

**FACTORS INFLUENCING SUSTAINABILITY OF WATER TREATMENT PROJECTS. A
CASE OF INNOVATIONS FOR POVERTY ACTION CHLORINE PROJECT IN
RACHUONYO SOUTH DISTRICT, HOMABAY COUNTY, KENYA**

BY

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DECLARATIONS

This research project is my original work and has not been presented in any other university or institution of higher learning for any award.

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DEDICATION

This document is dedicated to my mom Mrs. Pamela Kokiro and my dad Mr. Martin Kokiro. I thank them for the firm academic foundation they laid in me.

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LIST OF ABBREVIATIONS AND ACCRONYMS

AWD	–	Acute Watery Diarrhea
DWI	-	Drinking Water Inspectorate
EPA	–	Environmental Protection agency
GDP	–	Gross Domestic Product
HIV/AIDS	-	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
HPA	-	Health Protection Agency
HWTS	–	Household Water Treatment and Storage
IFAD	-	International Fund for Agricultural Development
IPA	–	Innovations for Poverty Action
KNBS	–	Kenya National Bureau of Statistics
MDG	-	Millennium Development Goals
NGO	–	Non Governmental Organization
POC	–	Point of Consumption
POU	–	Point of Use
PSI	-	Population Service International
SPSS	–	Statistical Packages for Social Scientist
SDW	-	Safe Drinking Water
TWAS	–	Third World Academy of Sciences
UN	–	United Nations
UNDP	–	United Nations Development Program
UNICEF	–	United Nations Children’s Fund
WHO	–	World Health Organization
WSS	-	Water and Sanitation Services
DALYs	-	Disability Adjusted Life Years
WASEH	-	Water, Sanitation and Education for Health
IFAD	-	International Fund for Agricultural Development

ABSTRACT

Drinking unsafe or untreated water has negative health effects and has led to increased water related diseases like diarrhea, typhoid amongst many other water related diseases. This has greatly contributed towards death rates in Kenya. Treating water at the household level using chlorine is one of the most effective and cost-effective means of preventing waterborne disease in development and emergency settings because it prevents recontamination of water. Despite the fact that Innovations for Poverty Action has implemented a safe water project to reduce water related diseases and deaths, and also identifying different factors that influence the sustainability of that project, the major problem is that there is laxity on the community side. The purpose of this study was to examine factors influencing sustainability of using chlorine for treatment of community rural water in Rachuonyo South District. The objectives of the study were: To determine the extent to which community attitude influences sustainability of water treatment projects; To assess the extent to which community needs influence sustainability of water treatment projects; To establish the extent to which cost of chlorine influence sustainability of water treatment projects; and to examine how management of chlorine dispenser influence sustainability of water treatment projects. Theoretical framework was developed with “diffusion of innovation” theory being adopted which seeks to explain how, why and at what rate communities accept new ideas. The study employed the descriptive research design and the target population of the study was 68,152 households within Rachuonyo South District from which a sample size of 382 households were drawn and involved in the study. Simple random sampling technique was employed and information was provided by the household heads, or their appointed representatives while the data was collected through both structured pre-tested questionnaires and observation guides. Pilot testing was done in Rachuonyo North District to assess validity and test retest method to ensure reliability. Data obtained from close ended questions was analyzed using quantitative techniques such as frequencies and percentage counts and presented using frequencies and percentage tables with the aid of SPSS (Statistical Packages for Social Scientists). Qualitative data in form of experiences, opinions and suggestions, were transcribed, organized into various emerging themes and reported and were used to strengthen quantitative findings. The study findings revealed that training and awareness greatly contributes towards sustainability of a project. However, despite training given there is still laxity within the community, 26.5% do not see the project benefits and 33% of the community members confirmed that they no longer make use of that chlorine project. 25.4% do not use chlorine even at home in treating their water and 33.0% believe that chlorine is bad in the body and it also has a bad taste and that is why they do not use it, 12.3% are either not satisfied or fairly satisfied with using chlorine as a treatment method and 28.8% do not see the importance of treating water using chlorine. 71.2% indicate that chlorine meet their needs in terms of health while 28.8% indicate that it does not. 81.4% believe that the cost of chlorine is affordable and are willing to pay for it with or without any incentives. Community participation during implementation was 90% which was important to enable the sense of ownership. The study concluded that lack of enough knowledge has greatly contributed towards misconception of chlorine as a water treatment method and therefore affecting sustainability of chlorine projects for safe drinking water. The study thus recommended that, the government of Kenya should come up with strong policies on safe water and various stakeholders should work together towards advocacy and sensitizing the community on access to safe water and their health. Areas for further research are suggested on: the same study to be carried out on other districts for purposes of comparison, the extent to which cultural practices influence sustainability of community projects.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Safe drinking water is a human right just as much as clean air. However, much of the world's population does not have access to safe drinking water. Out of the 6 billion people on earth, more than one billion lack access to safe drinking water. Together, these shortcomings spawn waterborne diseases that kill on average more than 6 million children each year (about 20,000 children a day). The problem is not the lack of freshwater, indeed plentiful freshwater resources are available in Latin America, the Caribbean, sub-Saharan Africa, Europe and Central Asia. Water resources, moreover, do not correlate with the level of economic activity within countries (Third World Academy of Sciences, 2002).

Access to safe drinking water can improve longevity; reduce infant mortality, health, productivity, and material well-being. The availability of drinking water within the household through a household connection provides better level of service. When there is no access to safe drinking water, the following can be adopted; Point-of-use disinfection, safe water storage, sanitation/hygiene, behavior techniques. Where a drinking water source is not available within the property and the household have to walk more than five minutes to get their water, there is likelihood that they will not use more than the very basic quantities required for hygiene, drinking and cooking which is 20 litres per capita per day (WHO and UNICEF, 2006).

Treatment of water at the household level, especially using chlorine has been shown to be one of the most effective and cost-effective means of preventing waterborne disease in development and emergency settings. Promoting household water treatment and safe storage (HWTS) helps vulnerable population to take charge of their own water security by providing them with the knowledge and tools to treat their own drinking water. Because it prevents recontamination of water in the home, treating water at the household level is more effective than conventional improvements in water supplies in ensuring the microbiological quality of drinking water at the point of point of consumption (POC) (Bunyi et al, 2010).

Most developed countries today are not experiencing much the problem of lack of access to safe water and sanitation unlike the developing countries. Their improved

technologies have great impact on the water and sanitation sector. Since the UN has high records of disease that are caused by unsafe water for drinking. For example in the United States, due to improved technology, almost 85% of its population has access to clean and safe drinking water. Since the 1990, the United States governments have tried so hard to ensure reduction of deaths caused by water related disease. A research finding by Salaam (2012) shows that most deaths in the United States is caused by modern lifestyle and not communicable or water related diseases like diarrhea, typhoid and other.

In England and Wales, from 1992 to 2003 there has been a consistent decline in the number of disease outbreaks associated with the public water supply, with a particularly dramatic decline since 2000. This has been because of the efforts made by the government to ensure high reduction of deaths related to water. In the 1980s, most communities within England did not have access to safe drinking water and 65% of the population lacked access to safe drinking water. This recorded almost 50% of deaths relating to unsafe water. The government of England and Wales have made efforts to ensure that its population get access to clean and safe drinking water by enforcing policies on clean water (Davidson and Capleton, 2007).

China's rapid economic growth has brought about a shift in health priorities as infectious diseases associated with poverty are gradually displaced by chronic illnesses yet the traditional causes of illness, including infections resulting from unsafe water and poor sanitation and hygiene still exist and are unevenly distributed across China's diverse cultural and geographic landscape as a result of regional differences in urbanization, economic development and environmental factors. The researchers found that in 2008 approximately 327 million people in China lacked access to piped drinking water and 535 million lack access to improved sanitation, leading to hundreds of millions of cases of diarrhea, parasitic and other infectious diseases. Unsafe water and poor sanitation and hygiene accounted for 62,800 deaths that year, and 2.81 million disability-adjusted life years, a measure of disease burden that includes morbidity as well as mortality. Children under the age of 5 experienced more than 80 percent of the disease burden and the highest burden was found in inland provinces that have the lowest income per capita (Johnson, 2012).

India's huge and growing population is putting a severe strain on all of the country's natural resources. Most water sources are contaminated by sewage and agricultural runoff.

India has made progress in the supply of safe water to its people, but gross disparity in coverage exists across the country. Although access to drinking water has improved, the World Bank estimates that 21% of communicable diseases in India are related to unsafe water. In India, diarrhea alone causes more than 1,600 deaths daily. Hygiene practices also continue to be a problem in India. Latrine usage is extremely poor in rural areas of the country with only 14% of the rural population has access to a latrine. Hand washing is also very low and therefore, increasing the spread of disease. In order to decrease the amount of disease spread through drinking-water, latrine usage and hygiene must be improved simultaneously (Damon and White, 2010).

Most people currently have knowledge on the different chlorine products; Water Guard, Pur and life straw. According to Clasen 2009, interventions to treat and maintain the microbial quality of water at the household level are among the most promising of these approaches. In rural Ethiopia, women and children walk up to six hours to collect water. Most people collect water from shallow, unprotected ponds which they share with animals. Other people collect water from shallow wells. Both of these sources are subject to contamination as rain water washes waste from surrounding areas into the source. The need for water and sanitation in Ethiopia is severe. Only 34% of the population has access to an improved water supply and safe drinking water. This makes Ethiopia communities more vulnerable to water related diseases and therefore worsening their poverty level since people concentrate more on drugs instead of food, hence deteriorating their health situations. In Uganda, almost 59% of the population still lack access to safe drinking water. Although the number of people with access to safe water and sanitation has improved over the past 10 years, there are still many communities (both rural and urban) that rely on contaminated water sources such as streams and open wells (Damon and White, 2010).

Promoting household water treatment and safe storage (HWTS) helps vulnerable population to take charge of their own water security by providing them with the knowledge and tools to treat their own drinking water. According to the Joint Monitoring Programme's 2012 report, access to safe water supplies throughout Kenya is 59% and access to improved sanitation is 32%. Due to lack of access to water and sanitation, diarrhea is second to pneumonia in deaths in children under five years of age (excluding neonatal). Water, sanitation and hygiene related illnesses and conditions are the number one cause of

hospitalization in children under age five. Access to safe water and sanitation also contribute to time savings for women, more hours in school for girls, and fewer health costs (UN, 2003).

Findings by Otieno, Moraa and Salim (2012) on “access to safe water in rural communities in Kenya”, revealed that about 50% of people living within rural parts of Kenya still lack access to safe drinking water. Rachuonyo South District being one of the rural parts of Kenya is one of the areas that is affected with lack of access to safe drinking water. Communities living within Rachuonyo district use water sources like the wells, rivers, springs and borehole. By the nature of these sources, their drinking water can never be safe and this is worsened during transportation and storage which is always unhygienic. Ground water is generally not clean but the local community since they have been using that water for so many years and they know it does not have any health problems, they perceive that water as safe for drinking and not give so much priority to treating (Moraa, Otieno and Salim, 2012).

In this respect, Innovation for Poverty action came up with a chlorine project in treatment of water. Innovation for Poverty Action (IPA) is an American non-profit organization founded in 2002 by Yale economist Dean Karlan. IPA conducts randomized controlled trials (RCTs), along with other types of quantitative research, to measure the impacts of development programs in sectors including microfinance, education, health, governance, agriculture, charitable giving and community development. IPA is focused on researching aid programs. It provides implementation services for studies (e.g., carrying out surveys) as well as assistance and training for them; it also participates in discussions with donors and the public about how to use the available research to maximize the effectiveness of aid; finally, its Proven Impact Initiative and scale-up initiatives aim to expand programs they believe to be well-supported by the research and that they have a comparative advantage supporting (Karlan, 2012).

For any project sustainability, the project owners must ensure that the project meets the needs of the local community and the main objective of the project should be in the forefront. The way a project is implemented can have considerable influence on its long-term sustainability. For instance, by fostering participatory approaches, remaining flexible in the face of inevitable setbacks, and strengthening the capacity of stakeholders to plan and manage future actions. IPA together with the Ministry of water and ministry of public health was to oversee the project and carry out continuous monitoring and evaluation within the

communities. This partnership was to ensure long-term sustainability of the chlorine project after the implementation of the project (IFAD, 2009).

Chlorine project for treatment of water by IPA has been implemented in the following countries: Ghana, Philippines, Bangladesh, Peru, Haiti and Kenya. The main aim of the project was to provide safe drinking water. IPA come up with a new technology that would increase the number of people getting access to safe drinking water while reducing diarrheal diseases especially to children under the age of five. This new technology-chlorine dispenser is to be used at the point of collection of water. In Kenya, 800 dispensers have been installed in the rural parts (Nyanza and Western). This has greatly resulted in the increase in the number of uptake of chlorine in treatment of drinking water (Lehmann, 2012).

In some communities the decision to use chlorine is dependent on the accessibility and availability of that chlorine. According to Kremer and Miguel (2009), on price, persuasion, promoters or product design and making water safe, the study revealed that the price of a product has great influence on the product. Secondly, whether the product is readily available and easily accessible, will reflect on the number of usage. They installed the dispensers and made chlorine refills affordable at the community level. Later they appointed local promoter to take care of the dispenser and refilling it with chlorine. The promoter was to educate the local community on the importance of treating water and how to use the chlorine in the dispensers, this was in turn supposed to reflect people's attitude on the use of chlorine in treatment of water (Miguel and Kremer 2009).

Kenya is one of the countries experiencing high death rates due to lack of access to clean water especially the rural parts like Rachuonyo South. This has been a problem in most rural parts of the country and measures needs to be taken to ensure every household get access to safe and clean water and to do this it is necessary to understand factors that as to why communities lack access to safe and clean water despite many measures that have been put in place to reduce the problem. The safe water project by IPA has been a success in different parts and it has greatly improved the health of the community and has reduced number of diseases and deaths related to drinking unsafe water. However, due to people's attitude, community needs, cost of chlorine and how the project is being maintained has a great influence on the sustainability of the project. Although, most literatures talked about each of these variables and how they influence sustainability of a project at the community level, most

of them have not talked about how these variables despite their influence on the sustainability of a project can be striven towards long term sustainability. This gap in the literatures has led to the study to try and access how well these variables can bring about the long term sustainability to the community projects that improves their lives.

1.2 Statements of the problem

Treatment of drinking water using chlorine is important since it helps in the re-contamination of bacteria especially after transportation and storage, this is because of unhygienic handling and storage. In addition, if the community is not treating water it means they are putting their health at risk and vulnerable to water related diseases like diarrhea and typhoid which records high rate when it comes to death. Although some community members do not prefer use of chlorine because of their perceived knowledge that chlorine is a chemical and not good inside the human body while others also dislike it because of its taste (Third World Academy of Sciences, 2002).

On this regard, Bunyi (2010) states that even when water is safe for drinking at the source it is commonly re-contaminated during collection, storage and use at home. Therefore, treating water at the point of consumption (POC) or point of use (POU) provides households with the ability to get rid of the microbiological contaminate. Outbreaks of acute watery diarrhea (AWD) added to other water related diseases like typhoid is a burden and require costly diversion of scarce health and other resources to minimize fatalities. Diseases associated with contaminated water has a heavy economic impact in the developing countries, in terms of the public health care system for treatment, persons affected for transport to clinics, medicines and lost productivity. They also adversely impact school attendance and performance, particularly for girls and young women who must care for and assume the duties of ill parents and siblings (UNICEF, 2008).

In Rachuonyo South district, despite Innovations for Poverty Action bringing up a project on the use of chlorine in treatment of water there is still a luxury on using chlorine in the communities due factors like the cost of chlorine. Within the community socio-economic situation is very low and therefore other community members might decide not to use the chlorine in treating their water since they prefer buying other items that they consider basic need. Secondly community attitude towards chlorine is also a factor influencing the

sustainability of IPA chlorine for water treatment project. Community attitude either positive or negative has a great impact on using chlorine as this determines whether they will use it or not. A third, the community will assess if the chlorine meets their needs and to what extent since sustainability of any project is dependent on whether the project successfully meets the needs of the local community. Lastly, management of the chlorine dispenser's also influences the use of chlorine since it needs time and dedication. In addition, how best these factors can be channelled towards longer sustainability of the chlorine project in treatment of water is also a problem at the community level despite the knowledge they have (DuBois, 2010).

1.3 Purpose of the study

This study sought to investigate factors influencing sustainability of water treatment projects a case of Innovations for Poverty Action chlorine project in Rachuonyo South District, Homabay County, Kenya.

1.4 Objectives of the study

The study was guided by the following objectives

- i. To determine how community attitude influence sustainability of water treatment projects in Rachuonyo South District.
- ii. To assess the extent to which community needs influence sustainability of water treatment projects in Rachuonyo South District.
- iii. To establish the extent to which cost of chlorine influence sustainability of water treatment projects in Rachuonyo South District.
- iv. To examine how the management of chlorine dispensers influences sustainability water treatment projects in Rachuonyo South District.

1.5 Research questions

The study sought to answer the following research questions:

- i. How does community attitude influence sustainability of water treatment projects in Rachuonyo South District
- ii. To what extent do community needs influence sustainability of water treatment projects in Rachuonyo South District
- iii. To what extent does cost of chlorine influence sustainability of water treatment projects in Rachuonyo South District.

- iv. How does management of chlorine dispenser's influences sustainability water treatment projects in Rachuonyo South District.

1.6 Significance of the study

Result from this study first is very relevant and reliable to the Innovation for Poverty Action as it will help them know what factors to consider for the sustainability of their chlorine project in treatment of water in Rachuonyo South and other parts of the Country.

The study is worth undertaking as this information is of help especially to the government and other stakeholders like the United Nation (UN), Population Services International (PSI), the local community and other relevant and interested partners that focus on safe drinking water and how best they can ensure increase in the number of people getting access to safe drinking water. This is because investing in safe water help improve the country's economy. For example, according to United Nations, investment in safe drinking water and sanitation contributes to economic growth. For each \$1 invested, the World Health Organization (WHO) estimates returns of \$3-\$34, depending on the region and technology. The overall economic loss in Africa alone due to lack of access to safe water and basic sanitation is estimated at \$28.4 billion a year, or around 5% of GDP (UN, 2003). Information from this study therefore, is to help in the design and implementation of using chlorine as a water treatment mechanism. This study result of this study will give reliable information regarding safe drinking water and its importance as it will act as a source of reference to all stakeholders in safe water project. This document will also add knowledge to the existing literature on the subject.

1.7 Basic assumptions of the study

The study was guided by a few assumptions. One of the assumptions of the study was that people within Rachuonyo South district are using chlorine for treating their drinking water. The study also assumed that the respondents will be willing to spare time to respond to the items in the questionnaire in order to provide vital information for the research. Finally, this study assumed that the information provided by the respondents will accurately reflect the situation within their community to the best of their knowledge.

1.8 Limitations of the study

One of the limitations of the study was that since in most communities the head of the household have to provide informed consent before their households participate in this study, some households may decline to participate for various reasons. In this case, the researcher substituted these households with others using the convenience sampling method whereby the researcher recruit any household that is within the target population and is willing to participate. A second limitation of the study was that since the results of the study was based on self-reported responses, there is a likelihood that the respondents might be biased and/or may attempt to give dishonest responses in order to give a desirable picture. In this case, the researchers ensured good rapport before starting the interview and try to explain to the respondent clearly the importance of providing an honest response and the importance of the whole research. Researcher also used observation schedule to verify the information provided by the respondent.

1.9 Delimitations of the study

The study was de-limited to Rachuonyo South District only. Although the study is feasible in other areas as well as nationally, Rachuonyo South District being a rural setting with deplorable health indicators like high infant mortality rate, high HIV/AIDS rate, poverty rate amongst others makes it of particular interest. Additionally, this study only focused on the use of chlorine as a water treatment method and overlooks other water treatment methods since the main research seeks to determine factors influencing adoption of use of chlorine in treatment of water projects. It does not give so much attention to other methods of treating water because chlorine is one of the new products introduced unlike other methods like boiling and filtering that is commonly known at the local level.

1.10 Definition of significant terms used in the study

The following are some of the significant terms that have been used in this study. Their meaning as used in this study is explained.

Sustainability of innovations for poverty action's chlorine projects: Is the ability of the project to maintain its operations, services and benefits during its projected life time

Community attitude: is the way a community views something or tends to behave towards it

Community needs: Is the necessary conditions for optimal function, development, or well-being of the community

Cost of chlorine: Is the value of chlorine in the market

Management of chlorine dispenser: Is how the chlorine dispensers are maintained and sustained

Access to drinking water: means that the source is less than 1 kilometer away from its place of use and that it is possible to reliably obtain at least 20 litres per member of a household per day.

Safe drinking water: is water with microbial, chemical and physical characteristics that meet WHO guidelines or national standards on drinking water quality.

Access to safe drinking water: is the proportion of people using improved drinking water sources: household connection; public standpipe; borehole; protected dug well; protected spring; rainwater.

1.11 Organization of the study

The study was organized into five chapters. Chapter one was the introductory in which various aspects were discussed. This included background to the study, statement of the problem, purpose of the study, the study objectives, research questions, and justification of the study, significance of the study, scope of the study, limitations of the study, delimitations of the study and organization of the study. Chapter two of the study focused on the review of relevant literature. A theoretical and conceptual framework was formulated and discussed and knowledge gaps identified. Chapter three outlined the study methodology to be employed to obtain information that would respond to the research questions and ultimately achieve the research objectives. The chapter further described the study design, the area of study, the sampling procedure, the data collection methods and instruments and the data analysis techniques. Chapter four discussed data analysis, presentation and interpretation and lastly, Chapter five consisted of a summary of findings, conclusions, recommendations for policy action and further research and lastly the study contribution to body of knowledge.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews empirical and theoretical literature related to this study. In this chapter, a review is made of existing knowledge found in academic literature as well as prescription from practitioners regarding the sustainability of use of chlorine. Studies carried out in several different regions and countries have also been reviewed in this chapter. This chapter exposes the gaps in knowledge that this study aims to investigate. The various sources of literature reviewed in this document include internet, reports, books, journals, among others. A theoretical framework has similarly been developed. In addition, a conceptual framework has been designed in order to explain the relationship between the independent, dependent and intervening variables.

2.2 The concept of sustainability of IPA chlorine project in water treatment project

Innovations for Poverty Action (IPA) is a US-based NGO founded in 2002 and its mission is to research what works in development using Randomized Evaluations. Projects span diverse sectors: Agriculture, charitable giving, education, health, microfinance and enterprise, governance and community participation, and water and sanitation. IPA scales up successful ideas that have been proven by research, through: Replication, dissemination, and implementation. Due to problems associated with lack of safe water, dispensers are designed to increase take-up and reduce cost of household chlorination and this is especially due to recontamination identified as an issue. The Chlorine Dispenser System presents a new innovation in drinking water chlorination. The Dispenser set up includes three key components: Dispenser hardware installed next to communal water sources; Local promoter to encourage Dispenser use and community education; and Bulk supply of refill chlorine delivered regularly and reliably (Swerrissen, 2007).

Sustainability is the ability of a project or program to operate on its own without outside support or intervention. Sustainability is often used as a measure of a project's long-term effectiveness. In other words the ability of a program or a project to continue operating even after the funding is stopped means that the project or the program is sustainable. Within the development community, sustainability refers to the ability of benefit flows to be maintained after project funding ceases. It is important to note that benefit sustainability does

not imply that the project itself continue. In fact, benefits are usually best sustained by beneficiaries themselves through NGOs, governments, or community groups, after the initial investment. Donors may need to sustain benefits over a longer time frame, however, to reach particularly disadvantaged, marginalized or poorly organized beneficiary populations is another challenge. Sustainable development involves strategies for assessing what benefits need to be sustained over what time frames with what resources. As change is unpredictable and hard to understand even in our own society. Results of surveys conducted over 2 years by IPA showed that sustained high chlorine take-up levels in dispenser communities compared to the controls. Control communities had access to for-purchase bottled chlorine. Although after two years, take-up remained between 50-60% (Russell, 1995).

Participation is a critical theme in the sustainability literature. Some thought has been given to the relationship between increased participation and type and goal of project, as well as the trade-offs between increased participation and management complexity. Community participation in any local project is very crucial for the sustainability of a project. Community ownership by poor rural people is another critical factor contributing to the sustainability of project benefits. Ideally, this should entail involvement of project participants at all stages of the cycle: design, implementation, and monitoring and evaluation (M&E). Most programs are often discontinued or radically reduce and alter their original activities when resources are reduced or discontinued. Failure to plan for resource sustainability is a critical problem for many programs. When it comes to continued funding, there are only a limited set of planning alternatives. When donor of a project routinely fail to consider resource sustainability and withdraw resources from otherwise effective programs as part of their funding approach program providers are likely to adapt. Some become disillusioned and unwilling to participate in future trials and project funding. In 1988, a study found only 11 percent of USAID projects to have a strong likelihood of being sustained after USAID funding (Swerissen, 2007).

Cordination between the project funders and the local government is a matter of concern. Different sectors have different concerns of sustainability for example, recent findings from the World Bank indicate that, in a democratic context, governments with close ties to the labor movement are more likely to be able to sustain structural adjustment programs than business-oriented governments. Sustainability failure can be costly for funders, dispiriting for providers and result in discontinuity, wasted effort and adverse health outcomes

for consumers. This is particularly a concern for new initiatives. By successfully integrating government stakeholders and NGO representatives into district societies as a proxy for project management units, this implementation strategy benefits project sustainability in several ways. First, by engaging the local government, the project is seen as a local initiative. For example, the Nyanza Healthy Water Project adopted the existing WASEH (water, sanitation and education for health) community mobilization and management structure and ensured support by first introducing the project to Kenyan government officials, community management committees, and leaders of women's groups (IFAD, 2009).

Benefits produced by health programs include prevention of injury and disease, restoration of health following injury and disease, and reduction of functional limitations associated with injury and disease, and reductions of distress and discomfort associated with disease, injury, disability and dying. Typically these have been measured as morbidity and mortality, but more recently aggregated utility measures such as Disability Adjusted Life Years (DALYs) have been developed. Programs are sustainable when improvements in health for populations or individuals resulting from them are maintained over time. Fundamentally, judgements about sustainability are judgements about whether or not initiatives improve health outcomes for individuals and populations that last. Sometimes programs themselves have to be sustained for benefits to continue. At other times they do not. Whether or not programs themselves have to be sustained depends on the contingencies that shape the desired outcomes (Barnett, 2012).

2.3 Community attitude and sustainability of water treatment projects

People normally tend to bring the same preference and discrimination they bring on food to their drinking water. They smell, taste and look into their water, then make a judgement. Personal preference for drinking water is based both on the psychological and physiological factors. Since the late 19th century, chlorine has been widely recognized as an effective, practical, and affordable disinfectant of drinking water. Studies have been done in Dominica Republic and Guantamala and both indicate reported atleast 30% cases of expressed dissatisfaction of the bad smell of the chlorine and that is the reason for luxury in the adoption of use of chlorine. Chemical disinfection of drinking water such as chlorination is now promoted and practiced at the community level as well as at point-of-use. Despite the international salience of water-related issues, relatively few studies have examined people's

beliefs about drinking water and its association with water treatment practices. One study in the Dominican Republic demonstrated a positive association between education and water purification practices, including boiling. One Guatemalan study examining psychosocial factors related to water treatment demonstrated that self-confidence, a positive attitude toward water treatment, the belief that a majority of the population treats water, and communication with one's partner are associated with self-treatment of water (Magata et al, 2011).

Sensory experience can influence people's perceptions and attitude. The unique smell and taste of chlorinated water has been documented in several contexts. In the United States and Canada, chlorine was one of consumers' most frequently reported odor and taste complaints to water utilities. In the United Kingdom, one study found that people preferred neutrality in the taste and smell of their drinking water; any additional smell or taste was perceived as unnatural, alarming, or bad. Respondents even reported setting water out overnight to lessen the presence of chlorine. A nationwide survey of 1,754 bottled water users found that 39% chose bottled water because it tasted better, while only 18% said it was because of safety. In a survey of consumers concerning home plumbing and drinking water, 34% said aesthetic factors (taste, odor, and color) were important. Similarly, drinking water utilities find that the sensory properties of water are what consumers most notice and result in the most complaints due to tastes, odors, or particulates. According to a research done by the EKOS research associates in 2006 states that 30% of the population in developed countries does not adopt the use of chlorine due to its odors and smell (Dietrich, 2006). In Quebec Canada, found that 30% of survey respondents expressed dissatisfaction with the taste of their tap water, 14% were dissatisfied with the smell, and 10% disliked the appearance. The main predictor of the use of alternatives to tap water (such as bottle water and home treatment) was dissatisfaction with the taste of tap water. Those who disliked its taste were six times more likely to use an alternative source than those who did not mind its taste (Elena, 2010).

According to a study done in Guatemala, slight majority of respondents (103 people) said they preferred drinking water that was chlorinated. The reasons cited most frequently for preferring chlorination included its ability to kill bacteria and germs (cited 42 times), the fact that only a small amount is necessary (24 responses), its ability to clean (10 responses), prevention of illness (9 responses), and prevention of diarrhea (7 responses). In contrast, 97 respondents said they preferred unchlorinated drinking water. The most common reasons cited were the chlorine's bad taste or smell (cited 47 times), its ability to cause illness (19

responses), their belief that it had no real function (10 responses), and their belief that it was too strong (4 responses). Municipal chlorination remains a divisive issue in Santiago Atitlán, where 48.3% of residents prefer tap water without chlorine. Future research might examine residents' preferences related to water treatment methods other than chlorination, such as filtration or boiling, which could inform municipal water policy alternatives or identify popular water treatment interventions to promote at the household level. Local beliefs about the relation between water consumption and health impacts could also be explored further (Mageta, 2011).

A study done in Britain on people's attitude towards chlorine by Harrison indicates that a good percentage of people appreciate the fact that chlorine has been welcomed as the saviour against cholera and various other water-borne diseases; and rightfully so. Its disinfectant qualities and economy of production have allowed communities and whole cities to grow and prosper by providing disease-free tap water to homes and industry. Some people have grown-up on tap water, and believe the taste of chlorine signifies purity and safety. Well, not necessarily so to everyone. According to others chlorine has so many dangers it should be banned. To them, putting chlorine in the water supply is like starting a time bomb. Cancer, heart trouble, premature senility, both mental and physical, are conditions attributable to chlorine treated water supplies. They believe it makes them grow old before their time by producing symptoms of aging such as hardening of the arteries (Harrison, 2000).

In Guatemala, a study was done on people's attitude towards treating drinking water; according to the findings only 50% of household has a positive attitude towards treating their water. They prefer to maintain their health than try to fight diseases. From this study, out of a population of 1500 that was interviewed, only 40% treat their drinking water using chlorine and the remaining people treat their using other means like boiling and filtration since they believe that is the safest method and the only natural way of treating drinking water for them. Due to high cost of living, a good percentage do not treat their water when treating the water entails money, that is, either buying chlorine products or fuel for treating drinking water. They prefer to use the money to buy other essential household item of food. In Pakistan the same study was done and only 50% of the populations treat their drinking water, 40% use other means in treating their drinking water and only 10% treat their drinking water using chlorine products (Kincaid and Elena, 2005).

2.4 Community needs and sustainability of water treatment projects

The task of serving the more than one billion people who lack access to safe drinking water must begin by identifying communities that may be reached through small-scale technological innovations before large scale solutions are feasible. IPA develop a needs assessment tool to facilitate the pairing of community- or household-based drinking water treatment projects with underserved communities that need and want them. The tool builds on existing assessments but is innovative in its emphasis on keeping the survey brief, minimizing gender bias, and treating water treatment technologies as innovations to be adopted rather than interventions to be imposed. “The World Health Organization (WHO) acknowledges that piped-in water supplies will continue to be unavailable to hundreds of millions of people” (Clasen and Bastable, 2003). A number of alternatives to centralized infrastructure exist, including point-of-use (POU) water treatment technologies that allow users to treat their own water in the home, improved water source protection, and community-scale water treatment systems. Each of these options differs from large-scale infrastructure in that household or community willingness to participate is essential for these alternatives to succeed (UNICEF, 2008).

A needs assessment is the first step in matching need with supply; it is used to gather information about a community in which a project or innovation may be implemented. The tool aims to assess residents’ perception of need for a change in water provision, because they will be less likely to use a new water system if they do not feel that they need it, and if they do not use it, then the investment will not result in improved health. The results of the needs assessment will allow the implementer to know if the community is ready for a safe water project, and if not, then the results can reveal how much work needs to be done in the community before such a project can be successful. Despite these good intentions, needs assessment surveys too often assume that a community that has access only to contaminated drinking water must “need” water treatment? Putting people first, meeting the needs of communities and involving them more directly in decisions while at the same time shifting more emphasis to prevention, promotion, and wellness and focusing more on outcomes. To respond to community health needs, you must start with a clear understanding of what they are, what capacity communities already have for addressing those needs, and what new options and solutions are available. To ensure programs and services are efficient and effective, it is essential that priorities be placed on meeting the greatest needs (Vergara and Ray, 2009).

According to Carter, Tyrrel and Howsam (2000), without the motivation of the community to utilize the new idea (chlorine dispenser), sustainability is doomed. The users must believe that the new idea is preferable to their traditional practices. The Innovations for Poverty Action must through training and sensitization educate the community on how important the dispenser project can impact in their life and the community must consider the project meeting their need in terms of health improvement. The main concept behind the chlorine for treatment of water is the reduction of the water borne related diseases that cause deaths especially to the children under the age of five years. In terms of health, it is important for the community members to understand clearly the importance of safe water. Health problems from water scarcity or germs in water can be especially dangerous to people who are already affected by chronic or life-threatening illnesses such as HIV/AIDS. It can be difficult to know if water is safe or not. Some of the things that cause health problems are easily noticed by looking at, smelling, or tasting the water. Others can only be found by testing the water. Understanding what makes water unsafe and taking steps to protect water from contamination can prevent many problems from unsafe water.

Information on water practices in the community, health knowledge in the community, and resources available in the community is needed before beginning a program. Potential sources for this information include existing reports, medical records at clinics or hospitals, on-site visits to households and institutions in the community, and conversations with community leaders, government officials, and non-governmental organizations (NGOs). Quantitative information can be obtained through a survey of community members. Information on water practices in the community, health knowledge in the community, and resources available in the community is needed before beginning a program. Potential sources for this information include existing reports, medical records at clinics or hospitals, on-site visits to households and institutions in the community, and conversations with community leaders, government officials, and non-governmental organizations (NGOs). It is important to identify the specific needs of a community that a project or a program is targeting to achieve. Perceived needs of non-community members may be different with the real needs of the community members and therefore proper needs assessment needs to be done in order to meet the real needs of the community. For example, the community might not see any problem with the water they use daily but non community members might have a problem with the water and therefore, doing something to improve the water might not be appreciated with the

community members and there for the project might not be sustained for a longer period of time (Lantagne and Gallo, 2008).

2.5 Cost of chlorine and sustainability of water treatment projects

Where piped water is not available like in most rural settings, a variety of point-of-use technologies have been developed, including locally-produced ceramic filters, chlorination, solar-disinfection, or simply boiling the water. Used in combination with safe storage containers that allow users to access water without actually touching it with dirty fingers, thus preventing re-contamination, these methods are inexpensive and can substantially improve the quality of the water. The cost to the consumer of water treatment technologies vary from less than 10 US cents to just over a dollar per thousand liters of water, depending on the method used. One bottle of chlorine costs about a quarter the average agricultural daily wage in many countries and can provide an average household with a month's supply of purified drinking water (Bunyi, 2010).

Disruption of existing interests and the use of resources such as staff, facilities, equipment and consumables are the costs programs incur. Programs have direct and indirect costs including out-of-pocket costs to individuals, lost productivity and intangible costs such as those associated with pain, suffering and distress. Programs are sustainable when the costs of reallocating resources are justified by the health benefits that are achieved. When these elements are brought together, program sustainability is defined as the occurrence of beneficial outcomes which are maintained for an agreed period at an acceptable level of resource commitment within acceptable organisational and community contingencies. By definition, programs are unsustainable when they do not produce beneficial outcomes over agreed periods, or require unacceptable levels of resource commitment or the necessary organisational and community contingencies to implement them cannot be arranged. The financial costs which communities are expected to raise as a contribution to capital or recurrent expenses may be unacceptable, unaffordable, or impracticable for example, monthly or quarterly cash contributions may be impossible for households which only receive income at harvest (Global Scan, 2009).

The advancement and expansion of clean water and drinking water systems has been worthwhile but costly. In the last twenty years, communities have spent \$1 trillion in 2001

dollars on drinking water treatment. Among the efficacy studies that use contingent valuation methods, reported that for a sample of 50 households in rural Bolivia who participated in a randomized control trial of ceramic water filters, the mean willingness to pay for a filter was less than 40 percent of the cost. Turning to the studies of POU technologies, the only one to say anything about willingness to pay which is based on real purchase decisions is forty three (43%) percent of households in their sample who are observed to have residual chlorine in their stored drinking water in the follow up survey round must have been willing to pay the \$0.33 for a two month supply of the product, since it was not distributed for free as part of the intervention which was based solely on encouragement to purchase. This is despite the fact that diarrhea risk among treatment households was 70% less than for comparison households and respondents' mean estimate of how much a filter system cost was remarkably close to the actual cost of \$25 (Miguel and Kremer, 2009).

Even a small difference in pricing can influence people's behavior. According to a study done by Null, Kremer, Miguel, et al (2012) on willingness to pay for clean water shows that in Kenya, access to free chlorine increased uptake to over 60 percent, whereas coupons for even a 50 percent discount had a minimal effect. In Zambia, for each 100 Kwacha (2 US cents) discount, the likelihood of purchase increased by 7 percent. Evidence suggests that people will not pay more for water treatment technologies, contrary to arguments put forward by many non-government organizations (NGOs) which operate on the principle that it is not sustainable to give people something for free. More research is needed to design innovative technologies and service delivery models to make water treatment methods more attractive and convenient for people to use. There is little evidence explaining why people are not willing to pay for clean water. The systematic review suggests that a family's level of income bears no direct correlation with people's willingness to pay for water treatment. So what influences people's decisions is the question to answer. Small changes in taste, appearance, or temperature of treated water can affect whether and how much people will use these technologies, particularly over time. In addition to cost, taste or appearance, time spent on the process can influence people's decisions to pay for clean water, or not. For instance, a family will have to consider the time spent in accessing clean water or treating it, basing their decision on the opportunity cost in terms of the number of working days or earnings lost in a year. However, willingness to pay may also be dependent on the health benefits. If the community understands that small additional cost for new technology to ensure safe water

will greatly reduce water related diseases like diarrhea, then the community will tend to contribute that little amount towards better health (Null, Kremer, Miguel, et al, 2012).

Another important factor that can play a role in adoption are accessibility to the water treatment technology in the local market and peer effects where individuals are influenced to change their behavior to match that of friends, family and colleagues. Chlorine dispensers developed in Kenya are an example of a novel distribution system that is promising in its ability to harness peer effects and act as a reminder to treat water by placing water treatment infrastructure and supplies at the point of collection. According to Beyene (2012), accessibility to safe drinking water eventually leads to less of diseases and deaths hence improvement of health. Accessibility to chlorine products for treatment of water greatly influence the usage in treatment of water, this is because most people tend to use a product (chlorine), if they see it more often within their surrounding they tend to use it frequently. Ease access of chlorine and being that it is readily available within the community to a greater extent influence the treatment of water within the community (Beyene, 2012).

2.6 Management of chlorine dispensers and sustainability of water treatment projects

The source-based approach makes drinking water treatment convenient because the dispenser valve delivers an accurate dose of chlorine to treat the most common transport container, while the public nature of the dispenser system also contributes to learning and habit formation. The promoters also provide frequent reminders and encouragement to use the product. As promoters are members of the community, their local knowledge, trust, and social influence may have contributed to their success in driving adoption. While interactions through social networks can help increase information-sharing and awareness, it will not necessarily change people's attitude towards these technologies. In Kenya, when some households were randomly chosen to be given a supply of chlorine for water treatment, they subsequently had more conversations about water and health with their friends and relatives, but this had a limited effect on the people they came into contact with through their social networks. By allowing the community to decide how and where the dispensers will be placed have a great role on how the dispensers will be managed hence maintaining the chlorine dispensers becomes a success for IPA as an organization. (Null, Kremer, Miguel, et al, 2012)

Examples of poorly maintained and dysfunctional public infrastructure are all too common in developing countries. Economic theory predicts a coordination failure when no individual's private incentive to maintain a common good is greater than their individual cost to take action, even if the social benefit of investing in maintenance would far outweigh the social costs. To complicate matters further, if users of the water source have self-control problems they might indefinitely delay dealing with a maintenance problem, even if they always intend to take care of it in the next period. After dispenser installation, three community members were randomly selected for a monitoring phone call to check on the functionality of the dispenser. The promoter and members of the fundraising committee receive additional training and t-shirts with the project logo in recognition of their important role in ensuring maintenance and use of the dispenser. The promoter and the committee member's role is to take care of the dispenser and encourage the community to make use of the dispenser each time they went to collect water at the water source. The promoter is also in charge of ensuring chlorine refill in the dispenser when the chlorine is over in the tank. The promoter's role was to inform the IPA staff in case the dispenser was spoilt or interfered with for purpose of replacement (Lehmann, 2012).

According to a study done by Lapeyer, Hoffman, Rostaphova and Null (2013) on "management and continuous use of dispensers in Western Kenya", the result shows that of the 44 dispensers in the threat of removal arm, 18 were removed at some point during the 11 months of monitoring, the first one just two months after installation and the majority occurring five months after installation when the regular monthly spot-checks were initiated at all dispensers. When project staff removed a dispenser, they left a wooden sign in its place. The sign reiterated the terms of the agreement which had been explained at the initial community meeting: the dispenser had been removed because it was empty and the community had one week to purchase a refill or else IPA would not return the dispenser. The second time a dispenser was found to be empty there was no possibility to reclaim it. Among the 18 dispensers that were removed, 5 were ever returned, one of which was subsequently removed permanently. Thus, a total of 30 of the 44 dispensers in the threat of removal treatment made it all the way through the study. Cumulatively, water users in the threat of removal treatment lost slightly more than 10% of their access to their dispensers over the year after installation 63 out of a possible 528 months (Lapeyer, Hoffman, Rostaphova and Null, 2013).

This therefore meant that greater availability of chlorine in the threat of removal treatment did not translate into higher chlorine usage, as measured in the follow-up household survey. It is possible that the large point estimate of the effect of the threat of removal treatment on chlorine availability is a reflection that community members knew they were supposed to have a stocked dispenser and thus were simply complying with the terms of the treatment on the day of the survey. Although the possibility of such bias casts some doubt on this result, it also implies that with strong monitoring, the threat of removal incentive could indeed be an effective strategy for promoting maintenance. Using a variety of measures, studies demonstrate that the ownership treatment had no effect on individual-level usage of the infrastructure, or on communities' ability to sustain cooperation. The threat of removal treatment, on the other hand, is effective at improving maintenance of the common good. The mechanism through which a threat of removal contract could affect sustainability is consistent with the predictions of behavioral economic theory. (Hoffman, Lapeyer, Rostaphova and Null 2013). According to Marks and Davis (2012), community participation in the contribution towards the chlorine dispenser and also during installation brings the sense of ownership and therefore a part from choosing the committee and the promoter to specifically take care of the dispenser; other community members also felt the responsibility of taking care of the dispenser is on them since they contributed as a community.

Most literature captured in this study clearly indicates different factors that influence sustainability of a project. Some factors that have been discussed includes; cost, management, needs and attitudes of the community. In the literatures, these factors have been identified as most influential for sustainability of any community project. However, these literatures do not indicate how well these factors can be best utilized to promote sustainability of any community projects. Literatures only identifies factors like cost, attitude and the needs of the community as factors that influence sustainability but they do not give any positive recommendations on what needs to be done or how these factors can be channeled towards positive and long term sustainability. Organizations should be able to know how best to engage the community and during what stages the community is supposed to be engaged. Organizations should also critically assess the needs and attitudes of the community they wish to engage in any activity since the project is always for the community, without the community there can be no projects or activities.

2.7 Theoretical framework

The theory guiding this study is the “Diffusion of Innovations”. The proponent of this theory is a sociologist by the name of Everett Rogers. This theory seeks to explain how, why and at what rate new ideas and technologies spread through cultures. Principle of this theory states that adoption of an innovation is not a single act, but a process that occurs over time. Potential adopters go through five stages when interacting with an innovation. The first stage is “Knowledge” in which potential adopters find out about an innovation and gain a basic understanding of what it is and how it works. The second stage is “Persuasion” in which potential adopters form a positive or negative impression of the innovation. It is only in the third stage, “Decision”, that the innovation is actually adopted or rejected. The fourth stage, “Implementation”, occurs when the innovation is actually used. In the fifth stage, “Confirmation”, the adopter seeks information about the innovation and either continues or discontinues use of the innovation. The Confirmation Stage might also describe the adoption of an innovation that was previously rejected (Morris, Marzano, Dandy and Brien, 2012).

This theory is applicable to this study in various ways. First, the use of chlorine in treatment of water is a new idea to help reduce water related diseases that in turn reduce death rates due to drinking unsafe water. For households to accept this new idea and be able to use it at the household level, first they need to get the basic knowledge and understanding of this chlorine and how it works. Secondly, the uses of this chlorine will therefore either form a positive or a negative impression after which they will make decision based on their impression of the use of chlorine. Based on the impression, the households can either decide to adopt or reject the use of chlorine at the household level. If they accept to use the chlorine in treating household water then it means they are confirming the use of chlorine which is a new idea. Secondly, for any new idea to be fully adopted, in this case the chlorine project, then full participation of the community members must be considered. The project in question must have a positive impact on the community and must also take into consideration the community’s culture. It must respect the culture of that particular community.

For sustainability of any project in any region, the owners of the project must have the long term goals and objectives and ensure necessary measures are in place for any inconveniences that might hinder the project. Personal initiative is very important for sustainability of any project. Without the local community accepting and taking ownership of

the project, it becomes very difficult for the project to be sustained within that area. This narrow down to their understanding of the project and the benefit it will bring to them as the uses. Full understanding of the project and its benefit to the local households within the community has an impact on the whether the project will continue after it has achieved its objective or not. Most projects always have a good course, however, they are never sustainable after the closure of the project and this is because the communities lack the sense of ownership of that particular project. The local community's needs are a very important factor to be analyzed before coming up with a project in any area. The owners of the project must ensure that the project idea is targeting the needs of the local community. A community will only get involved in a project if it directly meets their local needs and this is the only motivating factor to the community to take ownership of the new project idea (Suerrissen, 2007).

2.8 Conceptual framework

The figure below shows a self-conceptualized framework that will be used for this study.

Independent variable

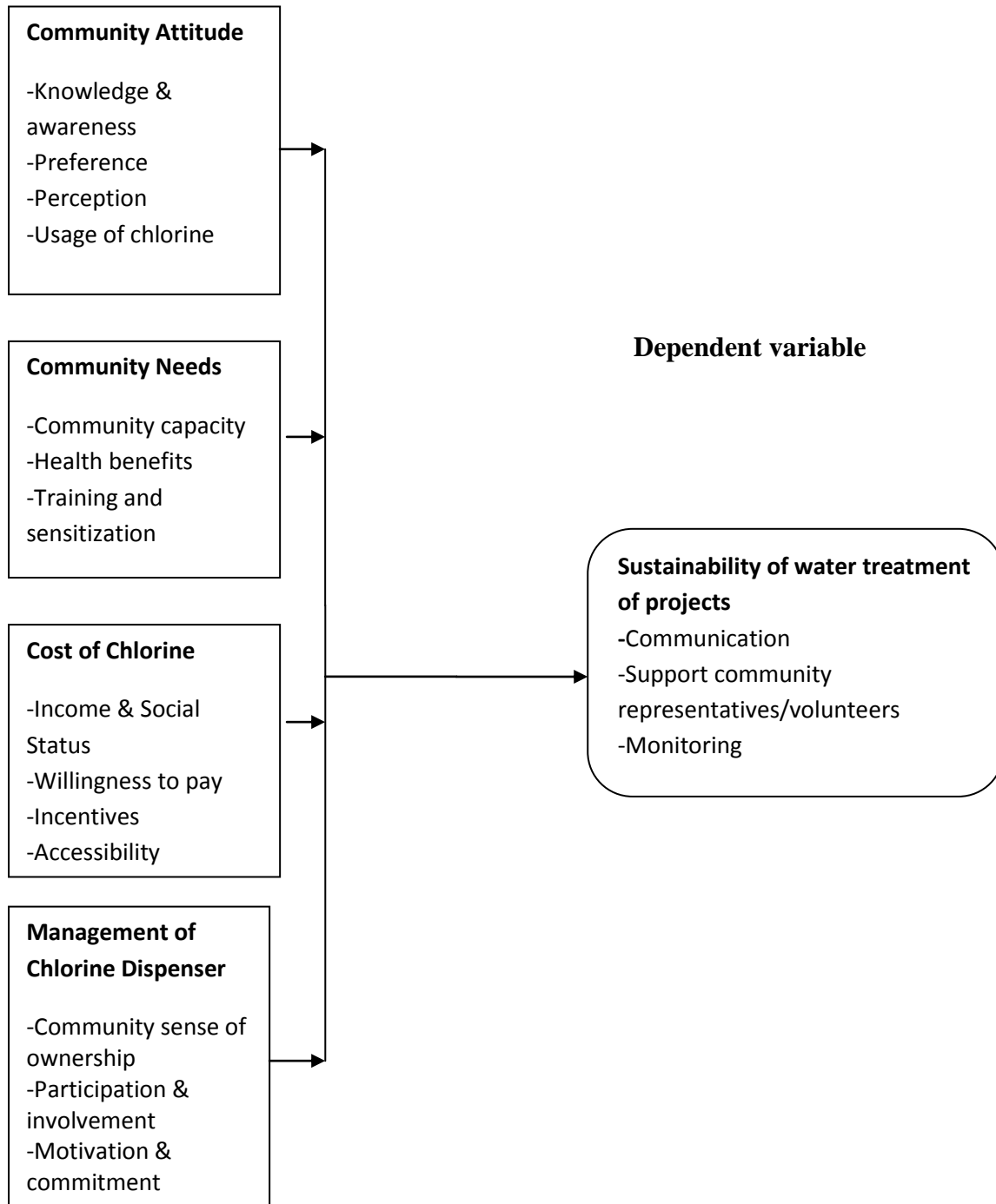


Figure 2.1 Self conceptualized framework showing relationship between variables

It reflects the concept sustainability of IPA's chlorine project for water treatment. The components which have been conceptualized as independent variables includes: Community attitude whereby the knowledge that people have on chlorine will determine their perception and preference on using chlorine. Others also use chlorine for other purpose apart from drinking water. For any project to be sustainable it must be able to meet the immediate needs of the community and identify local community capacities. Project owners should also ensure sensitization and training to the community members to ensure they clearly understand various benefits associated with the project. Income and social status together with the willingness to pay within the community member narrow down how cost of a product or a project influences sustainability of any project. Lastly, community participation and involvement together with motivation and commitment should be given more weight for sustainability of any local project within the community. Leadership and management encourage ownership at the local level hence longer life of a project.

The independent variable for the study which is the sustainability of water treatment projects interplays with intervening variables like the policies that are put in place. How these policies are implemented and enforced matters and this to some extent affects local projects either positively or negatively since the project owners can do very little about the nation's policies. Cultural norms and behaviors is also a factor that has an impact on any project sustainability within the community although the project owners and staff cannot manipulate and just have to understand various community cultural behaviors and respect them.

2.9 Summary of literature

Literature capture on this section has touch on the sustainability of Innovations for Poverty Action's chlorine project for treatment of drinking water. It explained briefly about the organization and the project. Secondly, this literature also talked about community attitude and explained how people's attitude influences the sustainability of chlorine project in treatment of water. Community needs is another variable that this literature did talked about. On community needs, it is important for any project to meet the immediate needs of the community for it to be sustainable for a longer period. Fourth, is how cost of chlorine influences the sustainability of IPA's chlorine project for water treatment within the community. Lastly, this literature tried to explain how management of the chlorine dispensers contributes to the sustainability of the chlorine project for treatment of drinking water. This literature did come up with a theoretical framework for the study and lastly it constructed a conceptual framework showing the relationship between the variables.

Despite the contribution from different scholars in this literature, they did acknowledge that most projects are never sustained not because the project owners do not know what is supposed to be done, but it is because of laxity during the project life cycle. Most literatures touch on how community involvement can influence sustainability of a project but leaving out on the project owners, that is, on what best they can do to ensure sustainability apart from just funding and overseeing the whole project. They dwell so much on the community involvement and therefore overlooking on other important factors that can also be considered.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the research procedure and techniques that was used in the study. It describes the research design, target population, sample size and sample selection. It also describes the procedure for application of research instruments, data analysis technique as well as ethical issues in research.

3.2 Research Design

The study adopted descriptive survey research design with both qualitative and quantitative approaches. Descriptive survey design is a method of collecting information by interviewing or administering questionnaires to a sample of individuals hence suitable for extensive research. It is an excellent vehicle for the measurement of characteristics of large population (Orodho,2003).It maintains a high level of confidentiality, it is convenient and enables data to be collected faster, enables questions to be asked personally in an interview or impersonal through a questionnaire about things which cannot be observed easily. It also gives the study an opportunity to get accurate view of response to issues as well as test theories on social relationship at both the individual and group level (Kothari, 2003).Descriptive design was appropriate for the study because it enabled the collection and analysis of both qualitative and quantitative data. On quantitative approach the study used the close ended sections of the questionnaires to collect data on the factors influencing sustainability of Innovations for Poverty Action’s chlorine project on water treatment. The overall goal of quantitative research is to develop generalizations that enable the researcher to better predict, explain, and understand some phenomenon. Qualitative researchers attend to the experience as a whole, not as separate variables. The aim of qualitative research is to understand experience as unified. In this context events can be understood adequately (Fielding and Pillinger, 2008). On the qualitative side, the study employed the open-ended sections of the questionnaire to collect data on the same parameters

3.3 Target Population

The study was conducted in Rachuonyo South District, Homabay County. Rachuonyo South District has two administrative divisions Kasipul and Kabondo Divisions. The study targeted a total of 68, 152 households (NCAPD 2005). The target population is the group or

the individuals to whom the survey applies. In other words, you seek those groups or individuals who are in a position to answer the questions and to whom the results of the survey apply (Lawrence & Kitchenham 2002).

3.4 Sample Size and Sample Selection

This section describes sample size and sample selection that was used in this study.

3.4.1 Sample Size

The study used a sample size of 382 households that were drawn from all selected households. According to Kregie and Morgan (1970), a population size of 68, 152 uses 382 respondents as appropriate target population. Therefore, the researcher administer a survey questionnaire to the 382 head of household or any appointed representative to provide information (see appendix 5).

3.4.2 Sampling Technique

Sampling technique is the actual procedure followed to obtain the individual members of the sample to represent the population. This study employed probability sampling techniques. Under probability sampling, the simple random sampling technique was used to identify respondents. Simple random sampling is used when a researcher has an accurate population frame, which is sequentially listed. The three hundred and eighty two (382) households was used as a sample for this study which chosen through the simple random sampling method. The simple random sampling technique was selected for this study since it is the best when generalizability of the findings of the study to the whole population. In this case, the findings from this study were able to be generalized to all households within the district (Sekaran, 2010). In statistics, a simple random sample is a subset of individuals (a sample) chosen from a larger set (a population). Each individual is chosen randomly and entirely by chance, such that each individual has the same probability of being chosen at any stage during the sampling process, and each subset of k individuals has the same probability of being chosen for the sample as any other subset of k individuals. Therefore, each household in the district had an equal chance of being selected as a subject (Rumsey, 2010). The researcher got a list of all households from the Kenya National Bureau of Statistics (KNBS) Office. This list of households that represented 68, 162 households was used as the sampling frame. Once the list was acquired, the researcher used a randomization table to select participating households.

3.5 Research Instruments

The study used questionnaires as the main data collection instrument and observation schedule. The Research Questionnaires was administered to the 382 randomly sampled household head. The questionnaire was organized into five sections namely Background Characteristics on the households as section (a), the next section (b) contained questions regarding objective one which is peoples' attitude on the use of chlorine. Section (c) had questions regarding community needs and section (d) had questions on cost of chlorine. Lastly, section (e) which contained questions on management of chlorine dispenser. Efforts were made to ensure that all the objectives are addressed and information accurately collected. The questionnaire had both closed and open ended questions which were administered to the household head.

3.5.1 Pilot Testing

This study conducted a pilot test in thirty eight (38) households in line with the opinions of Mugenda and Mugenda (2003), who propose that a researcher should use a tenth of the sample with homogenous characteristics for the study to pre-test their research instrument. This therefore means that, a tenth of a sample is the best representation for pilot and that is why this study used 38 households for pilot from Kadongo village in the neighboring District, Rachuonyo North District. This number was selected purposively to reflect the same characteristic as targeted population. The village was considered for pilot testing because they are situated in the neighboring District. For this reason the respondents from the neighboring District most likely display similar characteristics as the actual study respondents. Pilot testing is an important step in research process because it reveals vague questions and unclear instructions in the instruments. It also captures important comments and suggestions from the respondents that enable the researcher to improve on the efficiency of research instrument. The process of pilot testing commenced by the researchers identification and training of (5) enumerators. As part of training, the researcher guided enumerators to understand the context of the questions in the questionnaires. Questions were precise and concise to enhance validity of the instrument. The researcher ascertained the validity of the instrument by studying responses to the questions by the respondents to determine that they got the same meaning out of the questions.

3.5.2 Validity of the instrument

Validity is concerned with the meaningfulness of research components. When researchers measure behaviours, they are concerned with whether they are measuring what they intended to measure (Golafshani 2003). Dooley (1996) further defines validity as the extent to which the study instruments capture what they purport to measure. The validity of the instruments was ascertained by conducting a pilot study. This ensured that the instructions are clear and all possible responses to the questions were captured as a way of checking content validity. Content validity of a measuring instrument is the extent to which it provides adequate coverage of the investigative questions guiding the study (Mugenda, 2003). The researcher discussed the contents of qualitative data with the supervisors before conclusions and generalizations were made in order to sustain content validity.

3.5.3 Reliability of the instrument

According to Sekaran (2006), reliability of a measure indicates the extent to which it is without bias and hence ensures consistent measurement across time and across the various items in the instrument. Reliability is the extent to which measurements are repeatable, that is, when different persons perform the measurements, on different occasions, under different conditions, with supposedly alternative instruments which measure the same thing (Golafshani 2003). In sum, reliability is consistency of measurement or stability of measurement over a variety of conditions in which basically the same results should be obtained. This means that reliability refers to how consistent a research procedure or instrument is or a measure of degree to which research instruments yields consistent results or data after repeated trials. The test re-test method was used to assess the reliability of the instruments. This involved administering the same questionnaires twice to the (38) respondents in Rachuonyo North District during pilot testing and correlating their responses independently with the aim of identifying any inconsistency. There was also the use of triangulation where one question was asked in two different ways but with the aim of obtaining the same answer.

3.6 Data collection procedures

In order to collect data from the targeted respondents, the researcher obtained an introductory letter from the University of Nairobi and a permit from the National Council of Science and Technology. The researcher trained (5) research assistants who proceeded to

collect the data. The research assistants were those who have completed secondary education. The training included: understanding the questionnaire, the respondent sampling, interviewing skills, data collection techniques, data recording and ethical considerations. The Primary data was sourced through administration of questionnaires. The individual questionnaires was administered to 382 households within Rachuonyo South District and questionnaires were collected immediately after being filled by the respondents. To ensure a high response rate, the researcher explained the purpose of the study to the respondents, made questions precise and concise, clarified difficult questions and assured participants of total confidentiality.

3.7 Data analysis techniques

Data analysis is the process of systematically searching and arranging field findings for presentation (Bogdan and Bilken, 1992). It involves organizing the data, breaking the data into categories and units and then searching for trends and patterns before deciding to report. It seeks to fulfill the research objectives and provides answers to research questions (Bryman and Cramer, 2008). For the purposes of this study, data analysis entailed field editing before bringing the instruments together in order to reduce on errors and ensure that all instruments had complete information as desired. This was followed by categorization and coding of all open ended data. The next step was entry into a preset screen, cleaning, transformation and analysis. The statistical package for social sciences (SPSS) and Microsoft Excel was used for analysis. Analysis also involved descriptive statistics and content analysis hence the researcher ran frequency distributions, percentages and means while data has been presented in tables. Qualitative data has been transcribed, organized into various emerging themes and reported narratively.

3.8 Ethical issues

The researcher adhered to the laid down ethical practices and ensured that they were observed at all the time. First, the researcher ensured that all the necessary permits are obtained from the university and the National Council for Science and Technology. In the field, the researcher ensured seeking informed consent of the participants. In this regard, the researcher requested the respondent to indicate willingness to participate in the study willingly. Prior to seeking consent, the researcher explained to the participants the purpose of the study including the information that is being sought and for what purpose.

The researcher also ensured confidentiality of the information provided by the respondents. In this case, the participants were not required to provide their identity. This ensured anonymity thus ensuring that responses cannot be directly associated with any particular respondent. Confidentiality was however not limited to the participants of the study alone. During data collection, the researcher inevitably came across privileged information. The researcher, in this regard, ensured that privacy of communities and individuals is well respected.

During the presentation of findings, the researcher ensured that information gathered is accurately put across as provided by the respondents in the study. The researcher ensured that she did not take responses provided by the respondents out of context.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION, INTERPRETATION AND DISCUSSION

4.1 Introduction

This chapter presents and discusses research findings under thematic subsections in line with the study objectives. The sub themes include Questionnaire return rate of the study, demographic characteristics of respondents, sustainability of Innovations for Poverty Action's chlorine project, community attitude and sustainability of chlorine project, community needs and sustainability of chlorine project, cost of chlorine and sustainability of chlorine project and finally management of chlorine dispensers and sustainability of chlorine project.

4.2 Questionnaire Return Rate

This section presents the questionnaire return rate for the different categories of respondents that were targeted during the study. Quantitative primary data was obtained through administering questionnaires to head of households from Rachuonyo South district Homabay County. This data was collected by research assistants who directly administered questionnaires to respondents. The study targeted a total of 382 respondents. A total of 400 questionnaires were disbursed for data collection. Additional questionnaires were used in anticipation of errors so as to obtain 100% response rate. The questionnaire return rate was high because the researcher ensured that the respondents had been sensitized prior to administration of the questionnaires. The questionnaires were then administered and collected on the same date from the same date by the researcher.

4.3 Demographic Characteristics of Respondents

This section presents data on demographic characteristics of three categories of respondents that were identified. The demographic characteristics that were considered in this section included head of household, age, gender, level of education, and occupation. This gave deeper insight on understanding the relationship between variables under study.

4.3.1 Distribution of respondents by household head

The questionnaire was to be administered to the head of household or a representative chosen by the household head and therefore it was necessary for the respondent to be asked whether they are the head of household. This was relevant as it helps to identify how many respondents interviewed were head of households. This is shown in table 4.1

Table 4.1: Distribution of respondents by household heads

N=382

Household head	Frequency	Percentage
Yes	218	57.1
No	164	42.9
Total	382	100

According to table 4.1. Majority of the respondents 218 (57.1%) indicated that they were the head of household and 164 (42.9%) were representatives chosen by the head of household. This is in line with Cagatay (2000) who indicate that in local communities most houses are headed by someone who has authority over the family and make decisions pertaining to that family.

4.3.2 Distribution of respondents by age

The respondents were asked to give out their respective age brackets from the options that were availed to them to choose from. This was crucial in determining the age of the respondents as it is stated in the constitution that a certain age bracket qualifies one to be an adult that is eighteen years and above. This is shown in Table 4.2

Table 4.2: Distribution of respondents by age

N=382

Age	Frequency	Percentage
18-30	193	50.5
31-43	166	43.5
Above 44	23	6.0
Total	382	100

Table 4.2 revealed that 193 (50.5%) are of between the age of 18-30, 166 (43.5%) are of age between 31-43 and 23 (6%) are of 44 years and above. This indicated that most of the

household head within Rachuonyo South district are either at their early or middle age which is considered as the most productive age. They are of legal age and therefore mature and able to make independent decision on the use of chlorine within that household. This is in line with findings of Wasula (2000) who found out that age influenced adoption in that younger household head are more inclined to adopt new practices.

4.3.3 Distribution of respondents by gender

The respondents were asked a question based on their gender. The researcher sought to establish whether they were male or female. This was relevant as it could give insight on the category of respondents who were household head in relation to chlorine use. This is due concern of gender on policy pronouncements. This is shown in table 4.3

Table 4.3: Distribution of respondents by gender

N=382

Gender	Frequency	Percentage
Female	268	70.2
Male	114	29.8
Total	382	100

There were 268 (70.2%) female respondent and 114 (29.8%) male respondents. This is in line with Cagatay (2000) who indicates that among the local communities the number of women assuming role of decision making within the family is increasing as well although the men still outweighs them in numbers and in most occasions it's their responsibility to make final decisions. This affects some local African widows since the in laws assume the role.

4.3.4 Distribution of respondents by level of education

In order to determine the level of education and of household head, the respondents who participated in the study were asked to state the highest level of education attained. This was relevant as it could give insight to education level of the respondents. This is shown in table 4.4

Table 4.4 Distribution of respondents by education level

N=382

Level of education	Frequency	Percentage
No Schooling	30	0.9
Primary level	138	35.0
Secondary level	142	45.3
Tertiary/College level	72	18.8
Total	382	100

Table 4.4 revealed that most of the respondents had accessed formal education. Out of 362 Respondents, 142 (45.3%) indicated that they had secondary education, 138 (35.0%) had primary education, 72 (18.8%) indicated that they had tertiary/collage education and 30 (0.9%) indicated they had no education. This shows that at least most respondents has attained primary level of education and can therefore get access to employment and only a few percentage did not have access to formal education and therefore little chances of getting employed. This shows that education level within the region is very low which may contribute to poor adoption. However, according to Ndiema (2002) education is a significant factor in facilitating awareness and adoption of new or improved systems. High level of education enhances understanding of instructions given and also improves level of participation in community projects or activities.

4.3.5 Distribution of respondents by occupation

In order to determine the occupation of household head, the respondents who participated in the study were asked to state what they do daily to earn a living to sustain their family. This is shown in table 4.5

Table 4.5 Distribution of respondents by occupation

N=382

Occupation	Frequency	Percentage
Farmer	133	35.6
Health Technicians	10	0.9
Teacher	21	6.5
NGO/ Field work	35	8.0
Unskilled work	55	15.5
Own Business	128	33.5
Total	382	100

According to table 4.5, out of 362 respondents, 128 (33.5%) indicated that they run their own business, 133 (35.6%) are farmers, 55 (15.5%) indicated that they do unskilled work, 35 (8.0%) indicated that they work with NGOs/ Field work, 21 (6.5%) indicated that they are teachers and 10 (0.9%) indicated that they are Health Technicians. This is in line with Lingam (2005) who indicates that due to the limited level of education within the local communities, most of them do not have high profile jobs as considered to those living in towns and also have some reasonable level of income.

4.4 Sustainability of IPA's chlorine project

In order to determine sustainability of the IPA's chlorine project, the respondents were asked various questions concerning the project. This was necessary as it helps understand factors related to sustainability of a community project. For any community project to be continuous and stable, it will take both the efforts of the community members and the project owners. For example, a project can only be sustained when the communities can benefit from the project and the community can take initiative to own the project. To start with the respondents were asked to give their views on the IPA's chlorine project and different respondents had different views.

Table 4.6: Views on IPA's chlorine dispenser project

N=382

Variable	Frequency	Percentage
What is your view on IPA's chlorine dispenser project?		
Very Good	122	31.9
Good	205	53.7
No Difference	55	14.4
Total	382	100

According to table 4.6, it was revealed that out of 382 respondents 205 (53.7%) indicated that the IPA's chlorine project is good, 122 (31.9%) indicated that the project is very good and 55 (14.4%) indicated that there was no difference. This shows that a more than 50% of the respondents are excited with the project idea and only a small percentage see no difference with the existence of the project and to them the situation is still the same. This is in line with a study done by Wekesa et al (2003) who indicated that training has a great impact on adoption however, not at all times. As per the study, the respondents indicated that IPA provided sufficient education through training on the importance and usage of the dispenser. This therefore means that all of the users of the chlorine dispenser had knowledge on the dispenser, how to use it and its benefits.

Table 4.7: Project beneficial to the community

N=382

Variable	Frequency	Percentage
Project beneficial to the community		
Yes	282	73.8
No	100	26.2
Total	382	100

Despite the fact that IPA provided sufficient information to the dispenser users, others still indicate that the project is not so much beneficial. According to table 4.7, 100 (26.2%) indicate that the project is not beneficial to them and 282 (73.8%) indicate that the project is of beneficial to the community in terms of access to safe water within the community since the communal water is not very safe in terms of health. This is in line with Russell (1995) who indicated that there is a high likelihood that a project will be sustained when the community can identify the project benefits.

In another question respondents were asked if they know of any local group that IPA worked with at any time throughout the project cycle. This is shown in table 4.8.

Table 4.8: Any local group that IPA worked with

N=382

Variable	Frequency	Percentage
Do you know of any local group IPA Worked with?		
Yes	0	0
No	231	60.5
Don't Know	151	39.5
Total	382	100

According to this study, 231 (60.5%) indicate that IPA did not work with any local community groups and 151 (39.5%) indicate that they don't know whether there were any local community groups that IPA worked with during the project duration. This contradicts Swerissen (2007) that community is not likely to acknowledge the ownership of the project if local groups are not engaged. This is because it depends with the project and according to this, there is no need of engaging other local community groups since the whole community needs to be involved and according to the findings the project is successful despite not involving the local groups.

In order to determine sustainability of the project, the respondents were asked questions on continual monitoring and how often the project is being monitored by the project owners. This is important because there is that constant reminder of the project and the close contact is maintained between the community and the project owners. The respondents were

asked how often IPA do monitor their dispensers and various responses was given. This is shown in table 4.9

Table 4.9: Continual monitoring of the chlorine dispenser

N=382

Variable	Frequency	Percentage
Does IPA continually monitor the chlorine dispensers?		
Yes	288	75.4
No	94	24.6
Total	382	100

According to table 4.9, it clearly indicates that there is constant monitoring of the chlorine dispensers by the IPA. According to the study 288 (75.4%) of the respondents indicate that IPA always do come to check the usage of the dispenser and to ensure they are in good condition and maintained properly. 94 (24.6%) indicate that IPA never come to monitor their projects. This is in line with Wabwoba and Wakhungu (2013) who indicates that constant monitoring increases the success rate of a project since it shows initiative by both the project owners and the community.

Out of the 288 respondents who indicated that they are aware of IPA monitoring the dispenser projects were also asked further whether they know how frequent IPA comes to monitor the dispensers. According to the 288 (75%) had different choices on how many times the dispensers are being managed. This is important as it helps gives an insight on how frequently the projects are monitored to ensure they are safe and in good conditions to be able to continually sustain the community and therefore long term access to chlorine which translate to access to clean and safe water within the community.

This is shown in table 4.10

Table 4.10: How often does IPA monitor the chlorine dispensers?

Variable	Frequency	Percentage
How often do IPA monitor the chlorine dispensers?		
Once a year	91	31.6
Twice a year	83	28.8
Thrice a year	35	12.2
Rarely	79	27.4
Total	288	100

According to table 4.10, out of 288 respondents 91 (31.6%) indicate that IPA come to monitor the dispensers once every year, 83 (28.8%) indicate that the dispensers are being managed twice a year, 35 (12.2%) indicate thrice a year and 79 (27.4%) indicate that the dispenser project is rarely being managed. This clearly shows that at least 50% of the chlorine dispenser project initiated by the IPA should be successful and active since there is that constant check even after the project has been implemented. Continuous monitoring of the local project after the project implementation is very crucial as it contributes greatly towards project success. This is in line with Dickens and Watkins, (1999), who state that constant monitoring and getting feedback about the project highly increase the chances of the project being sustained.

Under the sustainability of the dispenser project, the respondents were asked to state if they are still using the dispenser. This was to help give an insight on how many are still using the dispenser despite the different conditions within the communities. Continuous use of the chlorine dispenser after the installation shows the project benefit to the community.

This information is shown in table 4.11

Table 4.11: Does the community constantly use the chlorine dispensers?

N=382

Variable	Frequency	Percentage
Does the community constantly use the chlorine dispensers?		
Yes	256	67.0
No	126	33.0
Total	382	100

According to table 4.11, 256 (67.0%) are using chlorine dispenser and this means that they have an access to safe and clean water while a good number of 126 (33%) because of various reasons no longer use the dispensers to get access to the chlorine. This means that despite the fact that the project has been a success and stable with the evidence of 67.0% still using the dispenser; some community members have stopped using the dispenser. Out of those 126 (33%) who have stopped using the chlorine dispenser have various reasons why they no longer use the chlorine. Out this number 38 (9.9%) indicate that they no longer use the chlorine because they can't get access to the chlorine anymore from the shops. There are specific shops that used to stock the chlorine for refill but unfortunately due to one reason or another either the shops closed down or the shopkeeper stopped bringing the chlorine. The other group 87 (22.8%) indicate that they no longer use the chlorine dispenser due to lack of community commitment and cooperation. This is in line with Swerissen, (2007) who state that the project can't be sustained when there is laxity on the side of the local community especially if they are not committed and cooperative enough towards maintain the project.

4.5 Community attitude and sustainability of water treatment projects

Community attitude in most occasions has been associated with the visual and physical appearance. Community attitude towards a project greatly influenced the success of any local community project. This project sought to understand community attitude with regard to using chlorine, because of this various questions were asked based on factors that influence community attitude. Different people within the community has different attitude on

chlorine and this is based on their views on chlorine both as an individual and as a community. To start with the respondents were asked to give their views on the quality of water they are using at home. This information is shown in table 4.12

Table 4.12: Respondents views on water quality

N=382

Variable	Frequency	Percentage
Views on water quality		
Bad	50	10.5
Good	95	20.2
Average	130	39.0
Excellent	107	30.3
Total	382	100

According to table 4.12, 130 (39.0%) indicate that their water that they normally use is average in terms of clean water, 107 (30.3%) indicate that the water is excellent, 95 (20.2%) indicate that their water is good and 50 (10.5%) indicate that their water is bad. Based on the findings it clearly shows that most respondents believe that the water they normally use is clean if not very clean and only a few states that their water is not clean and not good for use before treating. This is in line with findings of Odenya et al (2008) who found out that community attitude can influence adoption either positively or negatively. This is because if the community members believe that their communal water is safe it becomes a challenge to convince them to use chlorine in treating the same water and if they believe otherwise, then they will comfortably adopt the use of chlorine in treating their water.

The respondents were asked to indicate whether they use chlorine at home or not and for those who are not using the chlorine in treating their water were asked to indicate the method they use in treating their water and give their reason for the preferred method. This is to give insight on those who make use of the chlorine dispenser and their attitude towards chlorine in general in treating their drinking water at home either at point of consumption or point of collection.

This is shown in table 4.13

Table 4.13: Chlorine usage at home

N=382

Variable	Frequency	Percentage
Chlorine usage at home		
Yes	285	74.6
No	97	25.4
Total	382	100

According to table 4.13, 285 (74.6%) indicate that they are using chlorine at home in treating their drinking water and 97 (25.4%) indicate that they do not use chlorine in treating their drinking water. This is in line with UNICEF (2006), who indicate that most people have greatly adopted the use of chlorine in treating their water at the household level has been the aim of many organizations including the government of Kenya and other governments in order to reduce to a greater percentage if not completely eliminate diseases and death that is water related like diarrhea, dysentery among others. Out of the 97 (25%) who indicated that they do not use chlorine in treating there drinking water were asked which method they prefer and reasons why they prefer the chosen method. This is to give an insight on the other most preferred method of treating water and their reasons. Out of the 97 who indicated that they do not use chlorine, 95 of them indicate that they do not do anything to their water, that is, they do not treat their water and only 2 of them boil their water of all other treatment methods.

This is shown in table 4.14

Table 4.14: Treatment method and Reason why

Treatment method	Reason for preferred treatment method (%)				Total
	Because the water is clean	Easy method to use	Trust this method		
None	100	0	0		100
Boiling	0	50	50		100
Solar Disinfection	0	0	0		0
Filter	0	0	0		0

According to table 4.14, out of the 95 (100%) who indicate that they do not use any method to treat their drinking water believe that the water is clean and for the 2 (100%) that boil the water, 1 (50%) indicates that the it is the easiest method to use and the other (50%) indicate that they trust the method of boiling water. This is in line with the study done by Birgit et al (2006), who in their study done in rural parts of Kitui more than 60% boil water and this is because they still prefer this method and used to this method since it has been used for quit a long time before the advanced technological methods like filtering, chlorination amongst others and also because of the fact that they reside in the rural areas and are not exposed.

The respondents were also asked their perception on chlorine and the reason for their response. This is to give an insight on how people perceive chlorine as a water treatment method and based on this different respondents gave their responses.

This is shown in table 4.15

Table 4.15: Perception on chlorine

N=382

Variable	Frequency	Percentage
Perception on chlorine		
Good	261	68.3
Average	76	19.9
Bad	45	11.8
Total	382	100

According to table 4.15, out of 382 respondents 261 (68.3%) indicate that to them chlorine is good, 76 (19.9%) indicate that their perception on chlorine is average and 45 (11.8%) indicate that chlorine is bad. This in line with Nagata et al (2011), who according to their study done in Guantamala more than 70% of the community members have a positive attitude towards chlorine and only a few are of the contrary oppinion. In addition to this the respondents were asked to give their reasons as to why they gave out their perceived idea on chlorine. This is because perception is dependent on what idea the community. The respondents gave out various responses based on their knowledge and the information is provided in table 4.16

Table 4.16: Reason for the perception on chlorine

Variable	Frequency	Percentage
Reason for the perception on chlorine		
Because of its taste on water	44	11.5
Chlorine is bad in the body	82	21.5
Easy to use	12	3.1
Efficient and effective method	120	31.4
Kill bacteria in the water and prevent diseases	124	32.5
Total	382	100

According to table 4.16 the study revealed that 120 (31.4%) of the respondents indicate that the reason why they perceived chlorine as a good water treatment method is because it is an efficient and effective method of treatment. 124 (32.5%) indicate that they perceive chlorine to be good because it kills bacteria in the water and therefore prevent water related diseases, and 12 (3.1%) indicate that their perception towards chlorine is good because it is easy to use. On the other hand others perceived chlorine to be bad because of their reasons and according to the study 82 (21.5%) indicate that their reason why they perceive chlorine to be bad is because chlorine has chemical content and is not good in the human system, according to them chlorine is bad for consumption especially when it is taken for a longer period of time. 44 (11.5%) of the respondents perceive chlorine to be bad because of its taste in the water. They state that chlorinated water has a taste and therefore prefer unchlorinated water. This is in line with the study done by Martel et al (2000) that training the community might bring change in attitude and this explains why a good number of community members have adopted the use of chlorine. In the past, the use of chlorine has been associated with chemicals and bleaching agent and therefore, the community find it a challenge to change their long known work of chlorine especially those who perceive it to be bad believe that it can bring many complications in the body and even associate it with family planning methods. Community members believe that the use of chlorine is an idea of

the developed countries and as it has been confirmed that change is not easy and not everybody will accept change, others will resist depending on their knowledge and way of life.

On the same line the respondents were asked to give their overall satisfaction, this was to give an insight on their satisfaction level with using chlorine as a method of treating water. This is shown in table 4.17

Table 4.17: Overall satisfaction on using chlorine

N=382

Variable	Frequency	Percentage
Overall satisfaction of using chlorine		
Not satisfied	2	0.5
Fairly satisfied	45	11.8
Satisfied	86	22.5
Very satisfied	157	41.1
Do not use chlorine	92	24.1
Total	382	100

According to table 4.17, out of 382 respondents 92 (24.1%) indicate that they do not use chlorine, 2 (0.5%) indicate that they are not satisfied at all with using chlorine. With them there is no difference whether they use chlorine in treating their water or not, 45 (11.8%) of the respondents indicate that they are fairly satisfied with using chlorine, 86 (22.5%) indicate they are just satisfied and 157 (41.1%) indicate that they are very satisfied with using chlorine for treating water. This is in line with Nagata et al (2011), who states that for the chlorine dispenser project to be sustained then the community must be able to reach a certain level of satisfaction from using the chlorine dispenser. This shows that the level of satisfaction determines whether the community will use continually use chlorine in treatment of water.

Respondents were also asked to indicate how important is it to treat their water using chlorine and they were to give out their responses. This was to help identify how important is

treating water for the community members especially using chlorine. This is shown in table 4.18

Table 4.18: Importance of chlorine in water treatment

N=382

Variable	Frequency	Percentage
Importance of chlorine in water treatment		
Not important	55	14.4
Important	117	30.6
Very important	155	40.6
No difference	55	14.4
Total	382	100

According to table 4.18, 155 (40.6%) indicate that chlorine is very important in water treatment, 117 (30.6%) indicate that chlorine is important in water treatment, 55 (14.4%) indicate that chlorine is not important in water treatment and another 55 (14.4%) indicate that there is no difference whether they treat water using chlorine or not. This is in line with Birgit (2006), who acknowledge that most community members consider chlorine to be important in water treatment and only a few are not satisfied and therefore do not use chlorine in treating their water.

4.6 Community needs and sustainability of water treatment projects

The idea of access to clean and safe water has indeed been a problem in most rural areas. The idea of chlorine dispenser project was initiated with the main motive to help reduce diseases related to un- clean water within the rural areas of Rachuonyo South district especially to the young children. Access to clean and safe water has become a necessity to the rural community and because of this reason the researcher asked the respondents various questions to determine whether the dispenser project meet the needs of the community. To start with the respondents were asked to state their water source. This is shown in table 4.19

Table 4.19: Where do you collect your drinking water?

N=382

Variable	Frequency	Percentage
Where do you collect your drinking water?		
Borehole	11	2.9
Protected well	130	34.0
Spring	198	51.8
Unprotected well	48	11.3
Total	382	100

According to table 4.19, it was revealed that out of 382 respondents 198 (51.8%) indicate that they get their drinking water from springs, 130 (34.0%) indicate that they get their drinking water from protected well, 48 (11.3%) indicate that they get their drinking water from unprotected well and 11 (2.9%) indicate that they get their water from borehole. This is in line with Makutsa et al (2001), who indicate that most common communal water source is spring water, either protected or unprotected. Most of the respondents regard their water as very clean by just looking at it and therefore only a few treat their drinking water.

The respondents were also asked their knowledge on health consequences related to drinking unclean water. This is to give insight on the understanding of the community members on some of the health consequences and the risks. This is shown in table 4.20

Table 4.20: Knowledge on the health related consequences

N=382

Variable	Frequency	Percentage
Knowledge on health related consequences		
Yes	323	84.6
No	59	15.4
Total	382	100

According to table 4.20, the study revealed that 323 (84.6%) of the respondents indicate that they have knowledge on the health related consequences, 59 (15.4%) indicate that they are not aware of any health related consequence, according to them they are not aware of any threats or risks of drinking untreated water. However a bigger percentage have the knowledge on the related results of drinking unsafe water and this group will always take precaution and treat their drinking water to be able to avoid the side effects. This is in line with findings of Okoedo and Onemoleas (2009) which indicated that despite dissemination of information community members still did not adopt new technology of chlorine dispenser.

Among the group that indicated they had knowledge on some of the health related consequences were asked to identify some of those consequences that they have knowledge on. This is shown in table 4.21

Table 4.21: Health related consequences mentioned

Variable	Yes		No	
	Frequency	Percentage	Frequency	Percentage
Diarrhea	323	84.6	59	15.4
Abdominal pain	89	23.3	293	76.7
Fever	209	54.7	173	45.3
Vomit	91	23.8	291	76.2

Note: N is not equal to 382 because this was a multiple choice question

According to table 4.21, diarrhea is the most common mentioned consequence with 323 (84.6%) respondents mentioning, fever is the second most consequence mentioned by the respondents with 209 (54.7%) respondents mentioning, 91 (23.8%) respondents mentioned vomit as another consequence of drinking untreated water and 89 (23.3%) respondents mentioned abdominal pain as another consequence of drinking unsafe water. This is in line with the study of Kioko and Obiri (2012) which state that community members have the

knowledge on various consequences of drinking their communal water without treating; however some are still reluctant on treating their drinking water even with the chlorine.

The respondents were also asked on their knowledge on water related diseases. This was to give an insight on the awareness of the community members on diseases that can affect the community when they drink untreated water. The respondents gave out their responses as shown in table 4.22

Table 4.22: knowledge on water related diseases

N=382

Variable	Frequency	Percentage
Knowledge on water related diseases		
Yes	366	95.8
No	16	4.2
Total	382	100

According to table 4.22, 366 (95.8%) of the respondents indicate that they are aware of diseases that are water related, that is, diseases that come due to drinking unsafe water and 16 (4.2%) indicate that they do not know. This is in line with Kioko and Obiri (2012) who indicate that community members have the awareness on the diseases that one might suffer from by drinking unsafe water. Despite many having the knowledge on some of the diseases it is still evident that the use of chlorine is not widely adopted as seen with the chlorine project of IPA. Among the respondents who indicated that they have the knowledge were also asked to indicate some of them and various responses were captured.

This is shown in table 4.23

Table 4.23: Water related diseases mentioned

Variable	Yes		No	
	Frequency	Percentage	Frequency	Percentage
Cholera	304	79.6	78	20.4
Typhoid	300	78.5	82	21.5
Amoeba	283	74.1	99	25.9
Dysentery	158	41.4	224	58.6
Bilhazia	290	75.9	92	24.1

Note: N is not equal to 382 because this was a multiple choice question

According to table 4.23, 304 (79.6%) respondents mentioned cholera, 300 (78.5%) mentioned typhoid, 283 (74.1%) mentioned amoeba, 158 (41.4%) dysentery and 290 (75.9%) mentioned bilhazia. This is in line with Bunyi et al (2010), in their study community members are aware of the diseases associated with unsafe water and therefore they should be more cautious of their drinking water. Water related diseases cause more deaths in rural communities especially to the young children which is very expensive in terms of medication. These diseases if not detected early can cause death so quickly because of dehydration and bacteria in the body.

Identifying whether a project help meet the community needs is very important because it is one way of ensuring sustainability of a project. According to (Vergara and Ray, 2009), without carrying out a needs assessment it becomes a challenge to determine continual success of a project and this is because project owners might not be able to understand community needs and therefore will not be in a position to determine the success of a project for a longer period of time. To determine the reasons why the IPA chlorine project is fading

out the researcher tried to find out whether the project meet any of the community needs and the respondents were asked and they gave out their responses as shown in table 4.24

Table 4.24: Does chlorine meet any of your needs?

N=382

Variable	Frequency	Percentage
Does the chlorine project meet any of your needs?		
Yes	272	71.2
No	110	28.8
Total	382	100

According to table 4.24 the study revealed that 272 (71.2%) indicate that the chlorine project meet their needs and 110 (28.8%) indicate that it doesn't. Most of the respondents believe that the project help meet their needs however, over 25% still do not see how the project help meet any of their needs. This is in line with the study of Vergara and Ray (2009), who indicate that if more than 50% of the respondents acknowledge that the project help meet their needs then there is more likelihood for the project's sustainability. Among those who indicated that the chlorine project meet their needs were asked to state what kind of need and they all mentioned needs in terms of health. They all indicated that the project help improve health situation by reducing water related diseases since they get access to clean and safe water. This also reduces expense on medication within the community especially to the low income earners.

4.7 Cost of chlorine and sustainability of water treatment projects

Cost of a product is a determinant whether the users will the product or not. Bringing a new product to the consumers in most cases is always welcomed especially if the product is of quality and cheaper. The same applies to the implementation of new projects, before implementing a project it is always important to assess whether it is cost effective as compared to the normal existing cost. The chlorine dispenser project was initiated at the community level to enable the community get access to chlorine for water treatment at cheaper cost. Because of this the study sought to find out the community view on the cost of chlorine. Therefore, the respondents were asked various questions on what they think about the cost of chlorine as per the IPA chlorine dispenser project and this was their responses. The

respondents were first asked their access to IPA chlorine. This was to give an insight on the number of community members who are able to access the service. This is shown in table 4.25

Table 4.25: Access to IPA chlorine

N=382

Variable	Frequency	Percentage
Access to IPA chlorine		
Yes	284	74.3
No	98	25.7
Total	382	100

According to table 4.25 study revealed that 284 (74.3%) indicate that they are able to access the IPA chlorine at the water source and 98 (25.7%) indicate that they are not able to access IPA chlorine easily. This is in line with Bunyi et al (2010), who indicate that most people are able to benefit from the project only when they can access it and utilize fully. In some places the main water source is shared by even three villages, in those cases most village members who frequently use the water source are those who are nearer. Again other families have boreholes within their compounds and since IPA only install the chlorine dispenser at the main water source that most community use, this group is left out and to them it becomes a problem that they only visit the water source to get chlorine for use at home, therefore, some people are not able to access the IPA chlorine due to some of these reasons.

Respondents were also asked if they pay for the IPA chlorine and this was to give an insight on how many respondents pay for the chlorine and for those who do not pay are to give out their reasons why. The IPA chlorine price has been subsidized and they are getting it at a cheaper price and the research was interested to know how many will pay and how many won't pay despite the cheaper price offered.

This is shown in table 4.26

Table 4.26: Payment for IPA chlorine

N=382

Variable	Frequency	Percentage
Payment for IPA chlorine		
Yes	293	76.7
No	89	23.3
Total	382	100

According to table 4.26, study revealed that 293 (76.7%) indicate that they are paying for the chlorine and 89 (23.3%) indicate that they are not paying for the chlorine. This shows that many of the respondents are paying in order to get the chlorine and for those who are not paying there are reasons why and out of the 89 (23.3%) who indicated that they do not pay for the chlorine 56 (62.92%) of them indicate that because they do not use the chlorine and therefore cannot pay for the service that does not benefit them, while 33 (37.08%) of them indicate that IPA provide them with the chlorine for free and therefore, to them they just use the chlorine without paying. This is in line with Dubois (2010) who indicates that most people are paying for chlorine and this is because of their knowledge on the importance of chlorine. Other members will not pay for chlorine because they generally dislike the chlorine based on its taste and their general perception. For the group that were paying for the chlorine they were asked what they feel with paying for the chlorine and all of them indicated that they feel comfortable paying for the chlorine since its cheaper and they have no problem with paying for the chlorine.

The respondents were also asked their willingness to pay for the chlorine. This was despite the fact that the price has been subsidized and also for those who get the chlorine for free from the IPA. This was to give an insight on whether the community is willing to pay for the chlorine at any time without any incentives.

The responses are shown in table 4.27

Table 4.27: Willingness to pay for chlorine at anytime

N=382

Variable	Frequency	Percentage
Willingness to pay for chlorine at any time		
Willing	311	81.4
Unwilling	71	18.6
Total	382	100

According to table 4.27, out of 382 respondents 311 (81.4%) indicate that they are willing to pay for chlorine at any time and 71 (18.6%) indicate that they are not willing to pay for the chlorine at any time. This is in line with Miguel and Kremer (2009), who indicates that community members who appreciate the importance of chlorine in relation to health are always willing to pay for the chlorine at any time without being given any incentives in terms of price. In relation to this the respondents were asked whether they were being given any incentives for them to be able to get chlorine and this is shown in table 4.28

Table 4.28: Is there any incentives given by the IPA?

N=382

Variable	Frequency	Percentage
Any incentives given by the IPA		
Yes	122	31.9
No	95	24.9
Don't know	165	43.2
Total	382	100

According to table 4.28, 122 (31.9%) indicate that there is an incentive given by the IPA when they buy chlorine from them, 95 (24.9%) indicate that there is no incentives given by IPA when they get chlorine from them and 165 (43.2%) indicate that they don't know whether or not the community receive any incentive from IPA if they buy chlorine from them. This is in line with Wabwoba and Wakhungu (2013) who state that if a project is beneficial

and meet the needs of the community, then the project will be sustainable with or without any incentives from the project owners.

In relation to price the respondents were also asked to state the community's financial capacity to be able to sustain the dispenser project. This was to assess the capability of the community to continually sustain the dispenser project. This is shown in table 4.29

Table 4.29: Community financial capacity

N=382

Variable	Frequency	Percentage
Community financial capacity to sustain IPA chlorine project		
Yes	280	73.3
No/Don't Know	102	26.7
Total	382	100

According to table 4.29, 280 (73.3%) state that the community members have the financial capacity to continually sustain the IPA dispenser project and 102 (26.7%) indicate that the community has no financial capacity to sustain the dispenser project. This is in line with Marks and Davis (2012), who states that most members believe in their capacity to take initiative of a project and can sustain a project although some of them still do not believe in themselves.

The research in trying to determine the cost of chlorine and the sustainability of the chlorine dispenser project, the researcher sought the community's perception on the cost of chlorine and they gave their different views as shown in table 4.30

Table 4.30: What is your perception on the cost of chlorine?

N=382

Variable	Frequency	Percentage
Perception on the cost of chlorine		
Expensive	13	3.4
Affordable	369	96.6
Total	382	100

According to table 4.30, 369 (96.6%) of the respondents state that the cost of chlorine is very affordable and only 13 (3.4%) state that the cost of is expensive to them. This is in line with Global Scan (2009), who indicates that community members have no problem with the price of chlorine and it's affordable to them.

4.8 Management of chlorine dispensers and sustainability of water treatment projects

For the success of any community project it is important that the project owners involve the community members actively in the project (Moraa, Otieno and Salim, 2012). This will ensure that the community take complete initiative of the project and therefore, means project success and sustainability at the community level. Involving the community in any community project enables the community to have a sense of ownership of the project and they tend to give it their best and to protect it at all cost since it has become their responsibility. The research sought to investigate how and to what level the IPA involved the community members on the chlorine dispenser project, therefore, the respondents were asked to state whether they were involved in the chlorine dispenser project and at what levels they were involved and according to the study all of them indicated that at some point they were involved in the chlorine project by the IPA. This is shown in table 4.31

Table 4.31: Levels of community participation

Note: N is not equal to 382 because this was a multiple choice question

Variable	Yes		No	
	Frequency	Percentage	Frequency	Percentage
Planning	141	36.9	241	63.1
Implementation/ utilization	381	99.7	1	0.5
Decision making	128	33.5	254	66.5

According to table 4.31, in one stage or another IPA ensured that they involved the community members. During implementation/ utilization stage, 381 (99.7%) indicated that they were actively involved while only 1 (0.5%) indicate that they were not involved during

this process, 141 (36.9%) indicate that they were involved during planning stage while 241 (63.1%) indicate that they were not involved during this stage and 128 (33.5%) indicate that they were involved during decision making stage while 254 (66.5%) indicate that they were not involved during decision making stage. This is in line with the study of Park, (2006) who found out that active involvement of the local community members increase ownership and therefore sustainability of the project.

The respondents were also asked to indicate who manages the installed dispenser and this was to give an insight on how much the community has been involved in the project and their level of participation. After a project has been initiated it is supposed to be the work of the community members who benefits from the project to take the right measures to ensure that the project is a success. The success of a project is dependent on its maximum use with the beneficiaries, this means that if the beneficiaries of the project are not making maximum use of the project then there is a high possibility that the project won't be sustained for the required amount of time as per the project goal. According to the responses given it shows that management of the dispensers is left to the community members and therefore they might decide to choose themselves someone who will be responsible for the chlorine dispensers while other seek help from the IPA staff to appoint for them one person who will be responsible for the dispenser and this is the same person who is to give information to the rest of the community who are not aware of the project, they call this person local promoter. This is in line with Marks and Davis (2012), who indicates that when the community members are sufficiently engaged during implementation and management then the outcome of the project will be very evident.

Apart from the local promoter there are the committee members who are also chosen to assist the promoter and also be in charge of finances and maintenance of the dispensers. According to this it therefore means that the choosing of promoter and the committee members is not the same in all the communities and therefore the respondents were asked who chooses the local promoters.

This is shown in table 4.32

Table 4.32: Who chooses the local promoter and the committee members?

N=382

Variable	Frequency	Percentage
Who chooses the promoter and the Committee members?		
IPA staff	128	33.5
Community members	206	53.9
One volunteers him/herself	48	12.6
Total	382	100

According to table 4.32 it means that 206 (53.9%) indicated that the local promoter and the committee members are being chosen by the community members themselves, 128 (33.5%) indicate that the promoter and the committee members are being chosen by the IPA staff, and 48 (12.6%) indicated that the promoter and the committee members volunteers themselves to be the ones responsible for the chlorine dispenser. This means that not all communities were given the privilege of making decisions on who is to be the promoter and the committee members while other were allowed to choose for themselves while others were allowed to volunteer themselves to be either among the committee members or to be the promoter. This in line with Lantagne and Gallo (2008), who indicates that engaging the community in the decision making and choosing their own representatives, brings out the sense of ownership.

Based on this finding the respondents were again asked whether there are any special motivation given to the committee members or the local promoter and the type of motivation given to each group.

This is shown in table 4.33

Table 4.33: Is there any special motivation given to the promoter or the committee members?

N=382

Variable	Frequency	Percentage
Is there any special motivation given to promoter and the Committee members?		
Yes	188	49.1
No	118	31.0
Don't know	76	19.9
Total	382	100

According to table 4.33, 188 (49.1%) indicate yes, that there is a motivation given to the promoter and the committee members, 118 (31.0%) indicate that there is no special motivation given either to the promoter and the committee members and 76 (19.9%) indicate they don't know if there is any special motivation given to the promoter and the committee members. This means that being responsible is dependent on the motivation given to those who receive the motivation and maybe an issue to those who do not receive any type of motivation. Out of the 188 who indicated that there is a special motivation given to the promoter and the committee members 91(48.40%) of them state that they are being given t-shirts and money while remaining 87 (46.27%) indicate that they only receive t-shirts as a motivation. This might therefore means that the promoter and the committee members' effort will only last for as long as the motivation exists and may be if there is no more of that then they might not perform as needed. This is in line with Miguel and Kremer (2009), who indicates that motivation of any kind in most occasions has been proved to be the source of hard work in most work places.

Therefore, the respondents were asked on their opinion on the commitment of both the local promoter and the committee member despite any motivation given. This was to give a clear understanding on whether the motivation has an impact on an individual's effort or not.

This shown in table 4.34

Table 4.34: Is the promoter and the committee members committed to their work?

N=382

Variable	Frequency	Percentage
Do you think the promoter and the committee members are committed?		
Yes	300	78.5
No	79	20.7
Don't know	3	0.8
Total	382	100

According to table 4.34, 300 (78.5%) indicate that the promoter and the committee members are committed to their work, 79 (20.7%) indicate that the promoter and the committee members are not committed to their work and 3 (0.8%) indicate that they do not know. This is in line with Lantagne and Gallo (2008), who indicates that when the community members are allowed to choose their own representatives or volunteer, then they will strive hard and give their best towards the project and to their members who chose them to be their representatives.

For instance in this case as shown in table 4.35

Table 4.35: Motivation given and commitment of the promoter and committee members

	Commitment of promoter and committee members			
	Yes	No	Don't know	Total
Any special motivation				
Yes	152 (80.85%)	36 (19.15%)	0 (0.0%)	188
No	114 (96.61%)	4 (3.39%)	0 (0.0%)	118
Don't know	34 (44.74%)	39 (51.32%)	3 (3.95%)	76
Total	299	79	3	381

According to the information in table 4.35, out of 188 who receive motivation, 152 (80.85%) are committed to their work while 36 (19.15%) are not despite the motivation and out of 118 who did not receive any special motivation 114 (96.61%) are committed to their work while only 4 (3.39%) are not committed to the work assigned to them. To the respondent who did not know whether there were special motivation given 34 (44.74%) indicate that the promoter and the committee members are committed to their work, 39 (51.32%) indicate that the promoter and the committee members are not committed to their work and 3 (3.95%) indicate that they do not know whether the promoter and the committee members are committed to their work. This is in line with the Hoffman et al (2013), who indicate that any community member will be actively involved in the community projects when there is a little motivation given to them either in terms of cash or kind. This will improve their commitment to their work and towards the project.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECCOMENDATIONS

5.1 Introduction

This study was designed to research on the factors influencing sustainability of IPA chlorine dispenser project. The following were summary of the findings, conclusions recommendations, and suggestions for further studies and contributions to body of knowledge.

5.2 Summary of findings

The first objective of the study was to determine how community attitude influence sustainability of IPA chlorine project. Data analysis and interpretation of responses revealed that 261 (68.3%) indicate that to them chlorine is good, 76 (19.9%) indicate that their perception on chlorine is average and 45 (11.8%) indicate that chlorine is bad. In relation to this the respondents gave out their reasons for their perception on chlorine and it was noted that 124 (32.5%) indicate that they perceive chlorine to be good because it kills bacteria in the water and therefore prevent water related diseases, 120 (31.4%) of the respondents indicate that the reason why they perceived chlorine as a good water treatment method is because it is an efficient and effective method of treatment, 82 (21.5%) indicate that their reason why the perceive chlorine to be bad is because chlorine has chemical content and is not good in the human system, 44 (11.5%) of the respondents perceive chlorine to be bad because of its taste in the water and 12 (3.1%) indicate that their perception towards chlorine is good because it is easy to use.

The respondents were also asked to state whether they use chlorine at home and also to rate their satisfaction level with using chlorine. According to the study 285 (74.6%) indicate that they are using chlorine at home in treating their drinking water and 97 (25.4%) indicate that they do not use chlorine in treating their drinking water. And on satisfaction, the study revealed that 92 (24.1%) indicate that they do not use chlorine, 2 (0.5%) indicate that they are not satisfied at all with using chlorine. With them there is no difference whether they use chlorine in treating their water or not, 45 (11.8%) of the respondents indicate that they are fairly satisfied with using chlorine, 86 (22.5%) indicate they are just satisfied and 157 (41.1%) indicate that they are very satisfied with using chlorine for treating water. This shows that the level of satisfaction determines whether the community will use chlorine in treatment of water

at home, although others also use chlorine at home but are not satisfied. Because of this, different community members develop different attitudes towards the chlorine project. To get the community's attitude towards chlorine the respondents were also asked how important is chlorine in treating their drinking water and it was revealed that 155 (40.6%) indicate that chlorine is very important in water treatment, 117 (30.6%) indicate that chlorine is important in water treatment and 110 (28.8%) indicate that chlorine is not important or that there is no difference when using chlorine in water treatment. This shows that despite the fact that others acknowledge the importance of using chlorine in treating drinking water, some still are not of the safe opinion and this will definitely impact negatively on the chlorine project by the IPA in this community.

Second objective was to assess the extent to which community needs influence IPA chlorine project and according to the study it revealed that 272 (71.2%) indicate that the chlorine project meet their needs and 110 (28.8%) indicate that it doesn't meet any of their needs and for those who indicated that it help meet their needs 100% indicated that it meet their needs in terms of health. In relation to this, the respondents were asked their main water source and the revealed that 198 (51.8%) indicate that they get their drinking water from springs, 130 (34.0%) indicate that they get their drinking water from protected well, 48 (11.3%) indicate that they get their drinking water from unprotected well and 11 (2.9%) indicate that they get their water from borehole. All the water sources indicated are not safe especially for drinking purposes although some of the community members still do not see the importance of treating their water with chlorine.

In relation to this, respondents were asked their knowledge on health related consequences and the study revealed that 323 (84.6%) of the respondents indicate that they have knowledge on the health related consequences, 59 (15.4%) indicate that they are not aware of any health related consequence, according to them they are not aware of any threats or risks of drinking untreated water. For those who indicated yes, diarrhea was the most common mentioned consequence with 323 (84.6%) respondents mentioning, fever was the second most consequence mentioned by the respondents with 209 (54.7%) respondents mentioning, 91 (23.8%) respondents mentioned vomit as another consequence of drinking untreated water and 89 (23.3%) respondents mentioned abdominal pain as another consequence of drinking unsafe water. A part from the consequences, knowledge on health

related diseases was also sought and the study revealed that 366 (95.8%) of the respondents indicate that they are aware of diseases that are water related, that is, diseases that come due to drinking unsafe water and 16 (4.2%) indicate that they do not know. Among the diseases that were mentioned include, 304 (79.6%) respondents mentioning cholera, 300 (78.5%) mentioning typhoid, 283 (74.1%) mentioning amoeba, 158 (41.4%) dysentery and 290 (75.9%) mentioning bilhazia.

The third objective was to establish the extent to which cost of chlorine influence IPA chlorine project and first they were asked their access to the IPA chlorine and the study revealed that 284 (74.3%) indicate that they are able to access the IPA chlorine at the water source and 98 (25.7%) indicate that they are not able to access IPA chlorine easily. Again they were asked whether they are paying for the chlorine or not and the following was revealed 293 (76.7%) indicate that they are paying for the chlorine and 89 (23.3%) indicate that they are not paying for the chlorine. This shows that many of the respondents are paying in order to get the chlorine and for those who are not paying there are reasons why and out of the 89 (23.3%) who indicated that they do not pay for the chlorine 56 (62.92%) of them indicate that because they do not use the chlorine and therefore cannot pay for the service that does not benefit them, while 33 (37.08%) of them indicate that IPA provide them with the chlorine for free and therefore, to them they just use the chlorine without paying.

In relation to this the respondents were asked their willingness to pay for chlorine and the study shows that 311 (81.4%) indicate that they are willing to pay for chlorine at any time and 71 (18.6%) indicate that they are not willing to pay for the chlorine at any time. The respondents were also asked on their perception on the cost of chlorine and according to the study, 369 (96.6%) of the respondents state that the cost of chlorine is very affordable and only 13 (3.4%) state that the cost of is expensive to them. The respondents were asked if there is any incentives given by the IPA especially when buying the chlorine from them and according to them 122 (31.9%) indicate that there is an incentive given by the IPA when they buy chlorine from them, 95 (24.9%) indicate that there is no incentives given by IPA when they get chlorine from them and 165 (43.2%) indicate that they don't know whether or not the community receive any incentive from IPA if they buy chlorine from them. Lastly, the respondents were asked about the community financial capacity for them to sustain the chlorine project and according to the study 280 (73.3%) state that the community members

have the financial capacity to continually sustain the IPA chlorine project and 102 (26.7%) indicate that the community has no financial capacity to sustain the dispenser project.

The fourth objective was to determine how management of chlorine dispenser influences the sustainability of the chlorine project; according to the study the promoter and the committee member were chosen in order for them to be able to protect and manage the chlorine dispensers. The respondents were asked who chooses the promoter and the committee members and the study revealed that 206 (53.9%) indicated that the local promoter and the committee members are being chosen by the community members themselves, 128 (33.5%) indicate that the promoter and the committee members are being chosen by the IPA staff, and 48 (12.6%) indicated that the promoter and the committee members volunteers themselves to be the ones responsible for the chlorine dispenser. The respondents were asked if there is any special motivation given to the promoter and the committee members for them to take care of the dispensers and the study revealed that 188 (49.1%) of the respondents indicate yes, that there is a motivation given to the promoter and the committee members, 118 (31.0%) indicate that there is no special motivation given either to the promoter and the committee members and 76 (19.9%) indicate they don't know if there is any special motivation given to the promoter and the committee members.

In relation to this, the respondents were asked to state the commitment of the promoter and the committee member irrespective of whether they get incentives of any kind or not and the study revealed that 300 (78.5%) respondents indicate that the promoter and the committee members are committed to their work, 79 (20.7%) indicate that the promoter and the committee members are not committed to their work and 3 (0.8%) indicate that they do not know. The respondents were again asked what levels of the project are they allowed to participate and according to the study, in one stage or another IPA ensured that they involved the community members. During implementation/ utilization stage, 381 (99.7%) indicated that they were actively involved while only 1 (0.5%) indicate that they were not involved during this process, 141 (36.9%) indicate that they were involved during planning stage while 241 (63.1%) indicate that they were not involved during this stage and 128 (33.5%) indicate that they were involved during decision making stage while 254 (66.5%) indicate that they were not involved during decision making stage.

5.3 Conclusion

The first objective sought to determine how community attitude influence sustainability of the chlorine project. The study concluded that a significant number of community members have no sufficient knowledge on the chlorine as a method of water treatment and therefore many still have misconceptions about the product. Because of this most community members have different attitudes towards chlorine especially when it comes to its taste in the water and therefore, this affects the uptake and sustainability of chlorine projects for water treatment that is meant to help in access to clean water.

In accessing how community needs influence the sustainability of the chlorine project, the study concluded that most communal water sources includes; borehole, well, protected and unprotected springs which due to their nature one cannot get clean and therefore, must have a way of treating the water in one way or another to prevent water related diseases. Despite the fact that a significant number of the community members have knowledge on the consequences and diseases that can be caused by drinking untreated water, a number of them still are reluctant when it comes to treating their water.

Objective three sought to establish the extent to which cost of chlorine influence the chlorine project. The study concluded that those members who understand the importance of chlorine in water treatment and those who understand how chlorine helps in terms of safe drinking water will always be willing to pay for the chlorine at any time without getting any incentives in terms of price and to them the current price is affordable. Unlike those who are skeptic about the chlorine are not willing to pay for the chlorine at any price but they can use it when given for free.

Lastly, objective four sought to determine how management of chlorine dispenser influences sustainability of the chlorine project. The study concluded that it is the community members who understand themselves and therefore, should be allowed to take the initiative of choosing themselves the people they believe can be responsible towards community projects. Again, the community members should be allowed to participate in all stages of the community project since they can be able to give an insight on where and how to go about the shortcoming of the project and this also give them the sense of ownership towards the community projects and hence ensuring sustainability of the community projects.

5.4 Recommendations

The idea of chlorine project to get access to safe drinking water is a good idea. However, IPA should ensure systems are in place to help in monitoring of the project. This is because the more frequent monitoring systems are in place, the more active and stable the project. Most community members will be more active and receptive towards the community project when the project owners are showing their commitment to the project by continuous monitoring the community project.

The government of Kenya should take the initiative of ensuring that community projects that are striving towards millennium development goals and sustainable development like access to clean and safe water are seriously supported and sustained. This can be done by coming up with policies that support such projects.

The relevant ministries and the stakeholders like the ministry of health and ministry of water should keep on sensitizing the public on the importance getting access to safe drinking water. They should provide more training and information on the importance of treating drinking water. This would enable safe water projects to be sustainable within the communities since all community members will have the necessary knowledge and the importance of such projects.

IPA, the government of Kenya and other relevant stakeholders should partner together and source for funding that will sustain the chlorine project. The more the funds a project has the long term the project. In any community projects it's all about funds and the community commitment, therefore, if there is enough funds to be able to sustain the project then the project will be able run for a longer period before it's collapsed.

5.5 Suggestions for further studies

The researcher therefore suggests that some studies be conducted in the following areas:

1. A study should be carried out to examine the extent to which cultural practices influence sustainability of community projects.
2. The same study could also be carried out in other districts of Kenya for purposes of comparison.

5.6 Contribution to body of knowledge

Table 5.1 Shows the contribution if the study to the body of knowledge. It highlights the gains to be realized from the study which will add knowledge to the present situation.

Table 5.1: Contribution to the body of knowledge

Objectives	Contribution to body of knowledge
To determine how community attitude influence sustainability of water treatment Projects in Rachuonyo South district	The study supports that positive attitude towards chlorine has led to use of chlorine however, others with negative attitude on the contrary
To access the extent to which community needs influence sustainability of water treatment projects in Rachuonyo South district	The study revealed that there must be a need to the community and any project introduced must be able to meet the needs of the community.
To establish the extent to which cost of chlorine influence sustainability of water treatment Projects in Rachuonyo South district	The study supports that different people within the community will view the cost of anything depending on their financial ability and the necessity of that particular product/ project
To examine how management of chlorine dispensers influence sustainability of water treatment projects in Rachuonyo South district	The supports that involvement of the community members at all stages of a project cycle contributes towards the sustainability of a project and it promotes the sense of ownership within the community.

3.9 Operationalization of the variables

OBJECTIVES	INDEPENDENT VARIABLE	SCALE OF MEASUREMENT	DATA TOOLS	DEPENDENT VARIABLE
To determine how community attitude influence sustainability of Innovation for Poverty Action's chlorine project for treatment of water in Rachuonyo South District	<i>Community Attitude</i> -Knowledge & awareness -Preference -Perception	Ordinal	Questionnaire	<i>Sustainability of IPA's chlorine project for water treatment</i> Communication Monitoring Support community representatives/ volunteers
To assess the extent to which community needs influence sustainability of Innovation for Poverty Action's chlorine project for treatment of water in Rachuonyo South District	<i>Community needs</i> -Community capacity -Health benefits -Training & sensitization	Nominal	Questionnaire	
To establish the extent to which cost of chlorine influence sustainability of Innovation for Poverty Action's chlorine project for treatment of water in Rachuonyo South District	<i>Cost of chlorine</i> -Income & social status -Willingness to pay -Incentives	Ratio	Questionnaire	
To examine how management of chlorine dispensers influence sustainability of Innovation for Poverty Action's chlorine project for treatment of water in Rachuonyo South District	<i>Management of chlorine dispenser</i> -Sense of ownership -Participation & involvement -Motivation & commitment	Ordinal	Questionnaire	

Table 3.1 shows how the variables were operationalized

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APPENDICES

APPENDIX I: LETTER OF TRANSMITTAL

Ojuondo Zipporah Apiyo,
P.O BOX 127- 40100,
KISUMU.

To whom it may concern,

Dear Sir/ Madam,

RE: REQUESTING PERMISSION TO CONDUCT RESEARCH PROJECT STUDY

I am a Master of Arts in Project Planning and Management student at the University of Nairobi. As part of my course, I am required to carry out a research project study. The purpose for this letter therefore is to request for permission to carry out fieldwork which will principally involve interviewing household members within Rachuonyo South District. My study topic is on *The Factors Influencing Sustainability of IPA's chlorine project for treatment of water in Rachuonyo South District*. The information provided to me will be treated with utmost confidentiality and will be used for the purpose of this study only. In case of any information or clarification, please contact the undersigned on Telephone number 0728 098 405.

Thank you very much for your co-operation.

Yours faithfully,

Ojuondo Zipporah,

Student-UON (L50/ 83559/ 2012)

APPENDIX II: HOUSEHOLD SURVEY QUESTIONNAIRE

My name is OJUONDO ZIPPORAH, a Masters student at the University of Nairobi and I am carrying out a survey to investigate factors influencing the adoption of use of chlorine within this district. Therefore, wish to kindly request for a few minutes of your time to answer the following questions below as honestly as possible by ticking or filling the space provided to the best of your knowledge. Information given will be purely for institutional development purpose and will be held in highest confidentiality. Your responses will help me in compiling my final report of my project. Feel free to ask any questions about the study.

A: BACKGROUND INFORMATION

1. Are you the head of this household?

Yes No

If No what is your relationship to the head of this household?

Spouse Daughter/Son

Brother/Sister Father/Mother

Brother/Sister in-law Cousin

2. What is the age bracket of the household head?

18-30 31-43 44-56 57-69 70 and Above

3. What is the gender of household head?

Male Female

4. What is the highest level of education of household head?

No schooling Secondary School

Primary School Tertiary/ College

5. What is the occupation of household head?

Farmer Health technician

Teacher Skilled Work

NGO/Field worker Unskilled Work

Self Employed/ Own Business Student

B. SUSTAINABILITY OF IPA'S CHLORINE PROJECT

1. What can you say about IPA's chlorine dispenser project?

Very good [] Good [] No difference [] Bad []

2. Did they provide any educational session on how to use and maintain the dispensers?

Yes [] No [] Don't Know []

3. Do you think the project benefits the community in any way?

Yes [] No [] Don't Know []

i) If yes, what kind of benefits?

.....
.....

4. Do know of any group IPA worked together with?

Yes [] No [] Don't Know []

5. Did IPA staff provide sufficient communication to the community?

Yes [] No [] Don't Know []

6. Does IPA continually monitor the dispensers after installation?

Yes [] No [] Don't Know []

7. If yes, how often do they visit?

Once a year [] Twice a year [] Thrice a year [] Rarely []

8. Does the community still use the IPA dispenser constantly?

Yes [] No []

8a. If No, What is the reason why?

.....

C: COMMUNITY ATTITUDE

1. What do you think about your water quality?

Bad [] Good [] Average [] Excellent []

2. Are you using chlorine in treating your water at home?

Yes [] No []

i) If No, which method of treatment do you prefer and why?

[] None [] Boiling
[] Solar Disinfection [] Filter
[] Distillation [] Other, Specify.....

Reason

.....

3. What is your perception on chlorine?

Good [] Bad [] Average [] No response []

i) Give reasons for your response

.....

.....

4. What is your overall satisfaction with using chlorine?

Not satisfied [] fairly satisfied [] Satisfied []
Very Satisfied [] Do not use []

5. How important is chlorine purpose in treating water?

Not important { } Important [] Very important []
No difference { }

D: COMMUNITY NEEDS

1. Where do you collect your drinking water?

- Tap/Piped Borehole Protected well
- Spring Unprotected well
- Other

2. Do you know of any health related consequences with drinking untreated water?

- Yes No Don't Know

If yes, tick all that have been mentioned, if no go to question 3

- Diarrhea Abdominal pain Fever Vomit

3. Do you know of any water-borne diseases that are caused by drinking untreated water?

- Yes No Don't Know

If yes, tick all that is mentioned

- Cholera Typhoid Amoeba Dysentery Bilhazia

4. Does treating water using chlorine help meet any of your needs?

- Yes No

i) If yes, what kind of needs?

.....
.....
.....

E: COST OF CHLORINE

1. Do you have easy access to IPA chlorine within the community?

- Yes No

2. Do you pay for the chlorine?

- Yes No

4. Is there any special motivation given to the committee members and the local promoter?

Yes []

No []

Don't Know []

i) If yes, what are they?

.....
.....

5. In your own opinion, do you think the committee members and the local promoter are committed to their responsibilities?

Yes []

No []

Don't Know []

Thank you so much for your time

APPENDIX III: OBSERVATION CHECKLIST

Chlorine products	Y or N	Comments
Water guard bottles or aqua tabs box can be seen at the household		
Chlorine dispensers at the community water sources		
Awareness initiative	Y or N	Comments
There are posters to sensitize the community on how to effectively use chlorine in treating water and importance of treating water		

**APPENDIX IV: Table for determining sample size according to Krejcie and Morgan
(1970)**

<i>N</i>	<i>S</i>	<i>N</i>	<i>S</i>	<i>N</i>	<i>S</i>
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note- *N* is population size

S is sample size

APPENDIX V: LETTER FROM THE UNIVERSITY



UNIVERSITY OF NAIROBI
COLLEGE OF EDUCATION AND EXTERNAL STUDIES
SCHOOL OF CONTINUING AND DISTANCE EDUCATION
KISUMU CAMPUS

The Secretary
National Council for Science and Technology
P.O Box 30623-00100
NAIROBI, KENYA

17th July, 2014

Dear Sir/Madam,

RE: OJUONDO ZIPPORAH APIYO - REG NO: L50/83559/2012

This is to inform you that **Ojuondo Zipporah Apiyo** named above is a student in the University of Nairobi, College of Education and External Studies, School of Continuing and Distance Education, Kisumu Campus.

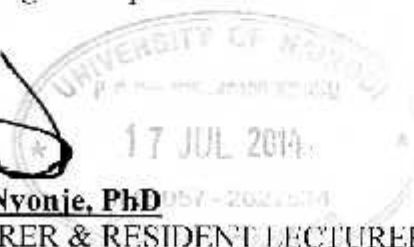
The purpose of this letter is to inform you that **Zipporah** has successfully completed her course work and Examinations in the programme, has developed Research Project Proposal and submitted before the School Board of Examiners which she successfully defended and made corrections as required by the School Board of Examiners.

The research title approved by the School Board of Examiners is: ***"Factors Influencing Sustainability of Innovations for Poverty Action's Chlorine Project for Treatment of Water in Rachuonyo South, Homabay County, Kenya"***. The research project is part of the pre-requisite of the course and therefore, we would appreciate if the student is issued with a research permit to enable her collect data and write a report. Research project reflect integration of practice and demonstrate writing skills and publishing ability. It also demonstrates the learners' readiness to advance knowledge and practice in the world of business.

We hope to receive positive response so that the student can move to the field to collect data as soon as she gets the permit.

Yours Faithfully

Dr. Raphael O. Nyenje, PhD
SENIOR LECTURER & RESIDENT LECTURER
DEPARTMENT OF EXTRA-MURAL STUDIES
KISUMU CAMPUS



APPENDIX VI: RESEARCH AUTHORIZATION LETTER



NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: +254-20-2213471,
2241349, 310571, 2219420
Fax: +254-20-318245, 318249
Email: secretary@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

9th Floor, Utalii House
Uhuru Highway
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No.

Date:

23rd October, 2014

NACOSTI/P/14/0147/2895

Ojuondo Zipporah Apiyo
University of Nairobi
P.O. Box 30197-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on *“Factors influencing sustainability of Innovations for Poverty Action’s Chlorine Project for treatment of water in Rachuonyo South District, Homabay County, Kenya,”* I am pleased to inform you that you have been authorized to undertake research in **Homabay County** for a period ending **12th December, 2014.**

You are advised to report to **the County Commissioner and the County Director of Education, Homabay County** before embarking on the research project.

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.


DR. S. K. LANGAT, OGW
FOR: SECRETARY/CEO

Copy to:

The County Commissioner
The County Director of Education
Homabay County.

APPENDIX VII: RESEARCH CLEARENCE PERMIT

THIS IS TO CERTIFY THAT: **Permit No : NACOSTI/P/14/0147/2895**
MISS. OJUONDO ZIPPORAH APIYO **Date Of Issue : 23rd October,2014**
of UNIVERSITY OF NAIROBI, 127-40100 **Fee Received :Ksh 1,000**
Kisumu,has been permitted to conduct
research in Homabay County
on the topic: FACTORS INFLUENCING
SUSTAINABILITY OF INNOVATIONS FOR
POVERTY ACTION'S CHLORINE PROJECT
FOR TREATMENT OF WATER IN
RACHUONYO SOUTH DISTRICT,
HOMABAY COUNTY, KENYA
for the period ending:
12th December,2014
Applicant's **Secretary**
Signature **National Commission for Science,**
Technology & Innovation

