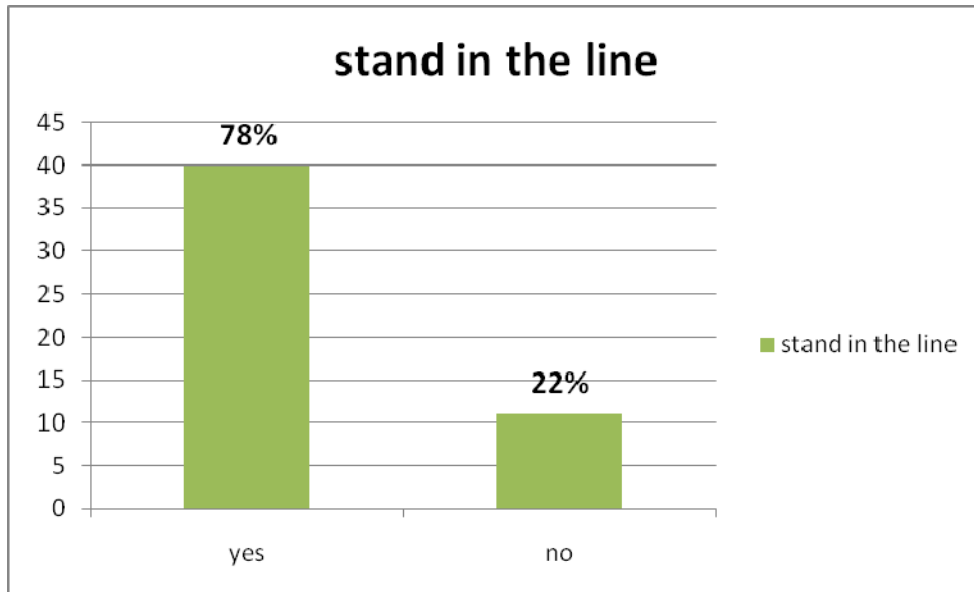


Figure 21: Time spend standing in the line

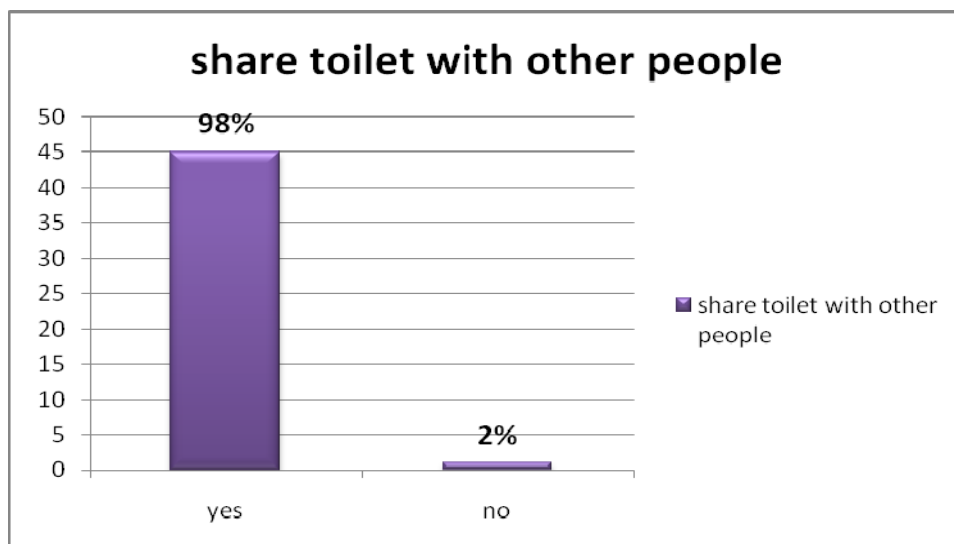


Figure 22: Sharing of the toilets

4.5.9 Location and time the product was used

It was observed that the bag was used in the house behind the door (30), others used the bag within the plot (15) and one used at the corridor (Figure 23).

On the time the product was used, most respondents indicated morning and evening as shown in figure 24. It is important to relate the time the product was used and the congestion in shared toilets as motivation that worked in favor of the bag.

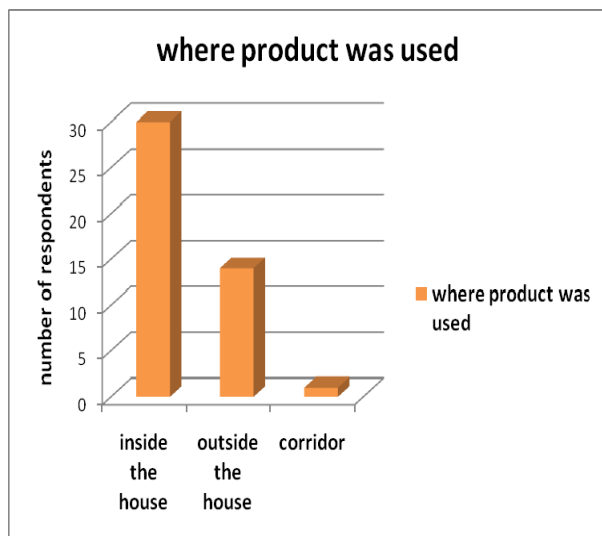


Figure 23: Where product was used

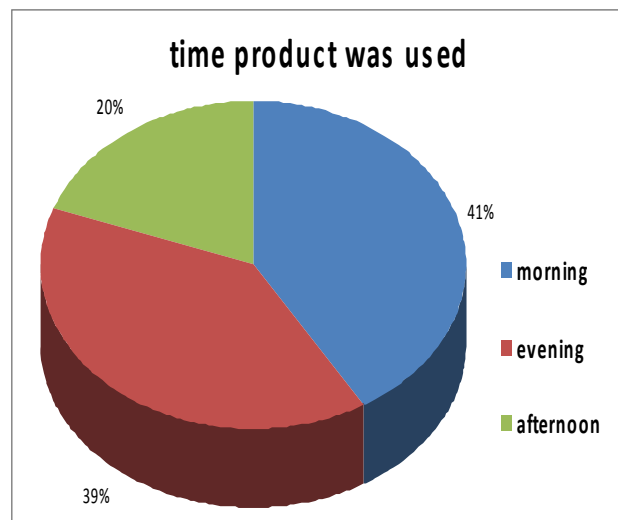


Figure 23: Time product was used

The time the respondents go to the toilet was categorized into morning, afternoon and evening. Most of the respondents (30) indicated morning hours followed by evening (21) and afternoon (16) in that order. This can be compared with the time Peepoo bags were used.

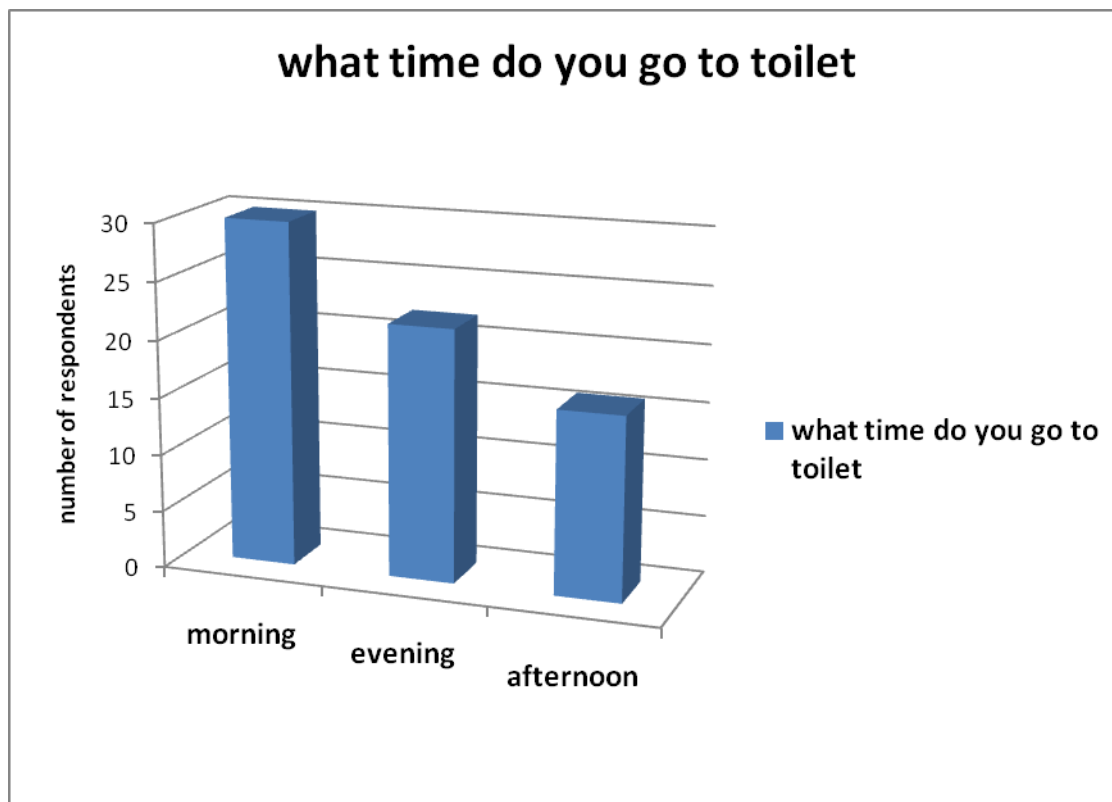


Figure 24: Time going to toilet

4.5.10 Impact of Bag On Everyday life

On the impact of the bag on everyday life of the respondents, it was observed that the majority preferred the fertilizer benefit, followed by the financial benefits, saving time, relieve, cleanliness, toilet benefits and cheap cost in that order (Figure 26).

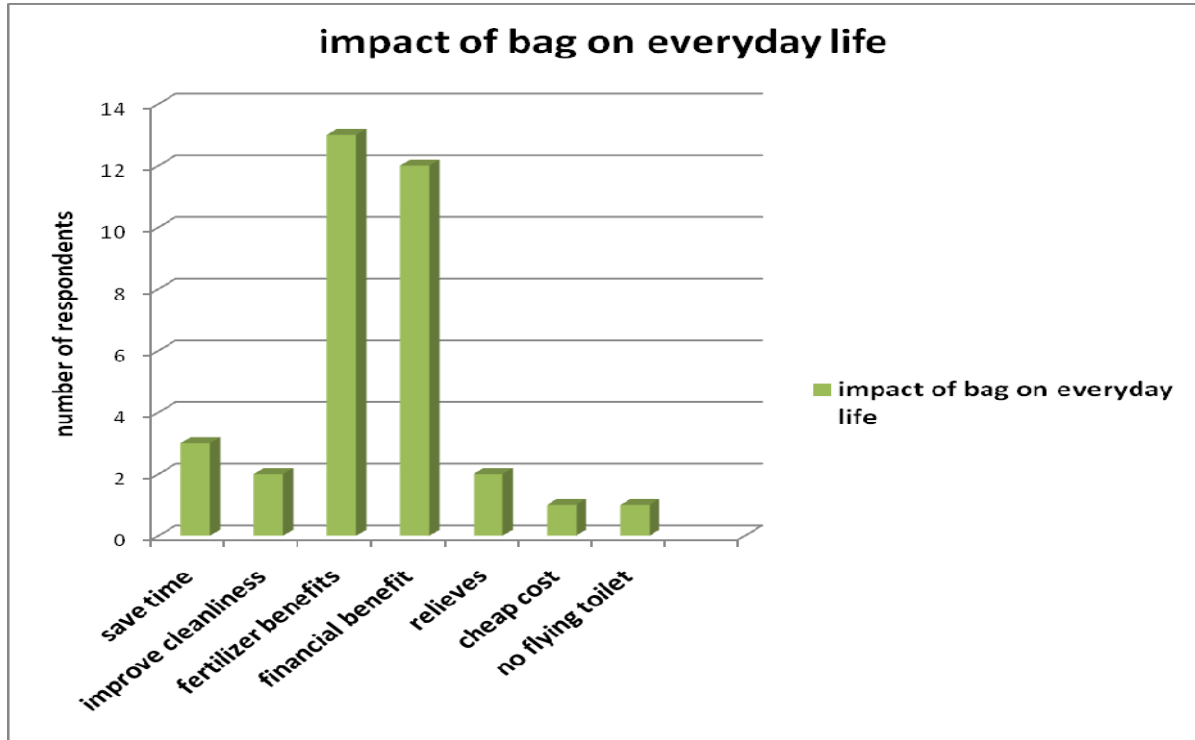


Figure 25: Impact of bag on everyday life

5.0 KEY CONCERNS ON HYGIENE AND SANITATION IN KIBERA SLUMS

5.1 Indicators of poor Sanitation and Hygiene

5.1.1 Toileting

According to Kibera community, a toilet is a place to relieve oneself, a basic need, a place to clean oneself, flush toilet, and thatched tinned house. The distance of the toilet from the users is important due to positive and negative effects.

The distance of the toilets located beyond 15 meters from the house make the residents feel insecure for themselves and for the safety of the entire family especially children. In addition, there is a tendency to waste time when a person visits the toilets, and there is long waiting periods due to many users, which leads to inconvenience. Due to long distances to the toilet many people end up relieving themselves in buckets, plastic bags, open spaces and bushes uncontrollably. In Kibera, very few people have toilets less than 15 meters from the house, women and children still feel insecure at night when they go to toilets. Toilets within 1-5 meters of reach, pose bad odour due to poor construction, insufficient cleaning and ventilation. Bad odour attracts flies which that spread diseases through food and water contamination.

The second issue is that insecurity is a major concern for women regardless of the distance of the toilet from the house. This is due to poverty, unemployment, poor governance and overcrowding in Kibera.

In Kibera, when the toileting facilities are located far from the residential areas, the residents defecate in plastic bags, which they later throw in ditches, on the roadside or as far away as possible. This form of toileting is commonly referred to as 'the flying toilets' in Kibera. In 2006, one in three people living in Kibera slums identified flying toilets to be a primary mode of excreta disposal available to them. The UNDP blames politicians and authorities for not discussing toilet facilities in this informal settlement.

Piles of the polythene bags used for defecation land in roofs, and attract flies. Some of them block the drainage systems while others burst from pressure impact. Some times when they land in open water systems they get washed away and people get hit by the plastic bags when they are tossed to the air. During the rainy season, the excretion is often washed away to people's houses. Children swim in the water, which leads to diseases such as typhoid, skin disorders, diarrhea and malaria. (UNDP, 2006).

According to AMREF (2007) report, women and children were the most vulnerable to infections related to hygiene during the rainy season when water systems become contaminated.

Toilets are built next to houses and they are hardly 15 meters deep and when you look closely you can see rats, worms and flies. These crawling creatures find their way into the houses and kitchens, thus contaminating food and water. Most of the diseases that prevail in Kibera slums are due to poor toileting. Poor toileting is the cause of all sanitation and hygiene related diseases and infections. This is a result of blocked drainage because when water gets stagnant, mosquitoes breed thus leading to spread of malaria and typhoid.

It is prominent that the availability, accessibility and maintenance of toilets are the most commonly cited health related problems in Kibera slums followed by poor drainage, water supplies and the lack of health services.

5.1. 2 Water

Since water is a very rare commodity for slum dwellers, they often tend to drink rainwater which is usually trapped by gutters on the roof. Rainwater is usually safe for drinking if it is boiled before consumption and stored in clean containers but because of the ignorance of the slum dwellers; they fail to do so thus the water becomes a health hazard in their life.

Most sewage trenches in Kibera slums are dug so shallow that when it rains they fill up and overflow into Nairobi River, which is usually the residents' source of water thus polluting the water. Due to the lack of water, the slum dwellers are forced to use the polluted water for basic needs leading to diseases, which can lead to death of thousands of innocent lives. The water catastrophe in Kibera slums must be recognized for what it really is: a crisis of governance – of weak policies and poor management – rather than a crisis of scarcity, at least in the immediate term. An essential change is needed in approach to urban governance if significant change is to be seen. The rising problem of poor sanitation presents the most dehumanizing aspect of the daily battle for survival for the Slum dwellers. The poor pay an intense price for the lack of clean water and sanitation, in disease and filth.

Inadequate water resources lead to the prevalence of diseases and ailments as expressed by the slum dwellers. Insufficient health facilities and the deficiency of quality care,

drawn out by cost and corruption, slum dwellers are exceptionally susceptible to diseases and illness.

There is usually no water in Kibera slums and you may find only one tap providing water to a thousand residents. Water from one tap is not even enough for everyone. Women spend the whole day and night queuing to get some water and even, sometimes, they end-up going home with empty containers.

The slum dwellers face problems with water accessibility, cost and quality. They also have inadequate access to water points, which are often located far from their houses. The landlords also ration water such that it is only available on specific days of the week and at specific times.



Picture 3: Polluted water in Kibera

5.1.3 Poverty

Poverty is a state of not having enough money to meet the basic needs such as water, food and shelter. Poverty is prevalent in Kenya. In 2003, 56 % of the population was below the poverty line, and it is expected to become 65.9% by 2015 (Government of Kenya, 2005).

Poverty in slums is more pronounced and has lead to poor hygiene and sanitation, increase in diseases and infections, lack of proper nutrition, security and safety. The most significant general needs of every human being are housing, employment, food, toilet availability and water accessibility; unfortunately, these are not available for

Kibera slum dwellers due to poverty. Poverty in Kibera slums is evident through the poor housing structures constructed of cardboard, corrugated tins, mud, thatch and plastics.

They are mostly single rooms, which are about six feet by nine feet and are partitioned by only a curtain. This single room is used as a living room, kitchen, bathroom as well as a bedroom where both parents and children share. People living in poverty are the most overcrowded because of the cost of housing and the large family sizes.

Lack of jobs is the main reason why poverty in Kibera slums is highly increasing. Men usually get part time jobs such as plumbing, building, cutting grass, carrying water, driving buses but women are the most disadvantaged when it comes to getting a source of income. In addition to poverty, the lack of employment also leads to the lack of education for the children, robbery, insecurity, diseases and other things.

Poverty in slums has led to poor hygiene and sanitation, increase in diseases and infections, lack of proper nutrition, security and safety. Women are mostly affected by poverty in slums because being as housewives, they are responsible for the upkeep of the family, taking care of the children, determining the nutritional status of the family, managing and budgeting the household income, ensuring hygiene and sanitation is observed.

In order for women to fulfill their roles in the family such as child bearing, maintaining the family, bringing up the children, they should maintain their health status and practice good health behaviours as it affects themselves as well as their families and community at large. The income level of women aged between 18-45 years is below poverty line. This makes it next to impossible for a woman to be able to meet the needs of her household in Kibera slums as well as maintain good health.

Poverty has also led to spread of diseases because of lack of money to access treatment as well as to purchase medicine. It has also been argued that lack of employment opportunities in the slums, which has led to poverty, is the main reason why there is a lot of informal trading manifested in the form of randomly distributed kiosks some of which are licensed by the City Council but the majority of which operate without a valid license.

5.1.4 Insecurity

It is the state of being subject to danger, injury or a feeling of anxiety. Being the largest slum in East Africa, Kibera is bound to face insecurity of the highest degree. All Kibera slum dwellers undergo insecurity but the main major insecurity each one of them experiences is Human insecurity. Human insecurity in any given community is the core

reason that food insecurity, health insecurity, violence insecurity, job insecurity among others is present.

Table 7: Human insecurity in Kibera Slums

Aspect of insecurity	Impact
1. Lack of water, sanitation and hygiene	Diseases
2. Poor housing conditions	Risk of fire, floods, collapsing.
3. Lack of security of residence occupancy	Fear of being evicted any time
4. Short of education	Illiteracy and limited choice of jobs
5. Lack of justice	Exploitation of human rights
6. Inadequate ability and enthusiasm to help slum dwellers	No recognition of human dignity.

Women and young girls often feel insecure as they are vulnerable to rape, sexual harassment and even physical harassment. This diagram above explains clearly how human insecurity is classified and what are its outcomes. Due to the lack of water, sanitation and hygiene, prevalence of diseases is more common. In addition, Kibera slums dwellers are at risk of their houses catching fire, collapsing or even being broken into because of poor housing conditions in this area. Most people living in Kibera illegally and attaining a house contract with their landlord is very difficult thus they live in the fear of been evicted or thrown out at any moment.

5.1.3 Gender inequality

Gender inequality is well defined as to women not having same rights, privileges and opportunities unlike men. In Kibera slums, gender inequality is more evident in the sense that women are more or less considered as housewives and anything involving money, property, decision making and many more is the responsibly of the men who in this case are always the heads of a household. Although many urban women enjoy equality in education and professional life, the majority women in Kibera slums are discriminated in this field mostly because the society is controlled on a patriarchal system.

The Forum for African Women Educationalists (FAWE) recognizes that there is need for women to be involved in decision making regarding sanitation and hygiene in order to give priority to women and girl’s menstruation needs a priority. In most of our cities only men are involved in decision making; men do not menstruate so the issue to address the menstruation needs is left out. Many African girls of menstruation age drop out of school hence losing the opportunity for education and better lives. There is

therefore the need for women to be involved in the designing of toilets and waste management decisions.

Most rapid gender assessments note that women are silenced on menstruation issues. Men look at menstruation issues as rather personal women issues that are filthy and should not be talked about by decent people. By silencing women, their need is therefore ignored and menstruation is therefore used to condemn and exile women. The women concern is how this silence has to be broken and women brought into designing toilets.

The African woman bears the burden of taking care of children, the disabled, the aged and household chores. Toilets are designed without consulting their users mainly women who have to take the people they care for to the toilet. It is therefore, difficult for women to fit in the narrow toilets with young children, the disabled or the elderly. Often the doors of the toilets do not close completely, and sometimes there is no water to wash hands or to flush. There are no proper places to dispose off the used sanitary towels by women

Women face male violence, which is usually domestic violence, and choose not to reveal this to anyone, because, in many cases, no one will believe, and they are afraid that if their husbands hear they reported the matter, they may be chased away from their homes.

Gender inequality has caused women in the Kibera slums to be over submissive to men and this has led to women having no say and, thus, a man is left in control. Young girls also face discrimination because their education is less valued by the members of the community in comparison to the boys. They are often forced to work as house girls thus their education level attainment is limited.

Female-headed households in the slums often lack support especially from their male partners, who are unemployed, because the men feel jealous of successful women. The slum dwellers that often migrate from rural to urban areas come with their traditional beliefs and practices. Some of these practices are related to family roles; beliefs related to diseases, food and lifestyle mostly affect women. If these traditional beliefs are not followed effectively, they are attributed to violation of cultural codes, social ethics and taboos.

Due to gender discrimination, men do not strictly follow all the traditional beliefs as compared to women who are tied down by these beliefs. Women fear being rejected and disowned by the community and family if they break their traditions. Thus they are forced to comply with the traditional beliefs even those that be done away with.

5.2 Impacts of Poor Sanitation in Kibera

5.2.1 General overview

According to UNDP 2006 report, the lack of sanitation poses security risks for women and girls. For instance, where there are no latrines, girls and women have to wait until darkness arises, for them to look for a place to defecate. Sometimes they have to walk long distances to the toilets and in the process, they end up being raped or mugged. Rapid population growth in conjunction to the accelerating rural-urban migration of the poor and the under employed rural dwellers is increasing the urban populations characterized by the informal settlements.

Overpopulation in slum areas has led to such problems as unreliable water supplies, poor garbage collection, excreta disposal, poor drainage, and unreliable electricity supply. Thus, the low standards of living in the Kibera.

5.2.2 Poor planning

The lack of sanitation facilities is considered a big problem by the women in Kibera slums, but it is very difficult to improve the situation because of several related issues.

First, there is hardly any space for latrines; the compounds are built up to capacity and available empty spaces are becoming encroached. Secondly, latrines are considered the responsibility of the landlord. The landlords in Kibera usually do not live in the slums, hence not interested in improving the latrine situation.

The lack of toilet facilities may trigger the tenants to construct a latrine for them, but they fear to do so as the landlord might increase their rent. Public latrines are the only possible sanitation problem in Kibera because all infections, diseases and poor conditions of living are as a result of poor sanitation.

5.2.3 Poor waste management

Wastes can be grouped into solid, liquid, or gaseous and can be categorized as domestic, industrial, agricultural, and municipal. The rapid population growth has increased demand for urban, agricultural, and industrial activities thus leading to generation of vast amounts of waste into the environment.

Hazardous wastes have such properties as being radioactive, toxic, explosive, corrosive, flammable, infectious among others causing or likely to cause danger to human health and the environment, whether alone or together with other wastes. Inadequate management of solid wastes and effluents can have devastating and often irreversible effects on the environment. Wastes emanating from industries and factories in the form

of effluents tend to find their way in to waters and soils, thereby making them less habitable for living organisms. The following observations were noted:

- ⇒ Most streams running through the settlement carry polluted water from all kind of sources, including sewage from bathing, washing clothes and utensils, pit latrine overflow and all other liquid sources. Most of this is received by the Nairobi Dam, which lies at the foot of the settlement.
- ⇒ The drainage system in the settlement comprises of shallow open natural drains, man-made drains and combination of both. Drains are often used as dumping points of solid waste and sludge. In some cases, open channels are used for emptying sewage from latrines.
- ⇒ 54% of households have no bathing facilities. 75% bathe inside their small rooms or in the compound at night.
- ⇒ Drinking water is contaminated by infiltration of liquid waste and overflowing latrines into burst pipes.
- ⇒ Community members in the lower sections of Kibera are the most seriously affected by flooding. This is caused by a combination of runoff and storm water flowing from the upper villages, and constriction of houses in the flood plain.

5.2.3.1 Lack of proper liquid waste management

There are no flush toilets in Kibera and most of the households have traditional pit latrines, which are inadequate and fill up quickly. Limited access to exhauster services has rendered about 30 percent of latrines unusable.

At a minimum,

- ⇒ The shortage of pit latrines is brought about by lack of space for new construction and landlords are not willing to incur the extra expense. Most of respondents interviewed stated that up to 150 people share a pit latrine.
- ⇒ Lack of adequate latrines force residents to use alternative means of excreta disposal, such as polythene bags referred to as "flying toilets" (wrap and throw method). These are commonly used at night when residents consider it insecure to use latrines outside. Children defecate in small used cooking fat plastic buckets (e.g. Kasuku buckets) which are emptied by their mothers either in the next pit latrine or in sewer.
- ⇒ There are few communal latrines in Kibera and availability has been made worse by influential landlords who seized communal latrines built by NGOs for exclusive use by their tenants.

- ⇒ There is lack of exhauster facilities to empty the latrines. This is complicated by lack of access roads. 80 percent of the latrines are emptied manually by directing waste water into the drainage channels (see picture 5). Others are simply covered and abandoned.



Picture 4: Manual way of emptying human waste from a pit latrine

5.2.3.2 Solid waste disposal

There is no regular solid waste collection within the settlement. Most residents dispose off solid waste by dumping it in open drains, along the railway line and in pit latrines. The closest collection point is on the main road outside the settlement.



Picture 5: River covered by Solid waste

The consultants observed that:

- ⇒ Lack of facilities for garbage disposal has lead to haphazard disposal of refuse.

- ⇒ Most households burn their garbage thus a potential risk of fires due to the congestion of houses.
- ⇒ During the wet seasons, solid waste is washed into compounds in low lying areas and thus blocking the drains.
- ⇒ Recycling and composting activities are limited due to mixing of organic and inorganic solid waste.

5.2.4 Communicable and water borne diseases

Health hazards are directly related to poverty, polluted and stressful environment, social instability and insecurity. People living in the slums of Kibera are vulnerable to communicable and water borne diseases and malnutrition.

Human and animal excreta can affect human health through various transmissions pathways (figure 30). Disease can be transmission through drinking of water for contaminated water, unhygienic handling methods and contaminated aerosols from poorly managed water and drainage systems.

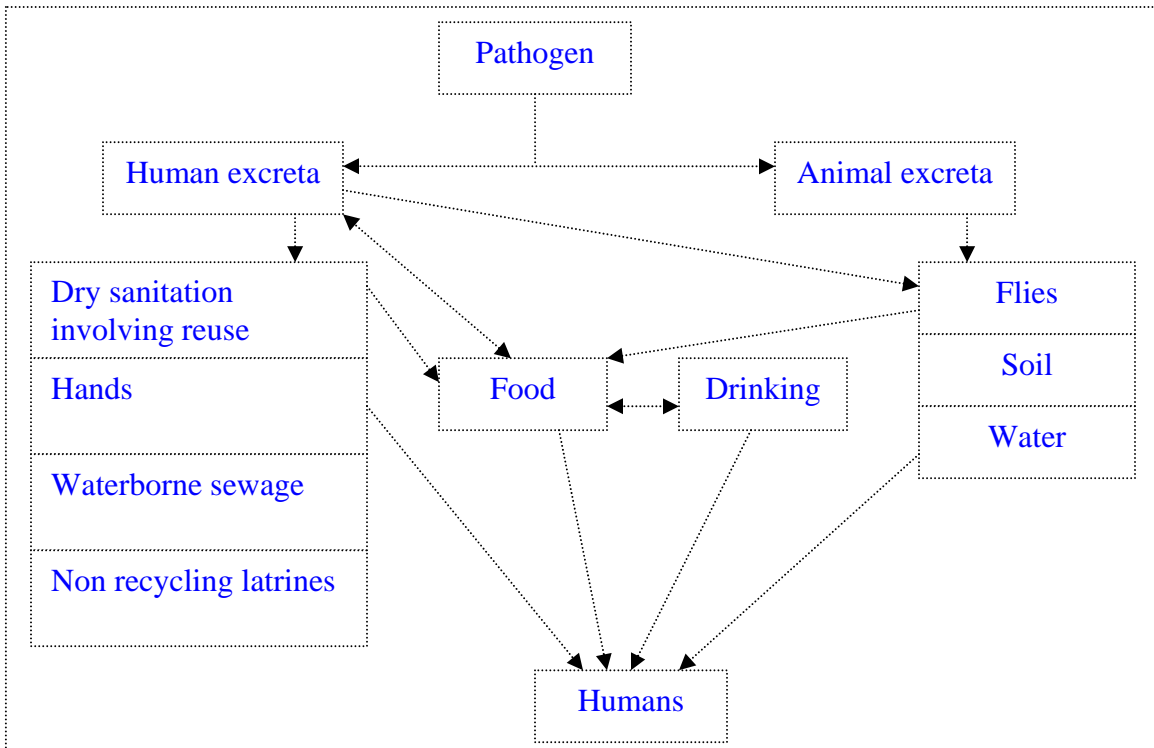


Figure 26: Transmission pathways of faecal- oral disease

Communicable diseases are spread through physical contact with infected individuals, liquids, food, body fluids, contaminated objects, airborne inhalation, or through vector borne spread. Most of the diseases in Kibera slums are as a result of poor personal hygiene standards and unreliable pit latrines. The spread of infections from one person to another are frequent because of the overcrowding and congestion situation in slums. Women face the hustle of communicable diseases related to the polluted air, unsanitary living environments and inadequate nutrition. The most common communicable diseases in Kibera slums are cholera, malaria, and diarrhea.

5.2.4.1 Diarrhea

Diarrhea means the passage of three or more loose stools per day. It is usually a symptom of gastrointestinal infection, which can be caused by a variety of bacterial, viral and parasitic organisms. It can be spread through contaminated food or drinking water, or from person to person due to poor hygiene. Acute diarrhea leads to fluid loss, and may be life-threatening, particularly in young children and people who are malnourished or have an insufficient diet. Diarrhea diseases pose a major threat to the health of people living in Kibera slums, particularly because of the poor environment.

Diarrhea poses a huge risk for Kibera slum dwellers because of the lack of proper sanitation and hygiene. Most Kibera slum dwellers are unemployed and poverty is a major problem. This is why the inhabitants of Kibera run indecent businesses to earn a living such as roasting maize, selling foodstuffs such as chips, mandazis, samosas, prostitution. The methods used to prepare these foods are poor and unhygienic. People usually cook the food besides the roadside where dust, flies, sewages and all kinds of dirt surround them. Most people tend to buy these kinds of foods because they are affordable and forget the low hygienic measures carried out when preparing the food.

This leads to the spread of diarrhea from time after time. The poor drainage also makes the slums muddy and impenetrable during the rainy seasons. This leads to several consequences including increase in breeding sites for mosquitoes, filth, foul smell and diseases such as diarrhea. The lack of washing hands with soap and water before handling food, eating leftover foods as well as a dirty food storage surrounding is major causes of diarrhea among children.

Lack of safe and treated drinking water is one of the main causes of diarrhea. Most of the water in Kibera is contaminated by leakage of sewage. The combination of poor sanitation services and inadequate water resources has led to frequency of communicable diseases, which pose a danger to the community at large. Children of less than 10 years of age are at high risk of contacting cholera as their hygienic levels are

very low and often need a grown-up person like a mother or elder sibling to take care of them. The health and nutrition of these children is very low as most of them only take one meal per day. (UNICEF, 2007) has estimated that 50% of these children facing such conditions are at a high risk of low resistance level to infectious diseases, which results to risks of high mortality.

Poor sanitation leads to spread of diseases in slum settlements thus increasing diarrhea incidences. Population Activities (2001) estimate that, water-borne diseases such as diarrhea infect about 250 million people yearly and almost ten million die. Diarrhea is a serious health problem in the overcrowded Kibera slum. There is scarce source of health information for the slum dwellers. Poor environmental conditions, poor methods of faeces disposal and high poverty levels expose the community to diarrhea diseases.

5.2.4.2 Cholera

Cholera is a severe intestinal infection caused by ingestion of food or water contaminated with the bacterium *Vibrio cholera*. Its incubation period is about one day to five days, and produces an enter toxin that causes a profuse, painless, watery diarrhea that can quickly lead to severe dehydration and death if treatment is not promptly given. Vomiting also occurs in most patients. Cholera is often transmitted by consumption of contaminated food and drinks. The risk of infection can be reduced by taking hygienic precautions. Kibera slums dwellers face the risk of Cholera infections because of the poverty levels, which lead to inadequate sanitation and lack of clean drinking water.

In Kibera, people rarely wash hands thoroughly with water and soap before handling food after visiting the toilet. Most people are not keen if the food is well cooked or warm enough to be consumed.

Women face the challenge of Cholera because no matter how much they try to clean their houses or cook food in a hygienic environment, they still face the problem. This is because they live next to blocked drainage systems or overflowing toilets in which germs and toxins breed. Furthermore, their children pick anything edible thus fall ill and spread the disease to all the members of the family. Due to lack of water, women use rainwater for basic needs which is often contaminated with human excreta thrown into the roofs. The wastes mixes with this rainwater which are collected thus spreading of diseases.

With lack of essential hygienic disposal of human faeces, adequate supply of safe drinking water, and good food hygiene, eradication of cholera is next to impossible in Kibera.

Due to the fact that those toilets were located next to water pipes, when the pipes burst the sewage contaminates the water during repair. The people end up drinking that water which is basically a mixture of faeces and urine thus ends up getting Cholera. Despite the women's high level of understanding the importance of providing appropriate diets for their families, poverty hinders them to accomplish this thus the immune system of especially their children is lowered leading vulnerability of catching infections. The shortage and contamination of water supplies and the lack of sanitation and suitable sewerage disposal make cholera one of the most common health problems in Kibera slums.



Picture 6: Fish exposed to unhygienic conditions

5.2.4.3 Malaria

Malaria is caused by a parasite called Plasmodium, which is transmitted via the bites of infected mosquitoes. In the human body, the parasites multiply in the liver, and then infect red blood cell. The World Health Organization (WHO) estimates the worldwide malaria morbidity burden as being between 300 million and 500 million clinical malaria cases a year.

The common occurrence of malaria in Kibera slums is associated with stagnant water that provides ground for mosquito breeding. Kibera slum dwellers are aware of malaria as a disease but are handicapped by lack of adequate knowledge on symptoms, cause, predisposing factors, and prevention and control measures. Mosquitoes breed in stagnant water, around bushes and also in areas where refuse is disposed poorly. Symptoms of malaria include fever, headache, joint pains and malaise.

The slum dwellers find malaria to be a big burden in their families because they spend a lot of money to buy medication and if a member of the family is sick they have to be absent from work to take care of the sick. Inadequate provision for drainage increases the risk of malaria in Kibera slums as its mosquito vector breeds in flooded areas and ditches, insufficient provision for sanitation. Lack of accessibility to affordable mosquito nets and treatment to those affected by malaria in Kibera slums are a challenge.

6.0 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

6.1 Sewerage and Effluent

Sewerage and effluent resulting from non-sanitary sources and wastewater from bathrooms is of significant concern if it is untreated. In Kibera, there are no septic tanks, no sewer lines and human waste goes into pit latrines, CDF toilets and other types of toilets provided by different projects. The human waste is dumped in drainage channels, dumpsites and road sites and certain instances in rivers that flow through the slums.

The issue of the disposal of human waste continues to pose a big challenge to the residents of Kibera community. The limited number of toilets available and the poor sanitary conditions of the pit latrines subject the families to untold suffering. Currently, women and children are the most affected group.

Mitigation Measures: To mitigate the above impact it would be prudent to improve the distribution, hygienic condition of the communal and private toilet facilities and consider introduction of technologies such as the peepoo bags in Kibera.

6.2 Surface Drainage

The drainage of the village is generally poor and highly contaminated with effluent and raw sewage. The stagnant effluent attracts mosquitoes that spread malaria, contaminates drinking water and spreads diseases to children and adults.

Mitigation measures: There is need for frequent cleaning of drainage channels and sensitization of the people to maintain high hygiene standards. The villagers should be provided with proper practices of handling and disposing of human waste without necessarily throwing it into open and drainage channels.

6.3 Segregation of Waste and Recycling as Fertilizer

Lack of separation of human waste from the rest of solid waste in the village is not only a health hazard but also a disincentive to the community.

Mitigation Measures: The above impact can be mitigated by provision of Peepoo bags allow for ease, safe and clean handling of faeces at household level accompanied by provision of storage bins or buckets for temporary storage before collection and disposal. This should be done at designated sites where the waste and the bag can

decompose and be available for use as fertilizer by the farmers and the City Council of Nairobi. There will be need to educate the slum dwellers on the importance of the Peepoo bag usage, the fertilizer aspect and the benefits involved. Use the biodegraded bag and the decomposed faeces as fertilizer to grow food crops and flowers. The main incentive to the villagers will be the income from the sale of the fertilizer.

6.4 Visual Intrusion

The spread of faeces everywhere in the village compounds, alleys, open spaces and drainage channels is a notable nuisance and a serious environmental impact.

Mitigation Measure: The impact could be mitigated by use of technologies such as the Peepoo bag, which can eliminate the problem of littering by human waste. The use of the Peepoo bag will require a lot of knowledge on management at community level and also continuous collaboration and building partnerships with other stakeholders.

6.5 Insecurity

Villagers are exposed to insecurity as they seek toilets to relieve themselves at night due to long distances from the houses. Women particularly feel insecure to access the toilets at night and, in most cases women are exposed to sexual harassment and as a result, many people are forced to use alleys and open spaces to relieve themselves.

Mitigation measure: To solve this problem there will be need to encourage women, children and men to use the Peepoo bag as an immediate intervention. This will help the residents to feel safe and secure.

6.6 Spread of Communicable Diseases

Open spread of faeces in compounds, drainage channels, roadsides and dumpsites attract flies and vermin, which spread human diseases due to poor sanitation.

Mitigation Measure: Use of the Peepoo bags within the testing period of four weeks was perceived by the participants as a potential solution to the problem of communicable diseases in the village.

6.7 Solid Waste Disposal

Use of plastic bags for disposal of human waste commonly known as “flying toilets” litters all over the village and pollutes the environment.

Mitigation Measure: Use of Peepoo bags accompanied with efficient collection and disposal arrangements within the village and beyond will go a long way in alleviating this problem.

Table 8: Summary of environmental aspects, impacts and mitigation measures

Aspect	Impact	Mitigation
Sewerage effluent dumped in drainage channels, dumpsites and road and river sites	Use of flying toilets Poor sanitary conditions leading to spread of water borne diseases	There is need for better distribution, and improved hygienic condition of the communal and private toilet facilities. Consider introduction of technologies such as the Peepoo bag in Kibera.
Surface Drainage	The stagnant effluent attracts mosquitoes that spread malaria, contaminates drinking water and spreads diseases to children and adults	There is need for frequent cleaning of drainage channels and sensitization of the people to maintain high hygiene standards. The occupants should be provided with proper means of handling and disposing of human waste without necessarily throwing it into open and drainage channels.
Segregation of waste and recycling for fertilizer	Lack of separation of human waste from the rest of solid waste is not only a health hazard but also a disincentive to the community.	Promote Peepoo bags technology as a solution for safe and clean handling of faeces at household level Provide storage bins or buckets for temporary storage of used bags before collection and disposal at designated sites. There will be need to educate the slum dwellers on the importance of the Peepoo bag usage, the fertilizer aspect and the benefits involved.
Spread of human excreta in the compounds, alleys, open spaces and drainage channels	Increased disposal can pollute the air, surface and groundwater, spoil the scenery and represent an imminent risk to public health	use technologies such as the Peepoo bag which can eliminate the problem of littering by human waste
Lack of accessibility to the toilets	Insecurity especially at night due to long distances from the houses e.g. sexual harassment Occupants forced to use alley and open spaces to relief themselves.	Encourage women, children and men to use the Peepoo bag as an immediate intervention. This will help the residents to feel safe and secure

8.0 PROMOTION OF PEEPOO BAG USAGE

The health of people living in the Kibera slums is largely due to ignorance and overpopulation. The slum dwellers have the primary responsibility to influence their health care pattern in their community. The residents can serve as educators as a link between the Ministry of Health leaders, authority leaders and the community. The slum dwellers should inform all community members and especially women that communicable diseases can be basically prevented by the use Peepoo bag which is clean and easy to handle.

The residents role in advocacy, awareness raising and information exchange on Peepoo bag usage is seriously needed. Education on the Peepoo bag usage is a vital intervention that can be applied in Kibera. Since women and children are the most affected, education can be done during visits to health care centres, and women group's organizations where selected persons could give a presentation and a demonstration on the Peepoo bag usage and its benefits to the community at large.

The residents should be encouraged to possess knowledge on situation and the specific interventions of managing, for example, problems that are caused by sanitation such as diarrhea. The residents in Kibera need to understand that intestinal and skin diseases are often caused by lack of proper sanitation and hygiene.

The slum dwellers of Kibera need to convince the government of the importance of increasing affordable health care facilities in area. By doing so, medical supplies, treatment and equipment will be freely available for the slum dwellers. This would reduce the morbidity rate and mortality rate. Women's and children's visits to health care facilities are frequent due to the opportunistic infections. The recovery process is slow and complicated when people continue living in the same environment with the pathogens and when there is no hospitalization during the treatment period. Education on proper hygiene and sanitation practices is therefore, a key asset in preventing infections. It is also the responsibility of community leaders to intervene for the slum dwellers by discussing with the government the importance of not demolishing the slums, but in the contrary, the government should improve the sanitation conditions in the existing slums.

The residents should campaign for the introduction of the Peepoo bag usage in Kibera slums where one has to pay a small amount of money to use the Peepoo bag. The Peepoo bag is clean and safe to handle. The slum dwellers have shown willingness to pay for the Peepoo bag usage. By doing so, sanitation and hygiene will be highly enhanced and the health status will be improved.

In almost all households in Kibera slums, there are over six children. This leads to congestion in the house, and parents lack time to care effectively for each and every child. It is therefore important to educating parents in Kibera slums on family planning methods, so that the women can well be able to plan the number of children they want. This way overpopulation is reduced in this area and the little amount of money the residents earn can now be enough for a smaller family.

Due to the lack of proper and available means of communication, Kibera community does not receive any new and important information. Therefore, the residents in this area should advocate the government to increase the number of communication channels such as televisions, radios, newspapers, journals and magazines in this area.

The government should ensure that the languages used are understandable by the community members of Kibera. Since residents are mostly involved in sanitation and hygiene situations, they should be encouraged to participate in community groups, drama sessions, dances, songs and poems, which are all involved in communicating developmental messages. By doing so, information will be effectively spread in the slum areas and the problems facing them will be curbed.

According to UN-Habitat and Gender Water Alliance (2005), community participation is becoming a central issue in modern times. It should have its own initiative, planning and management of people's quality of life. This requires a change in thinking and action of community based projects. Working with the community, requires skills, therefore, to start at the level of households, working upwards from there to the community and even higher levels. This will ensure that projects meet people's needs.

Government and organizations can then come in to help in sustainability of the projects. The residents have the potential to support and expand community based initiatives and to achieve goals for quality hygiene and sanitation.

A successful program in promoting the perception of Peepoo bag in terms of usage and the aspects such as ergonomic, hygienic and handling of the bag as perceived among the Silanga people requires implementation through the community context. Peepoo can borrow a similar example from the HIV/ AIDS campaigns that have had success around the country. The education strategy for the community, therefore, has the possibility to be implemented well, since the effectiveness will benefit the slum dwellers.

The Peepoo bag promotion in Kibera slums will involve the residents focusing on places where the people spend most of their time. The promoters and educators need to meet people in these areas to and interact with them, for example, in market places, health

care centers and religious centers. Working with the community helps the slum dwellers identify their problems and design ways on how to overcome these problems.

Education programs in churches have the greatest potential to reduce health problems. The Church and other religious institutions can influence people's behavior and change to a certain behavior. The residents should work in collaboration with churches to utilize the principles of community-based programs.

Developing education programs that are implemented in education curriculum for school goers is an effective way for residents to promote Peepoo bag usage practices at home in the present and in the future when children grow. Working with schools may fail to reach those children who do not attend school and especially girls who mainly do the household chores. In addition to visiting schools and teaching children on the ways and means of good sanitation and hygiene, residents should also encourage schoolteachers to introduce sanitation and hygiene lessons in the school curriculum. By doing this, the children would grow up having acquired knowledge on the ways and means of disease prevention and sanitation and hygiene maintenance.

The resident's involvement to promote the aspects such as ergonomic, hygienic and handling of the Peepoo bag as a good model for the awareness of the whole community to make uplifts their arms for a better future. This is the least expensive and sustainable way to improve quality of life than the old way of practice where the slum dwellers just wait for the government to improve their way of life.

The government is still doing their part with available funds to upgrade slums through the help of Habitat. However, this should not prevent the Silanga Village residents from promoting health according to the current situations. The Peepoo bag promoters in Silanga Village can use the same strategies for education, organizing walks for awareness of the community. Such campaigns are favored by the news because they attract large groups of people.

9.0 EVALUATION OF ALTERNATIVES TO IMPROVING SANITATION IN KIBERA

Four alternative options have been proposed as possible solutions to the issue of improving sanitation in Kibera. Each of these options has been considered in relation to their individual impacts in finding lasting solutions for the restoration of environmental quality. These options have been evaluated in terms of their potential environmental impacts, land requirements, capital costs, reliability, sustainability under local conditions, capacity building, training and monitoring requirements. Whereas each of these options present unavoidable and irreversible impacts, some of these impacts could be mitigated in one-way or the other. The options targeting the sanitation improvement in Kibera are as follows:

Option No. 1: Full municipal services to be provided for Kibera

Provision of municipal services such as piped water, water-borne sanitation facilities, and trunk sewerage connection to every housing unit within the Kibera slums will reduce the amount of domestic sewage (and human waste) currently draining into the drainage channels, rivers and the Nairobi Dam.

If this proposal were implemented, the whole of Kibera slum area would be catered for in accordance with planning laws. Under these laws, the NCC will play a full role in Kibera as the water undertaker in the city according to the Water Act and the Local Government Authority Act. Water undertaking includes provision of necessary social services, such as, water supply, solid waste collection and disposal, and sewerage services. NCCs' full participation as the water undertaker will stimulate creation of other physical infrastructure such as power supply and establishment of a roads network.

Given the current situation in Kibera, fulfilling Option No. 1 will require careful planning and adequate financing to ensure minimal disruption of livelihoods in the already over-populated area. However, to create space to reticulate water pipes and sewerage networks, build water-borne ablution blocks, and pave service roads will necessitate displacement of people and demolition of some existing housing units. Costs associated with taking this option will include land surveys, feasibility studies, stakeholder consultations for consensus building and re-location of displaced persons. The main impact of this option will be displacement of persons and demolition of dwelling units.

- ⇒ **Evaluation:** Although this option will create employment opportunities during construction stage, it is a costly initiative involving input of extensive financial resources. Taking this option will entail acquisition of land titles, thus raising

land tenure issues in the area, which remains an unresolved issue by the Government. A combination of these unpredictable circumstances makes this option a sensitive and potentially explosive political option, hence untenable.

Option No. 2: Every dwelling unit to construct a pit latrine

Option 2 advocates for a regulation to be passed and enforced by the NCC and the Provincial Administration requiring mandatory construction of pit latrines for every dwelling unit in Kibera. This option will ensure that no human waste will enter the river system. Taking this option will necessitate construction of access roads to facilitate exhauster service for pit latrines. Siting of toilets will be planned to avoid areas prone to flooding and water logging, and away from areas with high water table to circumvent groundwater contamination. Design of toilets will be the VIP (Ventilated Improved Pit latrines), which makes provision for escape of foul and smelly 'gases' into the open air above the houses.

Under this option it will be necessary to educate and train users on the hygiene and toilet maintenance to keep them clean and exhaust them when they fill up. Increased awareness and collaboration amongst cluster residents in using and managing pit latrines correctly at personal level will reduce the potential risk of disease outbreak. Participation and supervision by public health personnel will also be required to enforce hygiene standards.

⇒ **Evaluation:** Although this option will ensure less human waste is released into the streams, it will necessitate displacement of people and demolition of some structures to create room for toilets. Access roads in-between dwelling units to facilitate use of exhauster service for pit latrines will also be required. Whereas this is a desirable alternative its implementation will legitimize land ownership issue in the area. In addition, building consensus amongst Kibera residents to create space for toilets and access roads, and raising sufficient funds to undertake proposed initiatives under this option will require a lot of lobbying and negotiation. This makes Option 2 a politically sensitive issue with significant social implications, especially in the face of the unresolved land ownership prevailing in Kibera. These issues make this option untenable.

Option No.3: Maintaining the status quo

Maintaining the status quo means there will be no action taken to change the existing situation. The problem of 'flying toilets' remain unsolved, and the current adverse environmental conditions suffered by the residents will not change. Health expenses associated with a polluted environment will continue to rise.

- ⇒ **Evaluation:** If no intervention is taken, the residents will continue suffering and the streams will continue to lose its riverine biodiversity and certainly suffer an ecological death. Without keeping these water sources clean and maintaining a healthy slum environment, communities downstream will continue to suffer from the effect of using heavily polluted waters. Therefore, something has to be done to change the existing situation and the status quo cannot be maintained.

Option No.4: Promoting the usage of the Peepoo bags

Given the politically sensitive nature of the three previous options already discussed, it is important that the Peepoo bag technology be employed. This simple technology will cater for the extreme situation by moving away from hard structures into a soft approach to sanitation and excreta management giving the individual inhabitant a choice to hygienic and sustainable personal sanitation.

Evaluation: The proposed technology will be a universal remedy for prevailing human waste disposal facing Kibera residents.

- ⇒ This option is affordable and will improve the quality of life with minimal lobbying and negotiation with the residents. There will be need for awareness campaigns and sensitization on the use of the bags and the organic manure.
- ⇒ The organic manure utilization component relates to income generation and is expected to develop into a cottage industry, which will attract a significant proportion that will derive direct benefits from the initiative and build a sustainable micro-enterprise.
- ⇒ The Peepoo technology will not involve the construction of new infrastructure leading to the displacement of people, i.e this proposed intervention will not touch on the existing settled areas.
- ⇒ Therefore, option 4 has been selected based on merit. Determinant factors for making the choice included: the likelihood of wider occupant support, income-generating opportunities the technology presents, options for capacity building, and the social acceptability of the proposed Peepoo bags.

10.0 THE WAY FORWARD: RECOMMENDATIONS

Following the impact assessment study, the following recommendations were made:

- 1) Lobby with government to speed up formulation of a comprehensive policy on waste management
- 2) Harmonize various pieces of legislation on Waste management
- 3) Increase Government interest to cater for planning of slum areas with a view of providing essential sanitation Services
- 4) Identify Organizations that focus on sanitation services in Kibera to promote the use of Peepoo bags
- 5) Identify Organizations that can promote the use of fertilizer from the human waste
- 6) Increase awareness creation on the importance of sanitation services among the slum dwellers
- 7) Conduct education and awareness workshops to scale up the Peepoo bag usage in Kibera
- 8) Improve on the synergies of various service providers in slum areas
- 9) Identify Donors who are interested in promoting better sanitation services in Kibera
- 10) Introduce a new stool design to hold the Peepoo bag while in use
- 11) Introduce mobile Peepoo bag distribution and collection units
- 12) More testing is required for the bio-degradable characteristics of the Peepoo bag
- 13) Improve the Peepoo bag to accommodate the pee and the poo
- 14) Address the social cultural impediments on the use of the Peepoo bag

11.0 CONCLUSION

Basic environmental problems in Kibera are mainly due to lack of provision of normal municipal services. The temporary status of the settlement makes it difficult for NCC to plan for the area's adequate amenities such as housing, schools, water, garbage collection, sewerage or sanitation. Although slum dwellers understand that a polluted environment has its inherent health problems, many reckon they do not have alternative ways to help improve sanitary conditions. A coherent technology which can easily and widely be adopted to provide a sustainable solution to this problem is the Peepoo bag technology. Peepoo bag usage has been considered reliable, suitable under local conditions and environmentally friendly. Thus, education, advocacy for resident's rights, awareness campaigns on the usage of Peepoo bags, better hygiene and sanitation practices and active participation of the stakeholders (slum dwellers) will be of much benefit in ensuring the promotion of Peepoo bag usage. This is aimed at improving sanitation and quality of life of the present and the future generations more so in the informal settlements.

REFERENCES

- Deepa Narayan and David Nyamwaya, (June 1995). A Participatory Poverty Assessment Study – *Kenya*, prepared for the World Bank,
- Amuyunzu-Nyamongo, M. and Taffa, N. (2004) The triad of poverty, environment and child health in Nairobi informal settlements *Journal of Health & Population in Developing Countries*
- Bapat, J. D and Desai, S. K. (2003) In United Nations World Water Development Report 2. Water a shared responsibility.
- Birongo, M. J. and Le, Q. N. (2004/2005) *An analysis of water governance in Kibera Kenya*. Roskilde University centre- international Master of Science in environmental policy and the global challenges.
- Broome, B. (2007) Women and health care. *Urologic Nursing*. 27(1):81–83, 92.
- Brundtland, R.W. Guerra, C. A. Noor, A. M. Myint, H. Y. Hay, S. I. (2000) Malaria Risk: *Estimation of the Malaria Burden*.
- Camdessus, M. (2003) Financing Water for All. The dream of safe water for all is within humanity reach.
- Ekstrom, G. (2008) *Slum Health: Understanding to Action*. Karolinska Institute, Stockholm, Sweden.
- Elliot, D.S. Pietro, G. Gabriella, C. (2005) The 21st Century health challenge of slums and cities.
- Government of Kenya (GOK) 2005 National Poverty Eradication 2005-2015.
- Greene, V. (2001) Personal hygiene and life expectancy improvements since 1850: Historic and Epidemiologic Associations.
- Hiruma, H. (2007) Global Water Finance: Assessment of the Funding Needed to Attain the Millennium Development Goals for Water and Sanitation University of Pennsylvania.
- Kagiri, E. (2007) Integrating environmentally sustainable methods to upgrade basic Sanitation: *Case study Soweto East Kibera slum*.
- Karanja, J. Wambari, E. Okumu, D. Odhiambo, E. Karuri, I. Muthwi, S. M. Kibe, M.
- Osawa, N. and Osaki, Y. (2002) Community-based research by team. A study of awareness of malaria among Kibera population: Implication for community based intervention.
- Keraka, M. N. Wamicha, W. N. (2003) Child Morbidity and Mortality in Slum Environment along Nairobi River.
- Mara, D. D. (2002) Water, Sanitation and Hygiene for the Health of Developing Nations.

- Mulumba, J. Kakosova, B. and Juma, O. (2004) Health status of people of slums in Nairobi, Kenya. *Environmental Research*.
- Nordberg, E. and Winblad, U. (1994) *Urban Environmental Health and Hygiene in Sub-Saharan*. Reasons for unsatisfactory acceptance of antiretroviral treatment in the urban.
- Pruss, A. Kay, D. Fewtrell, L. and Bartram, J. (2002) Environment Health Perspective, Estimating the burden of disease from Water, Sanitation and Hygiene at a Global Level. *Environment Health Perspective*.
- Samantha, B.B. and Wijk, C.V. (1998) Criteria for successful sanitation programmes in low income countries. *Health Policy and Planning*.
- Sclar E.D and Northridge, M. E. (2003) Slums, Slum dwellers and Health.
- Sheth, M. and Obrah, M. (2004) Diarrhoea prevention through food safety education. *The Indian Journal of Paediatrics*.
- Stren, R. (2002) *Building Healthy Cities: Improving the health of urban migrants and the urban poor in Africa*. Woodrow Wilson International Centre for Scholars.
- Unger A, A. Johansson, R. Zachariah, D. Some, I. Van-Engel-gem, A. M. and United Nations Children's Fund (UNICEF) 2007 integrated management of childhood illnesses: An initiative for effective case management.
- United Nations Development Programme report on sanitation. The Collection of Household Excreta. The Operation of Services in Urban Low-income Neighbourhoods 2005.
- United Nations Economic and Social Council (1997) *World Water Vision. Results of the gender mainstreaming project*.
- United Nations Habitat (2005). The Unique Challenges of Improving Peri-Urban Sanitation.
- The United Nations Habitat (2006). A shared vision for hygiene, sanitation and water supply and a framework for mobilization of action.
- United Nations Human Settlements Programme. *Water and Sanitation in the worlds Cities: Local action for global goals*.
- Wag staff, A. (2002) Poverty and health sector inequalities. *Bulletin of the World Health Organization*.
- Werlin, H. (1999) The Slum Upgrading Myth. *Urban Studies: World Health Organization 1993*. Participatory Hygiene and Sanitation transformation: A new approach to working with communities.
- World Health Organization 2008. The challenge in disaster reduction for the water and sanitation sector: Improving quality of life by reducing vulnerabilities.

APPENDICES

APPENDIX 1: TERMS OF REFERENCE (TOR)



**Impact Assessment Study Peepoople Kibera
Terms of Reference**

2008 11 14

1. Introduction and Background Information

More than 2.6 billion people lack access to basic sanitation. The lack of toilets affects both society and the individual through the contamination of fresh water and ground water. Human faeces contain infectious and often lethal pathogens – viruses, bacteria, worms and parasites. One child dies every 15 seconds due to contaminated water. The problem is particularly severe in urban informal settlements where poverty, high density, lack of infrastructure and rapid growth makes sustainable sanitation systems hard to implement.

The UN Millennium Development Goal no 7, target 10 was established in 2002, with the aim of halving the number of people without sustainable access to drinking water and sanitation by 2015. Unfortunately the progress needed is slow or even negative. Peepoople believes that the most obvious way to a solution is to start at the source.

This means preventing disease transmission as early as possible in the chain through rapid inactivation of pathogens right after defecation. Peepoople does not believe that simply providing latrines in high-density urban areas will not achieve sustainable sanitation. Also, at the same time, those who need sanitation the most are often the ones who can afford it the least. Therefore, they have no other choice than to use whatever is available. Increasing choice by introducing an innovative low-cost product such as the Peepoo bag could at best, rapidly change demand patterns among the poor. The Peepoo bag is designed to cater for this extreme situation by moving away from hard structures into a soft approach to sanitation and excreta management giving the individual inhabitant a choice to hygienic and sustainable personal sanitation.

For validating the design features of the Peepoo bag and to assess the effectiveness of the use of Peepoo bags by the people within the target urban areas, it is important to take the product to the target group for evaluation. Therefore, two field tests will be conducted during 2008. The urban environment chosen for these tests are Kibera, a large informal settlement in central Nairobi, Kenya, comprising about 1-1 ½ million of inhabitants.

The first test was a pilot study and was conducted in April 2008 within the Soweto East part where a UN-Habitat field station is located with the cooperation of SEC Soweto East (Settlement Executive Committee). The overall finding from the pilot study was that the participants were positive and favourable to the use of the Peepoo bag; the woman a bit more positive than the men. The Peepoo bags main benefit where thought to be that it was a convenient toilet to use wherever and whenever it was needed. Also, the product when used perceived to lack of smell and that it felt clean and hygienic to

use and handle. However, the pilot study did not focus on the fertilizer aspect of the product.

The second study, Impact Assessment Study, will be conducted during December 2008 and January 2009 in Line Saba in Kibera by Peepoople and with the cooperation of Koinonia Advisory Research and Development Services (KARDS), Nairobi Recyclers (NAREC) and Jean Africa Consultants (JAC). The content that follows is a description of its objectives, purpose of the study, key questions, the research design, roles and responsibilities and significance of the study.

2. Statement of the Problem

The Impact Assessment Study is vital in the decision making process for future strategic planning and product development. If the results of the study verify Peepoople's belief that this is a product that could provide a sustainable health oriented and economical solution on the world's sanitation problem, it will be used in contacts with aid organizations and/or in the search for financial backing.

2.1 The objectives

The objectives of the research are:

- to understand the market need and demand for the Peepoo bag in both emotional and economical terms
- to understand how the product is perceived by the future users and/or what is necessary to improve in order to meet the demand
- to estimate the market value of the Peepoo bags fertilizer aspects

2.2 The Purpose of the study

The purpose of the study is to find out if the Peepoo bag meets the objectives and is perceived by the market to meet their need and demand, and if the product is designed in such way that it enables the growth of economical sustainable service system in a longer time frame.

3. Key questions and Hypothesis

Based on the objectives and the purpose of the study, the main questions that the research should answer are:

Market need and demand. Who will use the Peepoo bag as their main toilet, why and what are the products pros and cons? How many are in favour of using the Peepoo bag as their main toilet? What are the main obstacles?

Usage. How does the market perceive the Peepoo bag in terms of usage? How are aspects such as ergonomic, hygienic and handling of the bag perceived? What is the main benefit?

Target group. Does it work for all people or is it perceived as a product for certain age groups? Who will be the future target group and why? Which needs are met by these?

Willingness to pay. To what extent are the users willing to pay for the product and if so how much?

The products fertilizing aspect. Do they understand the products fertilizing aspect and if so how do they value it?

4. The Research Design – Methods and Procedures

In order to answer the main questions we believe that the user-test should use a combination of quantitative and qualitative approaches. Households within LineSaba in Kibera will be using the Peepoo bag as their only toilet during the 3 to 4 weeks test period (which depends on how many toilets the participants use every day). During the test-period they will make notes in a standardized way on how they perceive different aspects of the product. After the test period they will be interviewed in a quantitative manner. Some will be selected out for discussion in focus groups.

4.1 Sampling

Our suggestion is that at least 100 families are sampled and that at least 5 individuals in each family will use the Peepoo bag, which means that the participants in the study will be at least 500 people in different ages and gender. These 100 families should be a representative sample of the survey population and representative to the larger group that we wish to generalize. From these 100 families some will be asked to also participate in focus group discussions or in-depth interviews. If focus groups are being used as method, our suggestion is that there should be at least 6 focus groups with 6-7 participants in each group.

KARDS will be responsible in choosing the appropriate sampling methods and for the recruitment of all participants in the user test and for informing the participants on what is expected of them. KARDS will therefore be responsible to design the sampling methods, recruitment questionnaire, instructions/ information sheet to all participants, user test diary and hold a common meeting with all participants before start of test.

Peepoople will need to approve on recruitment questionnaire and sampling techniques before the recruitment starts. We will also like to be updated on the profile of each recruited person on a daily basis.

4.2 Distribution and collection of Peepoo bags

During the test period KARDS will be responsible to deliver and collect the Peepoo bags. There will be 4 boys under the supervision of KARDS that will distribute and collect the bags on a daily basis. Each boy will be responsible for 25 families and will collect the bags with a wheel barrel. The used bags will be disposed at the collection point, Christ of Church and from there be delivered to The Greek Orthodox Church where they will be buried in the soil.

4.3 Data collection

During the test, a diary of some sort should be used to record naturally occurring behavior according to specific categories. This tool will be used in this assessment to capture natural behavior. The diary should consist of a checklist, which will have items that will seek information on the extent of the effects of the Peepoo bags and any current strategies for improving people's livelihoods. To minimize the 'conscious of being under observation effect', the research team will use the participant observation technique, this is where the observer records what to be observed and consciously records what has been observed in the mind while taking part in the activities taking place. The observer then goes back to the room/office and ticks the list accordingly. Unlike the non-participant observation technique in which the observer records what is being observed on a piece of paper, which actually promotes the consciousness effect since people are aware of being observed, the participant method minimizes to a great extent the 'being observed effect' and will be the most ideal in this assessment. JAC will be responsible for designing the diary and collecting the data.

After the user test all participants, i.e approx. 500 people will fill in a user test questionnaire for the quantitative part of the study. A questionnaire should be used because of their economy, they can ensure anonymity, permit use of standardized questions, they have uniform procedures, provide time for the respondent to think about responses and are easy to score. The questionnaire should consist of open ended and close ended questions and a liker scale to measure attitude. Also, we would further like to suggest that the questionnaires will not be mailed. Instead they should be supervised by using trained enumerators on the ground. With the issue of ambiguous items the consultant (s) will review the reliability and validity of these items that is why it's important to travel with the other two consultants. A pilot survey should be made at the project site to find out if the questionnaires can collect the information they are meant to gather.

JAC will be responsible for designing the questionnaire and in collecting, processing and analyzing the quantitative data. Peepoople would like to give feedback on the

questionnaire before used. In order to get a deeper understanding on how the users perceive the Peepoo bag and why they perceive it in the way they do some of the participants will be interviewed in a qualitative manner, either through in-depth interviews or focus groups. In-depth interviews/focus groups also provide flexibility and the ability to probe and clarify responses. They will enable the survey team to note non-verbal questions in both readers and non-readers thus providing a high response rate will use interview guides. In-depth interviews/focus group discussions will allow for direct interaction with the respondents and the collection of in-depth information, which the questionnaires may not gather. We suggest that there will be 6 focus group discussions with 6-7 participants in each group or 40-50 in-depth interviews. The participants should be selected in a qualitative manner so that they reflect different opinions, i.e different user behavior, and attitudes; positive and negative etc. JAC will be responsible for designing the interview guide (see page 7 for a first draft provided by Peepoople) and conducting the interviews/moderating the focus groups. Peepoople would like to give feedback on the guide and be updated on the profiles of the participants before JAC conducts the interviews/focus group's discussions.

5. Document analysis

JAC will need to provide Peepoople with the necessary information on how the data will be analyzed and what techniques that will be used in order to meet the objectives and main questions of The Impact Assessment Study.

6. Presentation and documentation

The data should be processed and analyzed by JAC and the results be documented in a comprehensive report written with all findings (both qualitative and quantitative), conclusions and an executive summary, as well as the complete documentation of the survey methodology. We would, if possible, like to have the transcripts in English from the focus groups/in-depth interviews. We would like to have the report in both an electronic form and in hard copy.

Before the final report is written we would like to have a full-day workshop where the results are presented and discussed. At this workshop, useful inputs into the final report are expected to emanate. The workshop could preferably be held in Stockholm at the Peepoople office by the research manager at JAC.

7. Timetable, roles and responsibilities

Activity	By whom	When
Delivery TOR	Camilla Peepoople	14 November
Feedback TOR	KARDS / Maurice/Thomas JAC	17 November
Offer	KARDS / Maurice JAC	18 November
Design requirements questionnaire	Thomas JAC	19 November
Design instruction/ information sheet to participants	Thomas JAC	19 November
Approval / go ahead to KARDS	Camilla Peepoople	21 November
Start recruitment. Current feedback on recruitment to Peepoople	KARDS	24 November
Recruitment finished	KARDS	30 November
Common introduction to participants	Emery Peepoople/ KARDS	29/30 November
KARDS work finished		
Test period: 3 to 4 weeks depending on how many Peepoos are used each day per person. The Peepoo toilet should be the participant's sole toilet in house during test period.		1 December – 29 December
Distribution and collection: 4 boys will collect and distribute the Peepoos with wheelbarrow. Each boy is responsible for 25 families each. They will collect around 30 kg per day. The used Peepoos will be delivered to the collection point, Church of Christ.	KARDS / Emery Peepoople	Every day
4 NAREC boys will with truck pick up and deliver used Peepoos to Greek Orthodox Church. On site the NAREC boys will bury the used Peepoos in soil.	KARDS / Emery Peepoople	Once a week
Design of questionnaire and interview guide	Maurice/Thomas JAC	27 November
Feedback / approval	Camilla Peepoople	1 December
Test of questionnaire / spottiest interview guide	Maurice/Thomas JAC	Week 49
Final questionnaire and interview guide for approval	Maurice/Thomas JAC	11 December
Interview period	Maurice/Thomas JAC	Week 50 - 2
Debrief / workshop before final report	Maurice/Thomas JAC / Peepoople	?
Final report and delivery transcripts	Maurice/Thomas JAC	?

8. Significance of the Study

It is important that the Impact Assessment Study is design in such a way that it with meet the objectives and purpose of the study. And finally, that the report answers the main questions in such a way that conclusions can be drawn regarding the products cash value both in terms of usage and as fertilizer, product development and emotional and/or health related aspects.

APPENDIX 2: QUESTIONNAIRE

PART ONE

THE QUESTIONNAIRE FOR THE FIELD TEST

After the test period the participants will be aided to answer this questionnaire which will be administrated in local language that they understand (Swahili). The questionnaire asked for general information like names, ages, occupation, income, house rent and what kind of sanitation solution they use normally. Parents will be asked to answer for their children.

Respondent Profile

Name: _____ Age _____

Current Address _____ Gender: Male _____ Female _____

Occupation _____ Income _____

House Rent _____

Information on Peepoo Bag and its Use

Is it hard to understand how to use Peepoo bag? (No) _____ (Yes) _____

Do you feel safe when you are using it, does it feel clean? (No) _____ (Yes) _____

Does the bag have a good size? (Yes) _____ (No) _____

Does the human waste enter the bag easily? (Yes) _____ (No) _____

Did you try using it with both pee and poo? (Yes) _____ (No) _____

After having used it is it easy to close the Peepoo bag? (Yes) _____ (No) _____

Does the human waste ever come outside the thin inner bag? (No) _____ (Yes) _____

Does the human waste ever come into the knot? (No) _____ (Yes) _____

Does the bag smell after usage? (No) _____ (a little) _____ (Yes) _____

If possible could you consider using the bag everyday? (Yes) __ (Maybe) __ (No) _____

Do you think it is a sanitation solution that will work in Kibera. (Yes) _____ (No) _____

Other Comments _____

PART TWO

Questionnaire for the Impact Assessment Study in Kibera

The interviewee's General Information

Name: _____ Age _____

Gender: Male _____ Female _____ Occupation _____

Income _____ House Rent _____

Attitudes and general cultures towards faeces and toilets

(a) How do your families go to the "toilet"? _____

(b) At what time(s) of day do you usually go to the toilet? _____

And where? _____

(c) How do they do they describe their feelings after the toilet business?

(d) Do they mention it or do they just go? _____

(e) What words do they use? _____

(f) How would you describe your feelings concerning this matter? _____

(g) Are you open about it or not? YES _____ NO _____

(h) What problems do you face when going to the toilet? _____

(i) What are your major concerns? _____

The Initial expectations on the Peepoo bag

(a) Do you remember your immediate reactions when you first saw the Peepoo bag?

(b) What were they? _____

(c) How would you value these reactions? Positive _____ or negative? _____

(d) What were your concerns about the Pee poo bag? _____

The Product evaluation of the Peepoo bag

Tell us about your experience when testing the Peepoo bag. _____

Overall, how did it work? _____

What are the upsides about the toilet? _____

What are the downsides? _____

In detail;

• Who in the family used the product? _____

Is there anyone that did not use it or had any objections against using the product?

What were the main arguments against using the product? _____

• For those who used the product; where did they use it? _____

Where did they go? _____

In the home; in what room, outside; where exactly? _____

• When did they use it? At what time? For all visits? _____

• How did they work it (PET-bottle or other)? _____

Any problems? _____

• What are your thoughts on the bags function? _____

Pros and cons? _____

• Afterwards; how did you dispose the bag? _____

Any thoughts on that? _____

• Overall feeling or reactions towards the use? _____

Did you personally hesitate at all to use the product? YES ___ NO ___

Why _____ and

Why not? _____

Any improvements that you would like to see in the products function? _____

What would you say are the main functional obstacles against usage? _____

Any thoughts or ideas on how to improve these obstacles? _____

What would you say are the main emotional concerns against usage? _____

What from the list do you consider are the products main benefits? _____

In what way do these benefits improve your everyday life, i.e. functional, _____

emotional, _____

health related _____, as

Fertilizer, _____

socially etc? _____

The products fertilizer aspects

What do you think of the possibility to use the content as fertilizer? _____

What are your immediate reactions to this? _____

Pros and cons? _____

Does this change your impression for the product in anyway? _____

How? _____

Would you use the fertilizer you self or would you like to dispose of it in any other way?

If so, how? _____

Does this aspect raise the value of the product for you? _____

How do you think this aspect could best come to use? _____

Individually or as a community? _____

The Peepoos value for the user _____

What kind of impact could the Peepoo bag have on your everyday life and your

family's; both as "toilet"-use and as fertilizer? _____

If you could put a price on this, how much would it be? _____

Please elaborate on this. _____

Which of the products different aspects (toilet function, social aspects, heath related

aspects, as fertilizer etc) do you value? _____

Is there anything today that you would cut back on so that you could get this instead?

What is it and what is the price for this? _____

If you were asked to set a price on the Peepoo bag, what price would you set?

Why this price? _____

Who would buy it for this price? _____

If you were asked to promote this product, what would you tell people about the product?

What would you emphasize? _____

If the Peepoo bag will cost Kshs 5, would you buy it? _____

Why _____/why not? _____

How does the price change your impression on the product? _____

If the Peepoo bag will cost y, would you buy it? YES _____ NO _____

Why _____/why not? _____

How does the price change your impression on the product? _____

If the Peepoo bag will cost z would you buy it? YES _____ NO _____

Why/why not? _____

How does the price change your impression on the product? _____

If the product would be handed out for free instead, what would be the pros and cons?

How should the product be distributed? _____

By whom? _____

The future Peepoo user _____

How would you describe the future user of the Peepoo bag (age, gender, social background)?

You or someone else? _____

Please motivate. If not your self; why not? _____

Why would you like to use the Peepoo bag? _____

For what reason? _____

Time question

How much time do you spend normally going to your toilet?

Do you share the toilet with other people? YES _____ NO _____

Do you stand in a line? YES _____ NO _____

Do you throw waste? YES _____ NO _____

How much time would you save if you had a toilet at home (Peepoo bag)?

Marketing and Distribution

How much would you want to pay for the Peepoo Bag? _____

How would you like the Peepoo bag distributed within the village? _____

Design

Is the Peepoo bag design appropriate? (Yes) _____ (No) _____

How can the design be improved? _____

Conclusion

What are your main concerns? _____

APPENDIX 3: IN-DEPTH QUESTIONNAIRE

The potential questions for the In-depth Interview

These questions are simply to help you or how to get the conversation started on the theme, and reflect on the kind of information you are interested in.

These themes do not need to be addressed in any particular order.

Theme: Your ideas about being a Peepoo Bag User

Potential questions

Why did you decide to register for field test?-----

What did you like best about the field test for the Peepoo Bag? -----

Why did you like it?-----

What didn't you like about the field test for Peepoo bag? -----

Why didn't you like it?-----

In the field test study, if you did not understand something, what did you do? (for example, ask a question during the test, ask the consultants afterwards, ask another participant, or do nothing)-----

Can you tell me about one thing that you have read recently?-----

Why did you read it? ----- How did
you feel when you read it?-----

Theme: Attitudes and general cultures towards faeces and toilets

Potential questions

Was your husband happy or not happy that you did use the Peepoo bag?-----

Why? -----

Do you think anything has changed between you and your husband since you
completed the field test?-----

What has changed?-----

Theme : The Initial expectations on the Peepoo bag

Potential questions

What was your expectation on the Peepoo bag?-----

Which expectations?-----

What did you expect before using the bag?-----

Theme : Your general ideas about taking part in field test

Potential questions

Do you think that field test has helped you and your family?-----

How has it helped? -----

Do you think it has helped you personally? -----

How has it helped?-----

PROFILE OF RESPONDENTS

SURNAME : -----
OTHER NAMES : -----
DATE OF BIRTH : -----
GENDER : -----
ID NO. : -----
NATIONALITY : -----
LANGUAGES : -----
Present Address : -----
TELEPHONE : -----
CELLPHONE : -----
E-MAIL : -----
CIVIL STATUS : -----

APPENDIX 4: LIST OF RESPONDENTS

No.	Name	Age	Gender	Occupation	Income	Rent
1	Bernard Oyuga	30	M	electronics	6,000	500
2	Mary Yonga	47	F	Housewife	N/A	N/A
3	Floice Amimo	46	F	clothes vendor	3,000	800
4	Josefine Atieno	40	F	business	1500	1000
5	Aida Nafula	26	F	vegetable vendor	4,000	800
6	Peres Awino	29	F	Housewife	N/A	800
7	Willis O. Mutula	39	F	shoe maker	3,000	1,800
8	Jeniffer Akinyi	28	F	business	6,000	1,000
9	Ruth Ochango	35	F	N/A	Applicable	500
10	Lucy Ambiyio	27	F	N/A	N/A	500
11	jane Awino	25	F	N/A	Applicable	600
12	Ian Odongo	11	F	student	N/A	N/A
13	Mary Atieno	46	F	Housewife	N/A	800
14	Patricia Okelo	47	F	water kiosk	3,000	500
15	Ambrose Muthui	48	M	security guard	6,000	700
16	Jenifer Akinyi	32	F	vegetable vendor	4,000	500
17	Rosemary owino	37	F	juakali	Applicable	500
18	Joseph O. Oludo	46	M	Driver	4,000	1,000
19	Pauline Makau	21	F	N/A	Applicable	800
20	Mary Atieno	23	F	Housewife	N/A	500
21	Florence Odhiambo	39	F	business	200	1300
22	Baraza Nyangasi	59	M	watchman	4,000	500
23	Josely Atieno	45	F	business	3,000	700
24	Joice Nyapera	30	F	N/A	N/A	450
25	Norah S. Amana	22	F	N/A	1,000	400
26	Miriam Timothy	22	F	N/A	N/A	700
27	Jane Macharia	53	F	teaching	5,000	4200
28	Peres Awino	42	F	vegetable vendor	4,000	800
29	Micheal Okumu	39	M	panel beater	20,000	500
30	Beatrice auma	28	F	vegetable vendor	3,000	N/A
31	Eunice Akinyi	38	F	vegetable vendor	3,000	600
32	Julian Mwanika	19	F	N/A	1,500	1500
33	Dennis Njoroge	25	M	business	3,000	500
34	Christine Auma	54	F	store keeper	8,000	700
35	Beatrice Aono	27	F	N/A	N/A	700
36	Eric O. Okoth	32	M	business	5,000	600
37	Samson O. Ouma	25	M	footballer	7,000	500
38	Jeniffer Atieno	51	F	business	3,000	600
39	Fransisca k. Kithome	37	F	vegetable vendor	3,000	600

40	Henry Kioko	60	M	salesman	10,000	N/A
41	William O. Awich	50	M	business	3,500	800
42	Peninan Mutinda	40	F	Vegetable vendor	5,000	600
43	Jackson Muli	56	M	shopkeeper	4,000	2,300
44	Chris Nzioki	58	M	Business	8,000	N/A
45	Patricia Okello	38	F	Vegetable vendor	2,400	600
46	Peter Ochieng	40	M	Casual labour	4,500	1,000
47	Susan Auma	22	F	N/A	N/A	N/A
48	Hudson Nakholi	50	M	Health worker	15,000	1,000
49	Marion Ngure	10	F	N/A	N/A	N/A
50	Stella Wamboi	16	F	N/A	N/A	N/A
51	Hellen Achieng	27	F	Vegetable vendor	2,000	N/A
52	Dorine Auma	20	F	Business	3,000	N/A
53	Lavigne Atieno	12	F	N/A	N/A	N/A

APPENDIX 5: SUMMARY OF DATA COLLECTED BY MILLENIUM ENVIRONMENTAL SOLUTIONS

PEEPOOPLE IMPACT ASSESSMENT 10th December 2008 - 6th January 2009

No.	Family Representatives KISUG	No. of Family Members	Number of Peepoo distributed per day																												
			D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	D17	D18	D19	D20	D21	D22	D23	D24	D25	D26	D27	D28	TOTAL
1	Willice Mutula	5	10	10	2	4	5	7	2	3	2	1	1	2	2	1	1	3	1	3	1	3	2	2	1	1	1	2	1	2	
2	Erick Otieno	4	8	1	7	0	5	0	2	3	4	2	4	0	1	5	3	2	1	1	0	0	2	1	2	0	0	0	0	0	
3	Floice Amina	4	8	0	3	3	0	2	2	3	5	3	2	3	2	2	1	2	0	1	2	2	2	2	2	2	1	3	3	1	
4	Francisca Kambua	3	6	2	10	5	4	4	3	5	2	3	5	3	5	5	5	7	2	5	5	5	4	2	2	4	2	3	2	4	
5	William Owira	3	6	0	0	2	5	0	6	1	0	1	3	1	1	1	2	1	2	0	0	0	0	0	2	0	0	0	0	0	
6	Esther Wariga	3	6	0	0	5	0	1	1	2	1	3	2	2	1	1	1	0	1	0	1	2	1	1	2	2	2	0	2	1	
7	Jackson Muli	4	8	2	0	6	2	0	2	0	0	0	0	0	1	0	0	0	0	2	0	2	0	2	0	0	1	1	0	0	
8	Jane Ngige	3	6	0	0	4	2	3	0	3	1	1	1	0	1	1	1	2	0	0	0	3	1	2	1	1	2	2	1	1	
9	Dikson Makau	1	2	0	0	4	3	1	3	5	6	4	2	6	5	8	6	8	3	6	2	2	3	3	2	2	2	2	3	4	
10	Christopher Muli	7	14	4	0	3	4	5	5	4	5	5	4	5	4	0	0	0	4	2	4	6	4	4	4	4	4	4	4	4	
11	Julius Mwangi	5	10	0	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	0	0	0	0	
12	Dan Macharia	7	14	0	7	2	0	2	2	1	0	1	0	0	2	0	0	5	2	0	0	0	2	0	0	0	0	1	2	0	
13	Sadik Bilal	3	6	4	4	0	1	1	1	2	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
14	Comas Ouma	3	6	6	2	0	1	0	1	0	1	0	0	1	0	2	1	0	0	1	1	0	1	0	0	1	1	1	1	1	
15	Juliana Mwangangi	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	2	2	3	3	3	
16	Pauline Makau	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2	2	3	3	3		
	TOTAL	59	110	29	35	41	32	27	30	32	28	26	25	23	25	26	21	30	16	23	16	25	22	22	21	21	20	25	25	24	

	IAGER & OBAMA	No. of Family Members	Number of Peepoo distributed per day																													
			D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	D17	D18	D19	D20	D21	D22	D23	D24	D25	D26	D27	D28	TOTAL	
1	Henry Kioko Mwangangi	7	14	0	1	1	3	2	2	0	2	2	2	2	1	3	1	1	2	2	2	3	0	1	1	1	0	1	0	1		
2	Jenifa Atieno	5	10	0	0	2	4	7	7	8	3	6	3	5	2	0	2	2	0	0	0	2	2	2	1	1	1	2	4	3		
3	Titus Mutiso Kyamu	3	6	0	1	1	2	2	2	0	2	2	2	3	1	2	1	1	2	1	2	3	0	1	1	0	1	1	0	0		
4	Penina Mutinda	2	4	0	1	3	0	3	1	2	1	0	2	1	0	2	0	0	2	1	0	0	1	0	1	0	0	1	1	0		
5	Mary Yonga	8	16	3	3	4	2	3	1	2	2	1	0	2	0	0	0	3	1	2	0	2	3	1	0	0	4	3	0	2		
6	Patricia Okelo	6	12	4	3	4	0	3	4	4	2	1	3	2	8	3	3	2	4	4	3	2	2	1	1	4	0	0	2	2		
7	Mary Atieno	4	8	1	2	3	0	4	0	1	2	4	0	6	8	2	2	3	0	3	0	2	1	4	2	1	1	0	5	2		
8	Peres Awino	8	16	4	5	6	7	5	5	1	4	3	0	0	3	3	7	2	1	5	0	2	2	1	0	0	0	2	2	4		
9	Rose Nduko	9	18	3	4	9	0	7	7	5	2	5	3	0	2	2	0	0	3	0	3	1	3	1	0	0	1	2	2	1		
10	Ambrose Muthui	5	10	0	0	5	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	
11	Jane Akinyi	8	16	0	0	0	0	0	0	N1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
12	Jenipher Akinyi	8	16	6	3	7	4	4	3	3	4	5	5	2	3	1	2	1	0	1	2	3	2	2	1	0	1	1	3	1		
13	Peter Okoth	2	3	3	6	N2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
14	Pamela Awino	3	6	0	0	4	1	1	3	2	2	2	2	3	0	1	1	0	1	2	3	1	1	1	2	2	1	1	2	1		
	TOTAL	78	155	24	29	49	24	41	35	28	26	31	22	26	28	19	19	16	16	21	15	21	17	15	10	9	10	14	21	17		

NOTE 1: Jane Akinyi decided to be using alternative toilet;

NOTE 2: Peter Okoth was later included in Jennifer Akinyi's household

	SALE OKETE	No. of Family Members	Number of Peepoo distributed per day																													
			D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	D17	D18	D19	D20	D21	D22	D23	D24	D25	D26	D27	D28	T	
1	Osale Achinge	5	10	5	0	6	0	5	4	4	8	10	6	2	6	2	3	2	7	6	7	2	4	12	8	4	8	5	4	9		
2	Joseph Okele	5	10	3	2	0	4	1	3	3	3	2	2	2	1	1	1	1	2	1	2	2	4	5	1	3	2	1	1	3		
3	Denis Njoroge	1	2	1	1	1	2	1	2	0	2	2	1	1	1	1	2	2	1	1	0	1	1	2	1	1	1	1	2	2		
4	Resa Sande	7	14	6	7	5	0	6	5	4	4	5	4	4	5	3	4	3	5	5	0	3	2	2	2	2	2	2	1	2		
5	Juliane Mwanika	7	14	0	1	7	1	0	1	3	2	1	1	1	3	0	1	1	1	1	1	1	1	0	1	0	2	0	2	2		
6	Josephine Atieno	7	14	6	3	6	1	3	2	5	4	1	4	2	3	2	3	0	0	2	3	2	2	1	0	1	0	3	1	3		
7	Rose Lelii	5	10	0	0	1	1	0	0	0	2	1	3	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8	Peter Ochieng	3	6	2	2	3	4	0	4	0	4	2	0	2	0	2	3	0	3	2	3	2	3	3	3	3	3	3	0	3		
9	Samson Okoth	4	8	0	1	0	0	2	0	0	3	2	4	2	2	2	2	1	0	1	1	1	1	1	0	1	0	0	0	1		
10	Ester Kiraitu	4	-	-	-	8	2	0	0	0	3	2	1	1	1	0	1	2	1	1	1	2	1	1	1	1	1	0	0	1		
11	Baraza Nyar	1	2	2	2	2	2	2	1	2	2	1	2	1	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1		
	TOTAL	49	90	25	19	39	17	20	22	21	37	29	28	22	26	15	22	14	21	21	19	17	20	28	19	16	21	16	12	27		

	ELEPHANT	No. of Family Members	Number of Peepoo distributed per day																											
			D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	D17	D18	D19	D20	D21	D22	D23	D24	D25	D26	D27	D28
1	Joseph Oludo	7	14	7	4	11	7	10	7	6	7	1	3	5	2	1	1	4	4	8	0	0	0	0	0	0	0	5	3	
2	Eunice Akinyi	6	12	6	0	2	3	3	2	1	2	2	2	1	3	2	2	1	0	2	1	1	1	2	2	2	3	2	3	0
3	Christine Anyango	12	24	15	0	7	0	3	1	3	3	2	0	4	0	1	3	3	0	1	2	2	3	2	2	3	2	2	0	
4	Charles nakholi	9	18	1	5	2	6	6	2	5	5	4	3	4	4	2	3	3	3	0	10	3	3	3	0	2	2	4	4	4
5	Michael Okumu	7	14	5	6	4	6	4	4	2	6	4	5	1	4	2	4	3	5	2	3	3	4	1	2	1	1	4	5	0
6	Aida Nafula	12	24	11	0	13	2	5	7	6	9	4	5	0	9	3	4	2	1	3	1	2	2	6	1	4	2	0	6	3
7	Jane Awino	6	12	6	0	4	1	3	4	3	4	2	3	2	1	1	3	0	2	0	1	0	0	1	0	0	0	0	0	4
8	Rosemary Owino	6	12	3	3	7	8	5	3	3	14	10	1	4	10	0	1	1	1	4	5	3	14	3	3	1	0	0	1	4
9	Beatrice Auma	8	16	5	2	4	2	4	5	4	7	7	2	7	4	3	2	4	2	6	3	4	4	2	4	1	6	4	3	0
10	Ruth Ojango	6	12	1	1	1	6	5	1	3	6	7	4	3	2	2	2	3	2	1	3	2	7	3	2	4	5	3	4	3
11	Henry Otieno	5	10	0	0	0	0	0	1	3	2	8	5	2	2	3	1	2	1	2	3	1	1	2	1	2	2	4	0	2
11	Adidja Otieno	5	10	N3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	Mary Oluoch	3	N3	-	-	-	-	-	-	-	6	1	2	1	2	3	0	2	1	2	1	1	3	1	1	1	1	3	1	2
	TOTAL	92	178	60	21	55	41	48	37	39	71	52	35	34	43	23	26	28	22	31	33	22	42	26	18	21	24	26	32	25

NOTE 3: Mary replaced Adija who travelled

Table 9. Summary of Peepoo bag distribution

DAY	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	D17	D18	D19	D20	D21	D22	D23	D24	D25	D26	D27	D28	
TOTAL PEEPOOS COLLECTED / DISTRIBUTED	533	138	104	184	114	136	124	120	162	138	110	105	122	83	88	88	75	96	83	85	101	91	68	67	75	81	90	93	