

**ESTABLISHMENT OF BOREHOLE DRILLING PROJECT FOR  
SUSTAINABLE WATER SUPPLY FOR ECONOMIC DEVELOPMENT AT  
ISYESYE VILLAGE, ITEZI WARD, MBEYA CITY COUNCIL, MBEYA**

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**A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT FOR THE  
REQUIREMENTS FOR THE DEGREE OF MASTER IN COMMUNITY  
ECONOMIC DEVELOPMENT OF THE OPEN UNIVERSITY OF  
TANZANIA**

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**CERTIFICATION**

The undersigned certifies that he has read and hereby recommends for the acceptance by the Open University of Tanzania (OUT) a project entitled, establishment of water well drilling project at Itezi ward, a new residential area situated in Mbeya City for a sustainable economic development in partial fulfillment of the requirements for the degree of Master of Community Economic Development of the Open University of Tanzania.

.....

**Dr. Felician Mutasa**

**(Supervisor)**

.....

Date

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I, **Elias Manyama**, do hereby declare that this Community Economic Development project report is my own original work and that it has not been presented and will not be presented to any other university for similar or any other degree award.

.....

Signature

.....

Date

**DEDICATION**

This work is dedicated to Frida George Mwasulama (my wife), Sarah Elias, Evan Elias and Elvis Elias (my children) for the love and tolerance they showed to me all the time I was on studying, they really missed my care and support especially when I was travelling.

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## **ABSTRACT**

A dissertation on establishment of bore hole drilling project for sustainable water supply is a result of the community needs Assessments (CNA) conducted in Isyesye Village, Itezi Ward, Mbeya City council, Mbeya. The conceptual framework was tested through a survey of 65 community members, 20 males and 45 females in Isyesye area at Itezi ward Mbeya City Mbeya. The survey methodologies used were both theoretical and empirical literature review, site visit, physical observation, meetings and discussions. Questionnaire survey and interview were also conducted. Results revealed that all the respondents were facing water shortage problem and all of them were willing to contribute in cash and in kind. Various social economic problem associated with water shortage which were revealed through survey were water related diseases, high work load and burden of water to women, poor hygiene at primary schools and disturbance of carrying water from home to school and low income due to high water expenditure. The study recommends capacity building to community leaders so as to gain the skills and resources, which will enable them to mobilize the community for their own economic development. The results indicated that almost all the recourses are available at the community but the main problem is lack of mobilization among the community leaders and local government leaders. The proposal prepared as a result of this study will enable the government village leaders to emphasize the borehole construction which will supply water to community members and therefore reduce poverty and diseases in the community.

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## **LIST OF ABBREVIATIONS**

SDG	Sustainable Development Goal
UTI	Urinary Tract Infection
UNICEF	United Nations Children's Fund
EIA	Environmental Impact Assessment
CBO	Community Based Organization
SWOC	Strength, Weakness, Opportunity and Challenges
EPA	Environmental Protection Agency
DDCA	Drilling and Dam Construction Agency
NAWAPO	The National Water Policy
DED	District Executive Director
UNDP	United Nations Development Program
VLOM	Village Level Operation and Maintenance
CAN	Community Needs Assessment
CED	Community Economic Development
WEO	Ward Executive Officer
VEO	Village Executive Officer
Mbeya WSSA	Mbeya Water Supply and Sanitation Authority
UNESCO	The United Nations Educational, Scientific and Cultural Organization
DDCA	Drilling and Dam Construction Agency
MWLD	Ministry of Water and Livestock Development
NAWAPO	The national Water Policy
SWAP	Sector-Wide Approach to Planning

WHO	World Health Organization
NGO	Non-Governmental Organization
MDG	Millennium Development Goal
TBS	Tanzania Bureau of Standard



## **CHAPTER ONE**

### **1.0 PARTICIPATORY NEEDS ASSESSMENT**

#### **1.1 Background Information**

The Participatory needs assessment is also an integral part of the Higher Ground Initiative – an initiative moving Isyesye Community to a sustainable solutions which will ensure local needs are met, An integrated comprehensive needs assessment is required to help village leaders and to develop a picture of Community quality, recognize best practices, and identify possible opportunities for improvement. When a Community is being reviewed, its review is graded as follows on the needs assessment process through participation.

Community assessments can and should be more than just a gathering and analyzing of data, they can also be a basis for creating change. A community based needs assessment can help the community to address families by providing a snapshot of families in the service area and their economic well-being, educational status, health and welfare. Agencies can begin to create change either by setting a framework for programs and plans that work toward ending poverty (or helping individuals and families to move up and out) or family stabilization (helping individuals and families to stop moving down). It can provide important community information as to who may be working on issues and where gaps in community services lie. It provides an opportunity to meet and develop partnerships strengthening services for citizens in the area.

A Participatory needs assessment helps the researcher in its planning process by providing the 2 foundation for strategic operational planning, assessing if the agency/researcher is meeting the needs of the community and determining what programs or projects may have become obsolete and what programs or projects may provide new opportunities for the agency. It is the beginning of a comprehensive strategic planning process.

In carrying out this activity, the researcher decided to work with the residents of Isyesye to determine its needs. These were chosen because of a new residential area to know their needs and come up with an activity which can bring socio-economic development, if at all the community need assessment will be done accordingly.

Secondly, after discussing with Itezi LGA officials and other stakeholders within the district, it appears that this is the group that lives in area with an area with availability of abundant resources such as land for cultivation of Irish Potatoes, hills, water bodies and good climate.

Therefore, in carrying out the needs assessment exercise, the researcher applied various methods to gather data from the community, such as Focus Group Discussions (FGD), Individual key- informants, Office records, previous research reports and physical observations of events and situations. The data and information gathered enabled the researcher to prepare the community profile as well as a summary of community problems (stresses) and existing opportunities that can be utilized to solve identified problem.

## **1.2 Community Profile**

### **1.2.1 Administrative Structure**

The project is in Isyesye Village in Itezi Ward, Isyesye village is one of 36 administrative wards in Mbeya City of the Mbeya Region of Tanzania. According to the 2012 census, the ward has a total population of 18,445 people.

Mbeya City is a district of Mbeya Region, Tanzania and comprises the area of Mbeya town. It is bordered to the north by Mbeya Rural District, to the east by Rungwe District, to the south by Ileje District and to the west by Mbozi District. According to the 2012 Tanzania National Census, the population of Mbeya City was 385,479. Mbeya City is one of the 7 Councils in Mbeya Region.

Mbeya is the capital of the surrounding rural Mbeya region with a population of 2 million as per Tanzania National Census of 2012.

Mbeya is the first large urban settlement encountered when travelling overland from the neighboring nation of Zambia.

Mbeya is situated at an altitude of 1,700 meters (5,500 ft), and sprawls through a narrow highland valley surrounded by a bowl of high mountains. The main language is colloquial Swahili, and the English language is extensively taught in schools and the native languages are Nyakyusa, Wasafwa and Wandali. Local government is administered via the Mbeya City authority and a Regional Commissioner.

Mbeya City depends its water source from MBEYA WSSA. Mbeya WSSA is a fully

autonomous public water utility responsible for the overall operation and management of water supply and sewerage services in the Mbeya City. Mbeya WSSA is classified as a Class A water utility and its area of operation has a total population of 402,768. Proportion of Population Living in the area with water network is 20.1% (This is according to Tanzania National Census of 2012.). The utility draws water from surface (River - 31%) and groundwater sources (spring - 69%) with a production capacity of 51,446m<sup>3</sup> per day. Total Length of Water Network is 702.1km. The Utility has a sewerage system with a sewer line length of 102 km and sewage treatment is by waste stabilization ponds.

**Table 1.1: Quantity of Water Required For Survival**

<b>Simplified table of basic survival water needs</b>		
Survival needs: water intake (drinking and food)	2.5-3 litres per day	Depends on: the climate and individual physiology
Basic hygiene practices	2-6 litres per day	Depends on: social and cultural norms
Basic cooking needs	3-6 liters per day	Depends on: food type, social as well as cultural norms
Total basic water needs	7.5-15 litres per day	

From the above table the required quantity of water for survival is 30Litres/day which is equivalent to 0.03metres cubic per person per day. The city has a total population of 2millions which requires 60,000meter cubic per day. Looking at the discharge capacity for Mbeya WSSA is of 51,446m<sup>3</sup> per day which is equivalent to 85.7%, therefore 14.3% are not getting safe Water. The indigenous is most likely to benefit by getting water through borehole by having nearby connection to household.

### **1.2.2 Historical and Background**

In 2000 Isyesye Village in Itezi ward area was under the Indigenous people where they used to cultivate Irish Potatoes, Maize and beans and livestock keeping.

Due the increase of population and Immigrants from other region of Tanzania, in 2002 the Municipal decided to allocate plots for human settlements, most of the Government workers and some indigenous were obtained plots for settlement.

The area was not having social service like electricity, water supply and fielder roads, therefore new residents were suffering from getting social services such as getting clean and safe water for human consumption as well as getting transport from town to the village. But the major issue was unavailability of safe water for human consumption. Other issues such as electricity people use generators and solar power from Mobisol Company.

Most of the household in Mbeya City depends water supply from only one source which is Mbeya Water Supply and Sanitation Authority (MBEYA WSSA) The sewer has recently expanded through Mbeya water supply and sanitation Project Phase 1 financed by European Community and the Government of Germany through KFW Financing Institution.

The new sewerage network system has been expanded to 100 km old laid pipes with sewerage treatment facility comprises of seven waste water stabilization ponds. Out of these ponds, two are anaerobic, four are maturation and one is facultative ponds.

Both they have a volume of 129,233 cubic meter and their discharge capacity is 14,360 cubic meter per day) but as the population grows up the capacity of MBEYA UWSA becomes insufficient to fulfill the needs of their customers , therefore some areas have no enough water and Isyesye Village in Itezi ward is among of the area.

The establishment of water well drilling project through residential contribution assist to help the residents to obtain clean water hence improving their income through livestock keeping, reducing poverty and minimizing risk of epidemic diseases.

### **1.2.3 Demographic Features**

Isyesye Village in Itezi Ward has weather with enough rainfall and fertile soil which enable it to be the largest producer of maize, beans, potatoes (Irish & sweet). It is located in near to the highest peak (Mbeya Peak) the highest pick to all trunk roads across the country with an average of altitude 2961m , Longitude 33,25' and latitude of 08'35'. The peak produces waterfalls which are used for cultivation of food crops, The Ward has a free market in agricultural produce around Isyesye, and Firewood is collected by women and girls, from the wooded valleys of Mbeya Peak and mountainsides. Bamboo is naturally abundant in the forests, and there are plans to teach local people about this versatile plant and its many uses.

### **1.2.4 Ethnicity**

Ethnicity wise, the village comprises of Safwa, Wandali and Wanyakusya. The most dominant tribe in the ward is Safwa who are the native of the area. Other tribes are immigrant from neighboring wards and all over the country especially workers who

work in Government and Private Companies ,For the case of religious, the area is dominated with Christians, Muslims and few people are pagans.

### **1.2.5 Economic Activities**

The people at Isyesye Village in Itezi Ward engage in different economic activities including; farming, Livestock keeping, petty business and some residents are Government and private workers.

In arable farming food crops are cultivated by in the Ward. Food crops which are cultivated are; Maize, Sweet potatoes, Irish potatoes and beans. The Isyesye community also engages in horticultural cultivation in which vegetables (tomatoes) are produced. Irish Potatoes currently have been encouraged to be cultivated with majority. Apart from food crops the Village community engages in production of cash crops. Few people are engaged in livestock keeping and petty business.

### **1.2.6 Social Stratification**

The community members at Isyesye Village in Itezi Ward are composed of youth, men women, children, widow, widower and the children living in danger environment due to the use of unsafe water, There are 2 Primary Schools and 1 Secondary schools in which all the pupils and students respectively have no clean water for usage, they depend water from the ponds/streams for cleaning of their school uniforms.

### **1.2.7 Cultural factors**

Isyesye Village in Itezi ward community is dominated by safwa tribe, few are

nyakusya. The main language of the community is “safa” native language but Kiswahili is mostly used because some are non-indigenous people.

The Chief is the main leader of safa tribe; the chief is the one who manage the tribe and has a power of providing disciplinary action for any person who is against the tribe rule and regulations. Especially during funerals.

### **1.2.8 Education**

Isyesye Village in Itezi Ward has two Primary school, one was built by the Government and the other was built through contributions from the community members. It has one secondary school which is built at a ward level (Itezi Secondary School). Primary school and Secondary school education is emphasized in the ward is owned by the Government. The village has kindergarten and pre-primary school which helps to keep and preparing their children before entering standard one respectively as a requirement from the Government as Government circular of 2014.

### **1.3 Community Needs Assessment**

Community needs assessment for Isyesye village was conducted in order to examine the level of development in the community, to identify and assess needs and gaps in relation to available resources, opportunities that can be utilized by the community itself.

Intentionally it was conducted in a participatory way to enable identification of the real needs of the community and thereafter made interventions to the critical problem. The assessment was done based on the appropriate use of research design,



research methods in order to obtain relevant data. That assessment will help to plan strategies and interventions which would bring a desirable change.

A straight forward way to estimate the needs of the community was to simply ask residents their opinions about the development of services within the community, their satisfaction with services and what particular services are needed. Their opinions can be used in building their agendas aimed at community change that can build the capacity of community based organizations that are designed to provide resident's services and development opportunities.

The needs assessment process begins planning and organizing phase, data collection, summarizing and disseminating the needs assessment survey results and sharing results through public forums to facilitating action planning .

#### **1.4 Research Objectives**

This study aimed at collecting information and data with regards to causes and magnitude of the problem, contributing factors and community's opinion and recommendations which would equip decision makers with practical information useful for decision making process. On the other hand the study focused on helping the community members to acquire skills and knowledge in order to be able to use available opportunities to act on their own to improve their life.

##### **1.4.1 Overall Objectives**

Determining the intervention that can greatly contribute to the improvement of living standards of households.

### **1.4.2 Specific Objectives**

The community Needs Assessment intends to fulfill the following specific objectives;

- i) Identify the essential resources are already available within the community.
- ii) To examine the possibility of establishing or developing a sustainable project in the community for improvement of life standard.
- iii) To assess whether the identified project can have an impact to the improvement of life standard of people

### **1.5 Research Questions**

- i) What is the impact of the project in relation to better life?
- ii) What challenges do you think you may encounter in implementing the proposed project?
- iii) Does the community have reliable resources and opportunities for implementing the project?
- iv) What kind of business do you think are potentially, sustainable and economically viable?
- v) To what extent do the people at Isyesye Village in Itezi Ward community are aware of getting safe water for their income earning?

### **1.6 CNA Research Methodology**

During the selection of research method, the researcher considered the situation and conditions of subjects or respondents, time available, the quickest way to obtain data, and resources available for the study on bore hole drilling project. Therefore, a cross-

section research design was chosen to compute data obtained from data collection methods and tools were then developed. The research design was opted because data from different respondents were collected at a single point in time (households). The methods, tools and instruments had to be systematic, valid, reliable neutral and objective.

### **1.7 Research Design**

Provided the nature of the study was explanatory study, therefore, the cross sectional design was adapted as the ideal design because this type of study uses different groups of people who differ in the variable of interest but who share other characteristics such as economic status. The reason behind this selection was that, the design allow and helped the researcher to collect various data at single point in time and data collected at once from various respondents (Jamal, 2008). In order to understand the real phenomena, self-administered direct observation were used to measure people's water accessibility and the establishing of the new project under their supervision. Both qualitative and quantitative data collected in which both secondary and primary data collected from relevant sources. Primary data collected directly from the Indigenous people from Isyesye and immigrants.

And get their complain from the meetings, by viewing the agendas of the meetings the major complain was unavailability of safe water. Therefore key indigenous people were conducted with new immigrant's people in the village, the total number of people who were engaging in this study was 65 who attend the regular meetings. Therefore, the sampling frame under this study was 79 households. The sampling

unit in this study was the individual head of household. Key informants included were, WEO (1) and VEO (1) and Mbeya WSSA Team (3people). The sample size (key informants inclusive) selected and interviewed was 65 households which is 82.3% of the sample frame (79 households)

### **1.7.1 Sampling Technique**

The survey took place in Isyesye Village in Itezi Ward. The sample size was chosen using both probability and non-probability sampling methods. Probability sampling was used to get the chance of any given individual being selected was known and these individuals were sampled independently of each other for quantitative and qualitative study. This was also known as random sampling. A researcher was simply use a random number generator to choose participants (known as simple random sampling), or every *nth* individual (known as systematic sampling) was included. Researchers break their target population into strata, and then apply these techniques within each stratum to ensure that they were getting enough participants from each stratum to be able to draw conclusions.

A total of 60 household respondents were randomly sampled from the village which comprises of 79 house hold and other (influential person and three representatives from Mbeya WSSA) using simple random sampling. The sample size used for quantitative data collection took into consideration of researcher's resources and possibility of making meaningful analysis of data collected, Also purposive sampling technique was used to select potential respondents who were conversant to the topic, who comprised of WEO(1), VEO(1) and 3 experts from Mbeya WSSA making a

Total of 65. The Number of household around Isyesye Village is 79 based on the Ward report on August 2017; the census was taken during the meeting with Mbeya WWSA to determine the number of house hold which is in the need of obtaining clean water. Therefore the sampling technique used was roundly sampling to look at the number of household, the selected household were asked some questions and responded as per above details.

### **1.7.2 Data Collection Method**

Methodology of data collection was used to acquire information from different levels being primary and secondary information, primary data was collected from the community through various data collection tools such as focus group discussion, interview, observation and questionnaires. Secondary data information was delivered from different sources being District Planning Office, Community Development Department, Ward Office, Village Office, National farm, Research institute, Journals and National Bureau Statistics of Tanzania (NBS).

### **1.7.3 Direct Observation**

The researcher observed a particular issues, such as the number and location of water sources, their condition and intensity of use, what parents do when their children defecate on the ground etc.

A sanitary survey to assess the likely risk of contamination of a water source and measures needed to reduce that risk. This was perhaps the most useful in carrying out first phase assessments by using checklists.

Also a researcher passed through a household and observe if have MBEYA WSSA water by observing pipes connections, and also schools children where they clean their clothes in a stream water were observed and photographed.

#### **1.7.4 Interview Method**

Interviews were used to collect detailed information about specific issues, which cannot be gathered by simple observation. For instance, many practices to do with hygiene were not easy to observe, as they are carried out in private when possible. Interviews were more structured, depending on the sort of information to be collected and how it was to be interpreted and presented. Interviews were held with:

**Key informants:** - to gather information rapidly on a particular topic, such as the location of wells, seasonal variations in surface water levels or common practices regarding defecation. There was always a risk that the information was unreliable because of the possible personal interests or perspective of the informant, and their information should be verified. Key informants were often people who speak the language of the field worker or who were easy to approach for other reasons, and they were very unrepresentative of the general population.

**Formal Leadership Structures:** - to gather information about community structures and to encourage participation in programme implementation. Formal leaders was not representative of the general population and was not have the population's interests at heart. Again, verification was necessary.

**General Groups:** - Helps to gather general information about how the disaster had affected people and what their intentions and ideas regarding the availability of water in Isyesye Village.

**Focus Groups:** - These were groups of people with a particular interest in the topic on which information was sought, or whose views were otherwise not noticed in the collection of information on a more general level. For instance they were a group of people collecting water, or a group of children, or a group of women at an antenatal clinic, who may have particular needs or preoccupations.

**Households and individuals:** - Helps to ask about access to water supply and sanitation services and resources and hygiene issues at the household and individual level. Household interviews were used to gather detailed information by the use of a checklist with in-depth discussions, or were the basis of household surveys, where a large number of households were visited. Household visits were also an opportunity for visual inspection of toilets, water storage and use, food hygiene.

## **1.8 Community Needs Assessment Findings**

The findings from the CNA in Isyesye village are presented below based on the method and type of data collection. Gathering of information using the questionnaire the researcher prepared fifty questionnaires but managed to collect only forty. The findings from the questionnaire show the respondents sex, age, level of education, occupation, monthly income and level of fulfillment of basic needs.

Thereafter, follows the general overviews on economic activities. Qualitative data collection involved 79 interviewees who provided information through Focus Group Discussion and key informants.

The findings which are discussed under this chapter have based on the respondents interviewed. The CNA at Isyesye Village involved 60 respondents selected randomly from the 79 household in the Village and 5 key informative from VEO, WEOs office and 3 Key informative from Mbeya WWSA which is 82% of the entire populations.

**Table 1.2: Age of Respondents**

<b>Characteristics</b>	<b>Frequency</b>	<b>Percentage</b>
<i>From Household</i>		
Male	18	27.7 %
Female	42	64.6 %
<i>From Key informative</i>		
Male	3	4.6 %
Female	2	3.1 %
Total	65	100%

Source: Study findings from Isyesye Village

### **1.8.1 Findings on Personal Particulars**

Table 1.2 indicates that 67.7% of the respondents are female and the remaining percent is the male which is 32.3% , This imply that majority of the respondents who engage in fetching water or seeking for water are female. On the other hand, male's participation in fetching water is very low (32.5%) which imply that the activity is mostly done by females.



**Table 1.3: Quantity of Water Required Per Hamlet**

			Hamlets ( Minimum number of people per household is 2)			
Purpose	According to WHO		Northern Gombe (Hs 29)	Southern Gombe (Hs 21)	lambya (Hs 19 )	Majanta (Hs 10 )
	Recommended Minimum (litres /person/day)	Range (litres /person/ day)	#people -58	#people -42	#people -38	#people -20
Drinking water	5	2 to 5	290	210	190	100
Sanitation service	20 to over 75	-----	1,160	840	760	400
Bathing	16	10 to 70	928	672	608	320
Cooking and kitchen	10	10 to 50	580	420	380	200
<b>Total Recommended BWR</b>	<b>50</b>		<b>2,958</b>	<b>2,142</b>	<b>1,938</b>	<b>1,020</b>

Source: Study findings from Isyesye Village

(Hs===Number of household)

### **1.8.2 Finding about Number of Shallow Wells Available Versus Amount of Water Required**

The interest of knowing average number of the people at one household is to know amount of water is needed for caring the member of the household. This then helps to plan on how the depth of the bore hole will be, because as it goes down it generates a lot of water. According to table 1.3 we have considered an average of 4 people at the household (2 Children and 2 parents) therefore the average was 2 people. The household with only one member is 24.6% (single ) and 9.2% (widow and divorced ) The number of respondents revealed the need for safe water to suffice the needs of all members in the household and 13.8% business man needs water for their income generating activities, For the daily total quantity of water required for the 4 hamlet which are Northern Gombe, Southern Gombe , Ulambya, Majanta are 2958Litres, 2142 Litres ,1938Litres and 1020 Liters respectively.

**Table 1.4: Education**

Characteristics	Frequency	Percentage
<i>From Household</i>		
Primary Education	11	36.9 %
Secondary Education (Form Four )	19	29.2 %
Tertiary Education ( University )	30	16.2 %
<i>From Key informative</i>		
Primary Education	0	10 %
Secondary Education (Form Four )	1	1.5 %
Tertiary Education ( University )	4	6.2%
<b>Total</b>	<b>65</b>	<b>100%</b>

Source: Study findings from Isyesye Village

### 1.8.3 Findings Based on the Level of Education

Gathering the level of education of respondents as table 1.4 above indicates, only 46.9% of respondents had primary education and 30.7% managed to have secondary education. A very small proportion of the respondents' equivalent to 22.4% had achieved a higher education. This gives picture that while creating awareness to community members, the researcher should look for alternatives to make sure those respondents who have primary education participate fully during the presentation/discussion through regular meetings.

**Table 1.5: Marital Status**

Characteristics	Frequency	Percentage
<i>From Household</i>		
Single	16	24.6 %
Married	38	58.5%
Widow	3	4.6%
Divorced	3	4.6%
<i>From Key informative</i>		
Single	0	0 %
Married	5	7.7%
Widow	0	0%
Divorced	0	0%
<b>Total</b>	<b>65</b>	<b>100%</b>

Source: Study findings from Isyesye Village

#### 1.8.4 Findings from Marital Status

Table 1.5 indicates that 66.2% of the respondents are married, 24.6% are single, widow is 4.6% and divorced are 4.6%. This implies that majority of the respondents who engage in fetching water are married women. On the other hand, female's participation in fetching water is very high 66.2% which imply that the activity is mostly done by females. This shows that most of the head of households of the intended population were females. Looking for safe water activity includes both married, widowed, divorced and widow although it has low percentage compared to married.

**Table 1.6: Occupation of Respondents**

Characteristics	Frequency	Percentage
<i>From Household</i>		
Famers	17	26.2 %
Employed	34	52.3%
Business Man	9	13.8 %
<i>From Key informative</i>		
Famers	0	0.0%
Employed	5	7.7%
Business Man	0	0.0%
Total	65	100%

Source: Study findings from Isyesye Village

#### 1.8.5 Findings from Employment/Income Generating Activities

Table 1.6 shows occupations of the respondents, whereas the majorities were employed and peasant people this is due to the fact that the village is in the township which has a mixture of farmers, livestock keepers, business people and employees. As far as occupation is concerned farmers and business people constitute 40.0% whereas farmers of agricultural cash crops like Irish potato are faced with a problem

of a reliable water source whereby many of them engage in petty business in order to supplement their income. Livestock keepers constitute 20% followed by 15% being employees in government and private sector.

**Table 1.7: Number of Shallow Wells Available**

Hamlets Visited	Functioning Shallow wells	Non-functioning Shallow wells	Capacity of Water per day /Litres / Shallow well	Total Capacity of Water per day	Number of household
Northern Gombe	5	1	260	1040	29
Southern Gombe	3	2	300	600	21
Ulambya	4	0	200	800	19
Majanta	2	1	270	270	10
<b>Total</b>	<b>14</b>	<b>4</b>	<b>630</b>	<b>2710</b>	<b>79</b>

Source: Study findings from Isyesye Village

### **1.0.1 Findings from Quantity of Water Required Versus the Available Water**

Looking at table 1.7 which shows the number of household against the number the quantity of water needed per household Likewise table 1.3 shows the quantity of water obtained from other sources that is shallow wells it is evidenced that the quantity of water received by Isyesye Village from shallow wells dug by indigenous are not adequate, without considering the quality of water and other contamination.

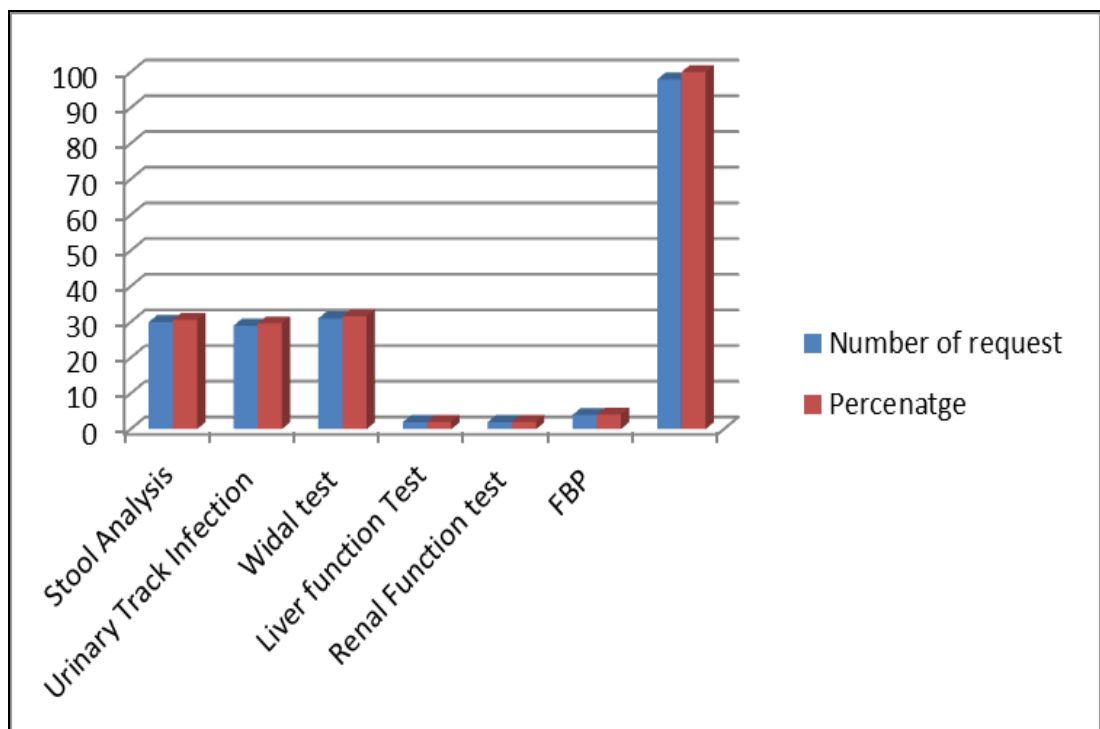
### **1.8.6 Number of Primary Schools**

The village has 2 primary schools (Gombe A and Gombe B), which was initially one school but later it was divided into two (A and B).Pupils and Teachers were interviewed through group discussion, the intention of asking the pupils and teachers was to know where they get water for daily school activities and the impact of using unsafe water for children.

**Table 1.8: Respondents from Primary Schools**

<b>Gombe A</b>				
		Number of people	Sources of water	
			Shallow wells	Mbeya WSSA
Pupils ( Std I-IV)		50	35	15
Pupils ( Std V-VII)		50	40	10
Teachers	Male	8	4	4
	Female	12	8	4
Total		120	87(72.5%)	33(27.5%)

According to table 1.8, 100 pupils and 20 teachers were interviewed, 72.5% indicates that they get water from shallow wells which was dug by indigenous people and the remaining percent indicates their sources of water is Mbeya Water and sanitation Authority , Although the 27.5% gets water from Mbeya Urban and Sanitation authority , the water supply was inconsistent. This helps the researcher to know where the schools get water.

**Figure 1.1: Clinical Diagnosis**

### **1.8.7 Findings from Clinical diagnosis for nearby health Centre**

The researcher went deeper to ask the respondents (pupils) regarding the health status in terms of abdominal pain as they use water wells for drinking, about 50% of the 72.5% agree positively of abdominal pain experienced for drinking unsafe water.

Getting the clinical status is to know how much people are affected for using unsafe water which is obtained from the nearby indigenous wells.

### **1.9 Community Needs Prioritization / Leveling of Need**

The community in Isyesye Village through focus group discussion, key informative and individual interviews had a list of IGA identified during CNA. Table 1.9 below show the way ranking the bore hole drilling became the first proposed project whereas the second followed by Movement of domestic animals within the village. After the prioritization exercise the researcher realized that, the three activities (1, 2&3) are interdependent. Meaning that establishing the bore hole drilling project should go hand in hand with other actions being to minimize movement of animals by providing safe water for animals at home and creates some employment for young people by selling water.

**Table 1.9: Prioritization of needs**

<b>S/No.</b>	<b>Human and service Issues identified</b>	<b>Ranked</b>	<b>Suggestion from House hold group</b>
1	<b>In adequate supply of clean and safe water for human consumption</b> - Mbeya Water and Urban Authority not managed to supply water due to low pressure of water	1 <sup>st</sup> ranked	Contributions from each household for installation of system to enable them get access to safe and clean water for daily consumption
2	<b>Movement of domestic animals within the village.</b> - Domestic animals includes (Goats, Cows and Chicken)	2 <sup>nd</sup> Ranked	Isyesye Village leaders to develop a team of young people to catch and send them to village office for paying a penalty.
3	<b>Employment</b> - Employment includes available resources for the unemployed and under-employed, career training and job opportunities, barriers to gainful employment, and recommended suggestions.	3 <sup>rd</sup> Ranked	Publicity of job opportunities, training programs, industry expansion, and other resources available to the unemployed and underemployed through – Presentations or distribution of information to civic clubs, churches, fairs, etc. can increase the availability of all employment services.
4	<b>Transportation</b> - Public transportation services that are currently available in Isyesye Village their benefits and limitations, and made several recommendations for providing additional public transportation services.	4 <sup>th</sup> Ranked	Due to a new residential site , Daladala in Mbeya does not reach in this place, One suggestion is whether it would be possible for transportation Council to expand their services and make them accessible to low-income and elderly people who are not DSFC clients

### **1.10 Conclusion**

Chapter one has dealt upon participatory assessment which is an ideal and effective way of involving the community to identify their own problems, causes of the problem and existing opportunities. The findings have been useful in enabling the community to identify top ranking problem and planning for the interventions that can sustainably address the existing problem.

The participatory needs assessment conducted in Isyesye village revealed an adequate water supply as well as unsafe water is the major concern in the community. From this study the community members came to agree that bore hole drilling will contribute to the improvement of socio-economic status



## CHAPTER TWO

### 2.0 PROBLEM IDENTIFICATION

#### 2.1 Background Information

Sustainable Development Goal (SDG) target 6.1 is to “*achieve universal and equitable access to safe and affordable drinking water for all by 2030*” (UN, 2015). With its emphasis on universality, the SDG target is a momentous shift from the Millennium Development Goal (MDG) target to “*halve, by 2015, the proportion of the population without sustainable access to safe drinking water*” (UN, 2015a; JMP, 2015).

In 20 out of 44 countries in the West, Central, East and South of Africa, less than 60% of rural dwellers use an improved water supply (JMP, 2015). Achieving universal access in countries with such a low baseline is a tremendous challenge for governments and support organizations such as UNICEF. Fragility and protracted crisis in many of these places raise the level of difficulty (Danert et al, 2016). Support agencies may need to work differently than in the past and reposition themselves to improve their effectiveness.

Margat and Vander Gun (2013) estimate that 45% of the global population depends on groundwater for domestic use. In Africa, groundwater dependence is even higher, estimated at over 75% (ECA et al, 2000). Sparsely populated areas within the continent are particularly reliant on groundwater, with hand dug wells historically playing a major role in rural and peri-urban areas. There is also considerable

dependence on groundwater for urban water-supplies, particularly in Nigeria (IAH, 2015).

UN-Water (2013) states that there is no doubt that groundwater supplies and boreholes in particular will play a tremendous role in achieving the SDGs in Africa. In rural areas, as countries gradually improve supply coverage, new sources are required in difficult-to-reach locations and tough hydrogeological conditions where the risks of drilling a dry borehole are high. Managing this uncertainty is one of the challenges of meeting the SDG drinking water target. Groundwater use for irrigation is also forecast to increase, placing further demands on a poorly understood resource. A borehole that lasts for its intended 25-50-year life span is a prerequisite for the sustainability of water systems that rely on groundwater. If boreholes are not well sited, designed, contracted and installed in the first place, the water supplies will fail, and investments are wasted. High quality boreholes are essential to ensure that the water withdrawn is safe. Groundwater resources need to be properly managed to prevent pollution or over-exploitation, and complete failure of the water supply service.

If the SDG targets for drinking water are to be met, drilling practice and groundwater resources management must improve.

In order to meet the SDG drinking water target, every country that uses groundwater needs a professional drilling sector. All professions, including manual and machine drilling, require special education or training.

Water quality, service reliability and sustainability require proper borehole siting, design, construction (or rehabilitation) and pump installation. Arguably, the drive for numbers of users over the last 15 years has led to a fall in the quality of project implementation. Individual drillers and consultants operating in a number of countries have expressed concerns to the authors about working for government and, more widely, the lack of capacity in-country to oversee drilling program and follow set procedures (Danert, 2008a; Danert, 2008b; Danert, 2015c).

Several countries (including Kenya, Mozambique, Nigeria, Sierra Leone, Sudan, Uganda and Zambia) are witnessing initiatives by the private sector, governments, UNICEF and other agencies to raise the professionalism of mechanized drilling. Efforts to promote and professionalize manual drilling are also taking place in at least 20 countries in Africa (Danert, 2015b). Many of these endeavors have been supported by UNICEF.

Establishment of water well drilling project in Isyesye Village at Itezi ward, a new residential area situated in Mbeya municipal for a sustainable economic development, is a result of the Community Needs Assessments (CNA) conducted in Isyesye Village located in Itezi ward at Mbeya City. Prior to project intervention, the CNA exercise was conducted which came up with the community needs and problems. The main problem unveiled with CNA exercise which faces majority community in Isyesye Village was unavailability of safe water supply for domestic use as well as for other economic activities like livestock keeping, gardening etc.

Identification of problems affecting Isyesye Village was executed under Community Needs Assessment approach. This has been the useful tool which in turn resulted into identification of problems there after plan for their immediate solutions to rescue the prevailing situation which has been an impediment and hindrance to the community striving for getting safe water and pooling themselves out of poverty wheel (income poverty in particular) through keeping domestic animals.

The study revealed that the Isyesye Village Communities still getting unsafe water for human consumption from indigenous people. Isyesye village communities have been engaging into various activities in striving pooling out from the abject poverty, mainly been keeping domestic animals.

## **2.2 Problem Statement**

The water supply in Isyesye area is inadequate and it is unlikely to satisfy the present population. This has resulted in the local community looking for the drilling of the borehole as the best alternative water supply mostly for domestic and animal keeping purposes. The Environmental Impact Assessment (EIA) study has been found necessary for this borehole drilling project in order to incorporate environmental issues during construction and operation.

The current study came up with the detailed study which unveils the opportunities for viable and reliable safe water and other activity which needs water with the focus of contributing in sustainable economic development. The bore hole drilling project therefore, is there to bridge the gap to ensure reliable, sustainable and quality water supply in Isyesye Village and animal keeping as a whole.

The assessment carried out by the experts examined the potential impacts of the project on the immediate surroundings throughout the construction phase. It encompassed all aspects pertaining to the physical, ecological, socio-cultural, health and safety conditions at the site and its environs during drilling. The study was based on laid down scientific qualitative procedures with the most recent methodologies and analysis required in EIA and, strictly adheres to the relevant legislative framework governing the groundwater abstraction industry.

### **2.3 Project Description**

The targeted community in the project is Isyesye Village community which is one among Villages in Itezi Ward which is one of 36 administrative wards in Mbeya City of the Mbeya Region of Tanzania. According to the 2012 census, the ward has a total population of 18,445 people.

The bore hole drilling project is located in Isyesye Village at Mshikamano hamlet nearby mafanikio Primary school, The project was executed by the small group of household who contributed during meetings under the general supervision of the Village Executive Officer (VEO) in collaboration with Ward Executive Officer (WEO). To ensure efficiency the group have internal Leaders who is the leader head of the hamlet. Project activities arranged to start on May 2018 but the Host organization which is Mbeya Urban and Water Supply Authority (Mbeya WSSA) accepted to come and invest the project at the start of the project.

VEO and WEO as the great stakeholders have promised to support the project by providing all necessary equipment such as procurement of drilling machine.

### **2.3.1 Target Community**

The target community is residential household in Isyesye village. The study has revealed that for the project to succeed the household members should contribute and other stakeholders including pupils and teachers around Isyesye Village, others include people who keep petty animals and keeping household animals.

Fortunately the bore hole drilling at Isyesye has come at the right time because Isyesye Village is embarking on building new more houses around Isyesye the project will enable the new house hold to get safe water for human consumption, as also the new primary is built called Mafanikio. Apart from the getting safe water from household consumption the project will sell water to the nearest villages like Gombe A and B and the money obtained will be used for other village purpose such as buying tents, utensils and chairs which will be used by the community during funerals and weddings within the Community.

### **2.3.2 Stakeholders**

Different stakeholders will contribute in the implementation of the project. The main stakeholder is the (Isyesye Village residents) who will facilitate procurement of processing machine, packaging tools and the necessary training to operate the project, Mbeya Urban and Water Supply Authority who will provide the technical support including finding area for a better drilling of a project, Nyasa Drilling Company who will execute the project and Health Officer who will oversee the hygienic condition of water.

Other stakeholders include; Isyesye Village Council who is the owner and the executer of the borehole drilling project. Itezi Secondary School, Mafanikio Primary school and Isyesye Village Community who will be the consumer of water products from this projects not only that but also Itezi ward communities as the consumer of the project products. Assemblies of God Church which is around Isyesye village will also benefit to get safe water from this project, not only that but also livestock around Isyesye village will also benefit from this project.

Table 2.1 shows the roles and expectations from stakeholders.

**Table 2.1: Roles and Expectations from Stakeholders**

<b>S/NO</b>	<b>Name of Stakeholders</b>	<b>Roles of stakeholders</b>	<b>Expectations</b>
<b>1</b>	Nyasa Drilling Company	1.1 To drill the bore hole , this company has been identified as a better company in Mbeya for water well drilling 1.2 Provide technical support like rewashing the bore hole after six months	<ul style="list-style-type: none"> <li>- To drill the require meters of the bore hole</li> <li>- Provide sustainable water resources</li> </ul>
<b>2</b>	Mbeya Urban and Water Supply Authority	2.1 Provide support on allocation of borehole drilling 2.2 Provide experts 2.3 Quality Water Check 2.4 Provide support on getting the drilling permit	<ul style="list-style-type: none"> <li>- Timely provision results of water quality check</li> <li>- Provide drilling Permit on Time</li> </ul>
<b>3</b>	Isyesye Village Council	3.1 Facilitate procurement of Pipes and electrical cables for installation.	<ul style="list-style-type: none"> <li>- Fund released at reasonable time for the installment of water tanks</li> <li>- Increased skills on quality of water to the concerned people.</li> </ul>
<b>4</b>	Isyese Community Villagers and nearby Communities (Primary and Secondary Schools)	4.1 Consumer of the produced Water	<ul style="list-style-type: none"> <li>- Reducing epidemic diseases such as cholera</li> </ul>

Source: Researchers finding



### **2.3.3 Project Goals in CED Terms**

The project goal is to ensure availability of safe water of the community members by household in Isyesye Village community and income poverty reduction among the petty keepers (Chicken, Pigs) for their decent life. Establishment of Bore hole drilling at Isyesye Village will help to reduce the burden of epidemic diseases among the household in Isyesye village community members as well as school children who safer for unsafe water which makes them to acquire diseases like cholera and other epidemic diseases Reliable market and good price of apples products will in turn encourage majority of the community members to engage into apples production hence, increased production.

### **2.3.4 Project Objectives**

#### **2.3.4.1 General Objective**

To develop a community borehole water supply project for water supply in Isyesye Village, Itezi Ward, Mbeya City Council from the community initiative phase, to the planning, design, construction and the operation and maintenance phases by June 2018.

#### **2.3.4.2 Specific Objectives**

Specifically the project intend to;

- i. With the assistance of the community members to determine and establish the coverage of public or private water supply in the case study area by June 2018
- ii. Through community involvement to determine socio economic problems that are contributed or associated with the water shortage or poor water supply in Isyesye Village, Itezi ward.

- iii. To increase the overall availability, accessibility, sanitation, and hygiene of water in Isyesye Village, Mbeya City, Tanzania.
- iv. To determine various water problems, which contribute to poor or lack of water supply in Itezi Ward settlements?

## **2.4 Host Organization/CBO profile**

The host organization is Isyesye Village Council. The Village is in Itezi Ward in Mbeya City Council. The Village is led by Balozi and the Village Chairman. In order to run the project, the Village selected 5 members in which 3 are males and 2 are females among the 79 households to run the project. The group is working under the leadership of Balozi. However, for effectiveness and efficiency of work the group has its own leaders, which are; chair person, Secretary and the treasury (the one who collects money during the hamlet meetings). The steering committee is made up with the group leaders with the three selected members to make five members of the steering committee.

### **2.4.1 Host Organization Leadership**

The leaders of the host organization are; Ambassador of the Hamlet, Village Chairperson, Village Executive Officer, Ward Executive Officer, and Treasurer. Under the Village leaders there are group leaders who are working in collaboration with Village leaders, specifically for the project, these are; Group chair person, Secretary and the treasurer (who has been elected by the members of the community) from their regular meetings. Therefore the steering committee has a sum of 5 persons (This excludes VEO and WEO).

### 2.4.2 Vision of the Host Organization

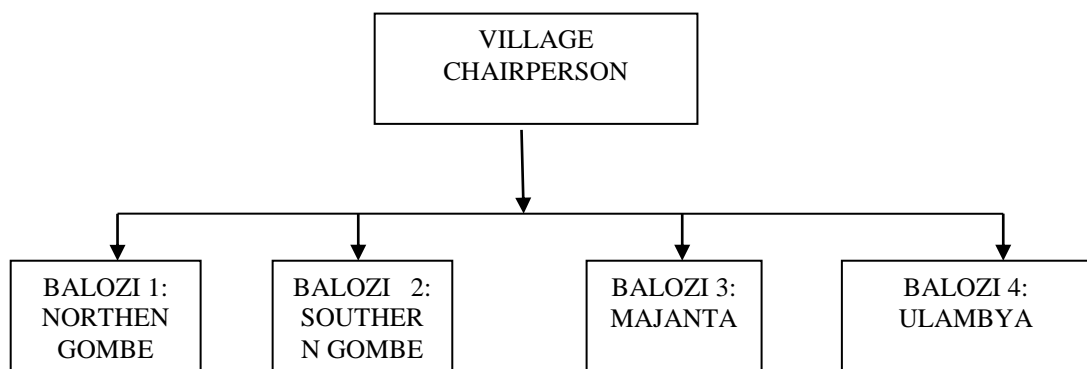
To make sure that members are facilitated to get accessible, Quality and Quality Water supply aiming reducing epidemic diseases.

### 2.4.3 Mission of the Host Organization

Isyesye Village intends to become a model organization in provision of basic needs for health services to the community members so as to ensure decent life to her people and free from diseases caused by drinking unsafe water.

### 2.4.4 Isyesye Village Organization Structure

At the Village level, the Village has been vested the day to day tasks of Village Government, therefore the Village Assembly/Village Government have not been included in this structure. The Village Organization structure is shown on Figure 2.1



**Figure 2.1: Isyesye Village Organization Structure**

### 2.4.5 Isyesye Village Council SWOC analysis

SWOC analysis intends to depict in-depth information of the concerned organization on the available opportunities which can help in the intervention of the project. It

also focuses to determine strength, weaknesses, and the challenges facing the organization/village in question. The Strengths, Weaknesses, Opportunities, and challenges of Isyesye Village were identified as shown in the Table 2.2

**Table 2.2: SWOC analysis of Isyesye Village**

<b>No</b>	<b>Strength</b>	<b>Weakness</b>	<b>Opportunity</b>	<b>Challenges</b>
1	Committed and active Village leadership	Treasurer who collects contribution is not an employee	<b>Members</b> trained on how to run the project	Village Chair person has no salary
2	Premises Availability of premises for borehole drilling.	Premises available is owned by individual not in the village premises	The premise situated at the centre of the Village along Ulambya road hence easily to access customers coming to fetch water	The Village has regular electricity cut off.  Generator has to be used
3	Committed for contribution for borehole drilling	Some members delays in providing contribution	Some members provide more money to cover delays	Members follows contribution for those not paying on time
4	Having regular monthly meeting	Some members are not attending	Some members meet in weeding and burial ceremony and discuss village issues	Village members has no tents to be used during rainy season
5	Female household has formed a group called Tupendane	Some members have different groups within Tupendane group	Through this group female get loans from SACCOS	The group is not registered

Source: Research Findings

#### **2.4.6 The Roles of CED Student in the Project**

The main role of CED student's is to ensure that the planned interventions are successful implemented as per plan.

To fulfill this the following activities undertaken;

- i. To sensitize Isyesye community members on the importance of bore hole drilling project.
- ii. To consult different stakeholders to access resources needed for the project implementation in this case include assist in getting drilling permit and water quality Check
- iii. To facilitate the purchase of project tools and equipments for project implementation such as water pipes and electrical cables
- iv. To facilitate training to Isyesye Village and group leaders on managing and operating the installed pump used to uplift water from underground.
- v. To facilitate market reliability incase the village will be selling water to the nearest village in collaboration with village chairperson
- vi. To facilitate and ensure participatory Monitoring and Evaluation process of the project.

#### **2.4.7 The Roles of the Host Organization**

- i. To attend all required training.
- ii. To participate in the community sensitization on the project
- iii. To participate in the project sensitization and marketing to the nearest villages

- iv. To ensure safe guard of all the project tools and equipments by ensuring are security guard of the project
- v. In collaboration with the MCED students to consult different stakeholders for fund to run the project especially during rewashing of the bore hole.
- vi. To participate in the process of the project tool/equipment procurement such as pipes, Sub merged pump and electrical cables during installation
- vii. To ensure administrative activities throughout the project life.
- viii. To ensure the progress report is provided at every interval it needed especially during the meetings which is conducted on monthly basis.
- ix. To ensure the project sustainability.

## **CHAPTER THREE**

### **3.0 LITERATURE REVIEW**

#### **3.1 Introduction**

This chapter review authors who wrote on issues related to borehole drilling as a project to support getting safe water for human consumption, reports the findings from various projects related to bore hole drilling / water wells , and the policy that guides the operation of the bore hole drilling in Tanzania. The chapter is divided into four parts: theoretical literature, empirical literature, policy reviews and the literature review summary. In theoretical reviews, the emphasis is to analyze the theory behind bore hole drilling /water wells. The empirical review, the objective is to narrate on work done by others, with the special interest on the approach used, outcomes, experiences and lessons learnt and their similarity and relevance to the intended. Lastly it ends by analyzing policy issues as they impact the project. Concurrently books, professional journals, reports from livestock departments and personal experience were used in gathering information.

#### **3.2 Theoretical literature**

##### **3.2.1 Groundwater**

###### **3.2.1.1 The Demand for Water**

The demand for water is increasing at an exponential rate relative to the world's population growth rate and poverty is the most significant factor that interferes with meeting that demand," as relayed by officials at the 3rd World Water Forum. Clean water has become increasingly inaccessible to a vast majority of people in our world.



According to the World Health Organization, there are 2.2 million diarrheal deaths related to unsafe water, sanitation, and hygiene every year. The great majority of deaths are children in developing countries. The Environment News Service also affirms that approximately one half of indigenes in developing countries are suffering from diseases caused directly by infection through the consumption of contaminated water or food, or indirectly by pathogens such as mosquitoes that breed in water.

Tanzania, Mbeya is no exception to this predicament. For this reason, our proposal will take an exclusive focus towards increasing water supply, availability, accessibility, sanitation and hygiene in Isyesye Village, Mbeya.

Groundwater storage in Africa is extensive, and acts as a natural buffer against climate variability. However, the quantities that can be abstracted are unevenly distributed, and yields vary. The lack of understanding of groundwater resources in much of Africa undermines its potential to contribute to poverty reduction and economic development, and threatens its environmental sustainability.

Over the past two decades, Africa has witnessed a significant increase in drilled water wells, or boreholes. These are financed by development programmers as well as investments by water users and local businesses. Not only do boreholes supply hand pump water, but they also play a substantial role in small as well as larger piped water supplies. Use of groundwater by smallholder farmers in sub-Saharan Africa is on the rise; use of groundwater for irrigation in Africa is expected to grow significantly.

### **3.2.1.2 Groundwater Flow**

Water aquifers are large in extent (1-10km) yet have variations in physical and chemical properties at small scales (1-100m). This poses a challenge in predicting transport from a potential leakage source to the receptor (Sirila *et al.*, 2010). Transport of contaminants in soil is an important.

Problem for different flow scales, from the fractured rocks to large underground aquifers (Hamrnon, 2011).

The rate, residence time and direction of groundwater flow, the movement of micro-organisms, pathogenic bacteria and viruses depends on the size of the pores on reactions within media, on the amount of food available and on their life span which affects its quality (Vladimir, 2003; Sanden, 1986). Deep, consolidated formations are characterized by slow groundwater movement, long residence times, ample opportunity for dissolution of minerals and therefore often poor natural water quality. These formations are confines under thick sequences of low permeability clays and are less vulnerable to anthropogenic influences (Chapman, 1996).

### **3.2.1.3 Groundwater Quality**

The quality of water is of vital concern for mankind since it is directly linked with human welfare. According to Ranjana (2010), the quality of public health depends to a greater extent the quality of groundwater. Though groundwater quality is believed to be quiet good compared to surface water, its quality is the sum of natural: geology of the environment and anthropogenic influences: withdrawal, land use change, and

solid waste dumping (Chapman, 1996). Water quality parameters reflect the level of contamination in water resources and show whether water is suitable for human consumption. Contaminated water is unacceptable due to health effects, poor taste and aesthetic value to consumers (Suthra *et al.*, 2009).

### **3.2.1.4 Physico- Chemical Parameters**

Temperature, pH, Colour, Turbidity, Total Dissolved Solids, Electrical Conductivity, Odor and Taste are the most important Physico-chemical properties of groundwater in relation to its quality.

pH is a measure of the hydrogen ion ( $H^+$ ) available in water. The acidity of groundwater is due to the presence of organic acids in the soil as well as those of atmospheric origin infiltrated to the water (Chapman and Kimstach, 1996). Acid rain contains dissolved Carbon dioxide ( $CO_2$ ), 8.

Nitrogen dioxide ( $NO_2$ ) or Sulphur dioxide ( $SO_2$ ) often yields an elevated Hydrogen ion ( $H^+$ ) ion concentration and Carbonic acid ( $HCO$ ) and may cause serious threat to groundwater pH (Hamil and Bell, 1986). The pH of rainwater is about 5.7 (Krauskopf and Bird, 1994). Increase in acidity is also attributed to the oxidation of reduced Sulphur compounds in the soils of the areas (Efe *et al.*, 2005). The pH affects the solubility and toxicity of metals by influencing chemical kinetics of important constituents. Other acids such as  $HNO_3$ ,  $HNO_2$  and humic acid are formed as a consequence of the decomposition of organic matter and sulphuric acid is produced when minerals such as pyrite ( $FeS_2$ ) breakdown. High pH levels make water to become less corrosive (Gustafsson, 2003).

Alkalinity is a water characteristic that shows the capacity of water to neutralize acids by accepting Hydrogen ions ( $H^+$ ) and preventing sudden changes in the acidity levels of water. Alkalinity is due to the presence of two forms of the Carbonate anions ( $HCO_3^-$ ), ( $CO_3^{2-}$ ) and ( $OH^-$ ) that act as buffer system (Chris, 2012). Borates, phosphates, silicates and other bases also contribute to alkalinity if present in groundwater. Inorganic ligands (anions) form complexes with metals (cations), this removes free divalent toxic metal ions such as  $Cd^{2+}$ ,  $Cu^{2+}$ ,  $Pb^{2+}$ ,  $Zn^{2+}$  or methyl-metal complexes. Metal complexes are not biologically available and hence not toxic. Alkalinity is an important property when determining the suitability of water for other uses such as irrigation, or mixing with pesticides and when treating contaminated water. Alkalinity is measured in  $CaCO_3$  mg/L. According to Fakoyode (2005), pH that is near to neutral (pH 7) is indicative of unpolluted water.

Carbon dioxide ( $CO_2$ ) readily dissolves in water as illustrated in equation 1. The dissolved  $CO_2$  (aq) reacts with water molecules to form Carbonic acid ( $H_2CO_3$ ) as shown by equation 2 and Carbonic acid is very unstable and quickly dissociates into  $H^+$  and a Bicarbonate ion ( $HCO_3^-$ ) as demonstrated in equation 3.

At pH 6.3, the amount of  $CO_2$  dissolved in water equals the amount of bicarbonate ion ( $HCO_3^-$ ). Dissolved carbon dioxide is dominant when pH is  $<6.3$ . At higher pH, basic water,  $HCO_3^-$  dissociates to yield  $H^+$  and a Carbonate ion ( $CO_3^{2-}$ ) as per equation 4.





At pH 10.3, the bicarbonate ion concentration equals the carbonate ion concentration.  $\text{CO}_3^{2-}$  is dominant at  $\text{pH} > 10.3$  and  $\text{HCO}_3^-$  dominates between pH 6.3 and 10.3. The pH of most natural water falls in the range of 6 to 9 because of the bicarbonate buffering (Chris, 2012).

**Total Dissolved Solids:** Total Dissolved Solids (TDS), is defined as the concentration of all dissolved minerals in the water. Natural waters contain a variety of both ionic and uncharged species in various amounts and proportions that constitute the Total Dissolved Solids (Agbaire and Oyibo, 2009). TDS in groundwater are due to enhancements of weathering of minerals from acids produced as byproducts of the degradation process. Hence TDS is a geochemical parameter that closely links the bulk conductivity to microbial degradation of hydrocarbon (Atekwanna *et al.*, 2004). High TDS, greater than 1000 mg/L, is commonly objectionable or offensive to taste.

TDS is a function of temperature and pH. At higher temperatures and lower pH groundwater dissolves more minerals. Sources of ion TDS include hard water ions ( $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{HCO}_3^-$  and  $\text{CO}_3^{2-}$ ), fertilizer in agricultural runoff ( $\text{NH}_4^+$ ,  $\text{NO}_3^-$ ,  $\text{PO}_4^{3-}$ , and  $\text{SO}_4^{2-}$ ), urban runoff / salinity from tidal mixing, minerals or irrigation water ( $\text{Na}^+$ ,  $\text{Cl}^-$  and  $\text{K}^-$ ) and Acidic rainfall ( $\text{H}^+$ ,  $\text{NO}_3^-$ ,  $\text{SO}_3^{2-}$  and  $\text{SO}_4^{2-}$ ).

Poor chemical quality of water is a health risk in the long term for consumers. Urban waste waters are often high in nutrients concentrations (macronutrients Na, Ca, P, K, Mg and micronutrients Fe, Zn, Cu,) and other chemicals which can stress the bacterial populations, in rainy seasons they are washed to the groundwater by infiltration (Thomas, 1995). The chemical composition of groundwater may be altered by the precipitation of ions from solution to form insoluble compounds.

**Nitrate:** Nitrate contamination of groundwater results from leaching of fertilizer, septic tank leachate, unsewered sanitation, pit latrines, animal waste or human waste mineralization of decomposing or oxidation of decaying matter by soil micro-organisms (Beauchamp, 2003; Spalding and Exner, 1993; Suthra *et al.*, 2009). Unutilized urea leached to groundwater for micro-10.

Organisms to degrade are also another source of groundwater nitrate (Singh, 2012). According to USGS (2012), nitrate concentrations of greater than 3mg-N/L indicate a fairly direct connection of water with source of pollution.

Nitrate can readily be transported beneath the soil zone because it is relatively soluble and not prone to ion exchange (Stumm and Morgan, 1996). Nitrate can be endogenously reduced to nitrite, which can then undergo nitrosation reaction in the stomach with amines to form a variety of N-nitroso compounds (NOC). These compounds are carcinogens, thereby causing health hazards like impairing the ability of the blood to carry oxygen (Blue-baby syndrome or infantile methemoglobinemia), gastrointestinal cancer, Alzheimer disease, vascular dementia, adsorptive secretive

functional disorders of the intestinal mucosa, multiple sclerosis, Non-Hodgkin's lymphoma and hypertrophy of thyroid (Suthra, 2009) and (Macdonald and Kay, 1986). In Aarlborg Denmark, water had a relatively high nitrate content of about 30mg/l and there was a slightly greater frequency of stomach cancer (Hamil and Bell, 1986). Nitrate contamination can be treated by technologies such as ion exchange; denitrification and reverse osmosis or anaerobic reduction in the subsurface which can limit Nitrate contamination of groundwater (Kapoor and Viraraghavan, 1997).

**Calcium carbonate:** Hardness refers to the ability of water to form suds with soap. Hard water leaves a ring in the bathtub, forms soap curds in clothing, and builds up scale in boilers and kettles (Wittmann *et al.*, 1998). Hardness is divided into two: Carbonate hardness  $\text{Ca}(\text{HCO}_3)_2$  and non-Carbonated hardness  $\text{Mg}(\text{HCO}_3)_2$ . Non hardness is due to presence of salts such as Calcium Chloride ( $\text{CaCl}_2$ ), Magnesium Sulphate ( $\text{MgSO}_4$ ) and Magnesium Chloride ( $\text{MgCl}_2$ ) (APHA, 1998; Burton and Pitt, 2002; Chris 2012). Any hardness greater than the alkalinity represents non-Carbonate hardness is measured as Calcium Carbonate mg/L. Hardness is classified as soft, moderately hard, hard and very hard (EPA, 1986). Areas with limestone formations have a higher hardness and alkalinity due to the dissolution of Bicarbonates and Carbonates. Calcium in groundwater is derived from Calcite, Aragonite, Dolomite, Anhydrite and Gypsum. In igneous and metamorphic rocks calcium is supplied by the feldspars, pyroxenes and amphiboles and the less common minerals such as Apatite and Wollastonite (Chris, 2012). Water hardness is an important component of water because it has a bearing on the portability of water.

**Iron:** Iron is not toxic, but imparts objectionable taste to water and may leave brown stains on porcelain and in clothing. Objectionable taste is due to reduced form ( $\text{Fe}^{2+}$  and HS), on exposure to air, water becomes reddish brown due to Ferric Hydroxide and prolonged consumption of such water may lead to liver disease (Ranjana, 2010). Largest contributors of iron in groundwater are minerals contained within the underlying bedrock, soil and sand, the most common is Ferrous Iron and borehole, limestone, shale and coal which often contain the Iron rich mineral Pyrite, acidic rain also releases Iron into groundwater (BGS, 2003; Lenntech, 2009). Iron content increases with depth (Dennis, 2002).

### **3.3 Empirical Literature**

The empirical review looked at the situation of bore hole drilling in Tanzania.

The development of a local capacity for cost-effective borehole drilling in the private sector is a critical factor for large-scale progress in rural water supply. If Tanzania wants to meet the millennium development goals (MDG), it needs to drill 14,000 boreholes with hand pumps and 1,500 boreholes for motorized small-piped systems. Cost for boreholes in Tanzania are rather high, USD 6,000 for hand pumps and USD 12,000 for mechanized systems.

As an input activity towards the World Bank, Water Sector Support Project the review team carried out an analytical study on the drilling industry in Tanzania. This industry represents one of the supply-side bottlenecks (lack of drilling capacity) for accelerated rural water supply services in Tanzania. The study aims at gaining a



better understanding of the problems associated with the industry, assessing options, and identifying support areas.

Many inter-related factors affected the emergence of local drilling capacity. In the past, drilling was done by the government through the regional offices of MWLD. This approach created a government owned drilling fleet. The rigs were typically purchased under projects and often used by foreign contractors. At the end of the projects period, they were handed to the ministry.

To centralize the regional drilling capacity, a public agency - Drilling and Dam Construction Agency (DDCA) was formed in 1997. As a para-statal drilling organization, DDCA suffers from the inefficiencies inherent to the public sector; low utilization of equipment due to disrepair and lack of supplies. Despite these setbacks DDCA remained the big player in the drilling sector.

Lately, under the drive for structural reform and re-focus of the public sector DDCA was excluded from competing for World Bank financed drilling contracts. The National Water Policy (NAWAPO) states that in future the provision of services has to be done mostly by private operators. Establishing a thriving drilling industry has been complicated by the small size of the market relying mostly on public contracts. Private operators were reluctant to reach out to isolated rural areas where risks and costs are high.

SWAP, decentralization, and community driven principles have been adopted in the NAWAPO. These approaches bring the risk of fragmenting the market with inherent

higher cost. They need to be reconciled with the requirement to plan drilling campaigns, which offer economies of scale by packaging sufficient number of boreholes. Consultant driven implementation often leads to over specified boreholes requiring expensive sitting, drilling, and development techniques.

Drilling costs account typically for 80 % of the hardware investment costs for boreholes, the rest consisting of the hand pump and the apron. The potential for cost saving in drilling is tremendous, the stakes are considerable; an average cost reduction of more than 10% is easily realistic, which, if realized, would result in savings of USD 10 million. In order to achieve these savings it will be necessary to create a favorable environment for the private sector drilling industry to grow and invest in equipment and human skills. The public sector needs to be structured to make use of the opportunities the emerging market offers. Factors like productivity and costs for obtaining contracts have a bigger impact on drilling cost than diameter of wells and yield criteria. The young emerging drilling industry needs a steady stream of smaller contracts and mechanisms are required to help local drillers entering into the market.

However, that does not mean that the saving potential lying in technology should be neglected; smaller diameter boreholes require smaller rigs, realistic acceptance criteria help to bring cost down for well development and sitting. Low-cost drilling technologies provide a significant potential for helping the local drilling industry being established. The investment costs are clearly less and the price per borehole

can be reduced. The issue is not to develop new technologies but to transfer and adapt existing ones.

Boreholes have been constructed in Tanzania since at least 1930 up until the present day. The borehole database maintained by the MWLD, Directorate of Water Resources in Dodoma lists 9,242 boreholes. The data entry is not consistent; many boreholes have no data recorded and for others the data are incomplete. It is therefore difficult to establish how many of these boreholes are actually used to provide water. It appears that the shallow boreholes drilled by hand drilling methods were not recorded or only partially recorded.

There are few other Companies that have been and are currently drilling the bore hole in Tanzania, from among them are; KADET Drilling , Nyasa Drilling, Jiangsu Geology and Engineering Co. Ltd. (Chinese Contractors) and Onesmo Karumba, to some extent they have opened Tanzanian mind on the importance of borehole drilling which enable them not depending on water supply authority.

Below is some the drilling situation of borehole in some cities in Tanzania: Many water supply projects in Tanzania have failed to satisfy the demand due to rapid expanding cities. Low and lower middle-income countries have experienced poor service coverage and inadequate water supplies and sanitation services due to many reasons ranging from lack of proper operation, poor revenue collection to simple mismanagement. Therefore, this argument goes, private or public operation of MBEYA WSSA) will be relevant to poor communities only if it will bring them

easier access to taps and will clean their communities. Putting it another way, it appeared to the researchers that the 'privatization' of MBEYA WSSA) is primarily an issue only to those who had connections. For the unconnected urban poor, what happens in the debates (on who gets to own the system, makes decisions, regulates prices, and so on) is less of a concern. "Get us connections now!" they seem to be saying, "Then we can talk about all the other issues that follow" - ownership, connection costs, prices.

Dominick de Waal,(2000) reported in his Survey that 17.6% of the two and a half million people in Mbeya live below the basic needs poverty line. People living below the basic needs poverty line are those classified as living on less than 9203Tsh a month or 329Tsh a day. Though water prices in the city vary according to factors such as location, type of supply, season and MBEYA WSSA) breakdowns, research done by Water Aid and its partners show that households in low income areas buy around 30 litres of water per person per day at a cost of around 1Tsh a litre. For people living on 329 Tsh this represents just fewer than 10% of their daily expenditure.

While a 100% price rise in water only amounts to 30 Tshs a day, it has the potential to prevent a further 4% of the population from affording these basic needs. In other words around an additional one hundred thousand people would be forced to substitute a proportion of bought water with water from other often unprotected sources such as open 'tire' wells or polluted streams with the inevitable consequences on their health. Although Public-private partnership is accepted as a solution to the

prevailing problems water price and security is a challenge to water supply in the city. Appropriate approach to adopt such action requires commitments of both parties and well-defined mode of operation. Mashauri, D. A. and Kayombo Sixtus, (2000) explore that Operational Model of Public-Private Partnership in the provision of water supply and sanitation can work if the government will have the responsibility of regulator while the private sectors play the role of implementation.

### **3.4 Policy Review**

Tanzania National Water Policy of July 2002 institutional framework objective is to have effective management of water resources. The components of institutional framework include coordination and collaboration in at the community level and water uses association. Community play major role in the water sector because they are the primary users, guardians, and managers of water sources. Participation of both men and women in decision making, planning, management and implementation of water resources management and development will be enhanced. Youth and children will be educated on the management, protection, conservation and development of water resources as they are facilitators for change.

#### **3.4.1 Community Participation Policy Issue**

Participatory approaches are often termed as "bottom-up" approaches. In this regard it is contrasted with "top-bottom" approaches where governments or agencies are termed to impose development policies or plans. However Martin (1997) highlights that citizen participation has a political and social nature.

A public participation is a cornerstone to both Community development and community economic development .In order to make this cornerstone functional consensus or at least significant majority support is very necessary. In implementing the bottom up approach Tanzania Water policy highlights community Participation issues to include water scheme ownership, choice of technology, involvement of communities in planning, design and construction and involvement of communities in operation and maintenance.

### **3.4.2 Water Scheme Community Ownership**

The goal of community ownership in water supply and sanitation services is to facilitate legal ownership of the project by the communities themselves. Water supply and sanitation facilities provided without active participation of the beneficiaries in planning and management are often not properly operated and maintained is unsustainable. No ownership of the facilities by the communities water well may result into lack of commitment to maintenance of the facilities by the users. Including water wells is neither perceived to be, nor legally vested in uses communities. These factors lead to lack of commitment to maintenance of the facilities by the users. Communities are to be empowered to initiate, own and manage their water schemes including water wells.

In order to ensure that communities become legal owners of water supply schemes the following is essential:

- i) Legal registration of water users' entities will be instituted to ensure that communities are legal owners of their water supply schemes.

- ii) Roles, responsibilities, rights, and limits of authority of water user entities will clearly be defined.
- iii) Communities will be facilitated in acquiring, technical and management skills.

### **3.4.3 Involvement of Communities in Operation and Maintenance**

The goal of this objective is to have a sustainable arrangement for making communities fully responsible for operation and maintenance of their water supply schemes within Isyesye Village. For sustainability of the of water schemes, communities will be required to pay full for operation and maintenance and costs of higher service levels as well as to manage their schemes.

In order to make communities responsible for the operation and maintenance of their water supply and sanitation services the following will be carried out.

Communities will be educated and facilitated to enable them manage operations and meet operation costs including that of the scheme improvements. The communities also will be trained to acquire skills in the letting and supervision of operation contracts. Isyesye Borehole construction project is trying to address community participation on Policy issue on:

- i) Community participation on Water Scheme,
- ii) Involvement of Isyesye community in selecting the area were the borehole will be installed.
- iii) Water scheme community ownership, operation and maintenance

### **3.5 Literature Review Summary**

The government of Tanzania has placed Water and Environmental sanitation as a key pillar in its poverty reduction strategy. Tanzania has also actively participated in the global efforts to achieve Millennium Development Goals and World Summit on sustainable development. The goals aims at targets on water and sanitation, that is, to reduce by at least half the country's population that is without access to safe and adequate water and sanitation by 2015. This implies that the sector needs to adopt urgent and well-coordinated strategies and actions to ensure that coverage of both water supply and sanitation is accelerated and sustained.

Understanding the link between Poverty water and sanitation is very necessary. Water is essential to life and is part of every cell furthermore is necessary for most basic functions like respiration and digestion. Access to clean and safe water is a major requisite for poverty reduction, improving human health conditions promoting sustainable development.



## **CHAPTER FOUR**

### **4.0 PROJECT IMPLEMENTATION**

#### **4.1 Introduction**

This chapter contains information on how the project was planned, action taken at each step of project implementation. It analyses products and output from the project, activities undertaken to meet the objective, resources required, responsible personnel and time frame to accomplish the project. It also analyses tentative budget for installation and purchase of tools including sub merged pump and electrical cables and other installation cost, including drilling permit and Water quality Check. The total cost of the project will be 10,000,000/=TZS.

Bore hole drilling Project (BHDP) had been planned to start operation by mid of June 2018 after accomplished all activities except the mid and annual evaluation that will be carried after the project take off. The (BHDP) was officially opened in Isyesye Village on June 2018 during the opening of the bore hole, the Villagers fetches water freely then later will be charged at a cost of 150 shillings per bucket.

The anticipated goal of the project is construction of bore hole project at Isyesye Village community members, hence household income poverty reduce through keeping domestic animals. Horticultural development and economic development sustainability for the household will then contribute in poverty alleviation as a whole.

#### **4.2 Products and Outputs**

The project output was as follows:-

One borehole is expected to provide 6000 liters per day. Each bucket of twenty litres will be sold for 20 shillings. The amount of money expected to be obtained daily and monthly will be as follows.

**Table 4.1: Project Output**

	<b>Expected amount</b>	<b>Total Amount</b>
Daily	6000 liters x 50Tsh	300,000/=Tsh
Monthly	300,000/=Tsh x 30 days	9,000,000/=Tsh

#### 4.2.1 Financial Plan

Borehole construction Cost is **10,000,000/=** Tsh.

The community will contribution hundred percent of the total cost for 3 months in order to raise **10,000,000/=**Tsh.

**Table 4.2: Cost Analysis of the Proposed Borehole Construction**

<b>Activity</b>	<b>Recourses Needed</b>	<b>Cost</b>
Consultation	Consultation Fees	1,000,000/=
Pilot Hole drilling( Survey of area of available water)	Excavations machines and expertise	1,500,000/=
Drilling	Drilling machine personnel	1,000,000/=
Bore hole construction	Drilling material labor	5,760,000/=
Project Hand over / in auguration	Invitation , drinks and bites	1,500,000/=
<b>Total Cost</b>		<b>10,760,000/=</b>

#### 4.2.1.1 Financial Analysis

The following is the financial control.

- **Revenue Side**

**Table 4.3: Financial Analysis**

Expected output	10,000,000/=
Electricity tariff	100,000/=
Bore hole drilling permit	60,000/=
Water quality check	272,000/=
Salaries for one people who operates the	100,000/=
Operation and Maintenance Cost	500,000/=
<b>Net Profit (Income –Cost) per Month</b>	<b>8,968,000/=</b>

For the first month the Net Profit will be **8,968,000/=** and the following month the Net profit will be **9,300,000/=**

**Women loan:** In order to generate more income 50% of the money, which is **4,650,000.00/=** each month will be borrowed to needy women for business activities. They will be required to pay after two months with the interest rate of 5% only.

**Total cost:** According to the Drilling Company which is Nyasa Drilling Company the cost of the drilling and construction of the borehole will produce 1000 litres of water per hour can cost **10, 000,000/=Tshs.**

**Contribution criteria:** Mbeya Urban and Water Supply Authority are currently implementing a water supply borehole projects at Isyesye Village. On January 2018 Mbeya WWSA conducted a Meeting with Sub ward leaders informing them on the project and suggested that they will requires at least 97.5% of the total cost to be contributed by the community members, while the rest 2. 5% will be taken care of by the Mbeya WSSA (This includes the water quality Check). In this regard the community will be able to get a borehole of the cost of 10,000,000/=. Meanwhile the Village community Members is expecting to get a technical assistance from Mbeya WSA and VEO which will reduce the cost again by 10%.

### **4.3 Project Planning**

Project planning is the major component in the project development process. The project planning involved the following major steps:

- i) Identifying project objectives
- ii) Sequencing activities
- iii) Identifying responsible person for carrying out the activities
- iv) Identifying facilities equipments and service needed
- v) Preparing the budget

#### **4.3.1 Project Implementation Plan**

In order to ensure smooth implementation of the project, a work plan was prepared indicating different activities to be carried out, the required resources, time frame and person responsible for each project objective. The project implementation of the project involved different stakeholders physically and others were consulted at their working places to get their views especially on technical aspects. The Isyesye Village leaders was fully engaged from the beginning this as they are key implementers of the project. The implementation follows the project implementation plan as shown on Table 4.4. Among the major activities in project implementation are securing community participation, coordination of activities, monitoring and evaluation. The implementation of the project involves household, VEO and WEO members, and extension staff with deferent professions from Mbeya Urban and Water Supply.

The implementation task participated and involved household, Isyesye village leaders, and officers from Mbeya WSA with their expertise relevant to the project mainly from Mbeya City. The main activities under the implementation were coordination of activities, supervision as well as monitoring and evaluation. Project monitoring allowed the project flexibility on the undertaken activities to ensure

smooth implementation of the project and that activities are done as per plan. Evaluation process has been ensuring whether or not the planned interventions are carried out under the right track. In general the plan helped at large in realizing the set objectives and built the cohesion among the project implementers and other stakeholders.

Project implementation should ensure that activities are carried out according to the prepared plan without many diversions. Following the plan stipulated under Logical Frame work in Table 4.5, project budget in Table 4.6 and the Gant chart which is shown in Table 4.7 among the major activities in project implementation plan in table 4.4 include coordination of project activities; ensure enhanced community participation in project intervention and undertaking participatory monitoring and evaluation for the smooth implementation of the project.

The project implementation resources contributed by various stakeholders including; Household (VEO, WEO and Individuals. Apart from materials resources, Mbeya council provided project professional for training and follow ups on the project implementation.

**Table 4.4: Project Implementation Plan**

Objective	output	Activity	Project Implementation Months							Resources Needed	Responsible Person
			1	2	3	4	5	6	7		
1. To sensitize 79 House hold members in Isyesye Village On bore hole drilling project by June 2018	1.1 meeting conducted every month	1.1.1 To have a meeting								Human, Stationary	Host organizer
		1.1.2 to organize a day to discuss with VEO &WEO								Human , Stationary	Host organizer
	1.2 At least one fifty household members attended the meeting	1.2.1 Conduct sensitization meeting with house hold								Human, Stationary	Host organizer
		1.2.2 meet with Mbeya Water and Sanitation Authority								Transport cost	Host organizer
2. Site selection, Surveys	2.1 Having a viable drilling site.	2.1 Select of the consultant to evaluate the site.								Human , stationary	Mbeya ,WSSA Host organizer
		2.2 Deployment of hydro geological tools								Tools, Consultant , Fund	Mbeya ,WSSA Host organizer
	2.2One professional selected	2.2.1 Listing of professionals								Human , Stationary	Host organizer
		2.2.2 stakeholders meeting for selection									
3.0 Borehole Specifications	3.1 Completed bore hole with required specs	3.1.1 Selection of pump								Fund, Consultant	Host organizer Mbeya WSSA
		3.1.2 Hiring consultant for selection of pump								Fund	Host organizer Mbeya WSSA
	3.2 Consultants	3.2.1Meeting with stakeholders								Fund, Stationeries	Host organizer Mbeya WSSA
		3.2.2 Calculating the amount of water required								Stationary	Mbeya WSSA

<b>4.0</b> Regulations	<b>4.1</b> Drilling permit obtained	<b>4.1.1</b> Meeting with stakeholders								Human , Stationary	Host Organizer Mbeya WSSA
		<b>4.1.2</b> Apply for drilling permit								Stationary, Fund, Human	Host Organizer
		<b>4.1.3</b> Submission of required documents								Transport , Human	Host Organizer
	<b>4.2</b> Certificate of Quality check	<b>4.2.1</b> Meeting with Stakeholders								Human, Stationary	Host Organizer
		<b>4.2.2</b> Apply for certificate								Fund	Host Organizer

#### **4.3.1.1 Logical Framework**

Logical Framework is an analytical tool which is used to plan, monitor, and evaluate projects. Its name have been derived its logical linkages/relationship set by the planner in order to bring about connection between project means and its ends. The Logical Framework which has been used here is a logic Matrix. A logical Framework as a Matrix has a standard form in its representation. The format which has been used in this framework is sometimes known as a four by four Matrix. It consist a vertical logic which show the hierarchy of objectives, sometimes it is known as Narrative summary. It describes arrangement of objectives logically. It starts with Goal followed by objective, then Outputs and activities. The matrix allow the planner to arrange objectives in logical order by asking simple questions such as; what objectives are needed to achieve this goal?

What output are expected to realize objectives? And then what activities should be done to realize the outputs? After the question on output the last variable which not necessarily to be within the matrix is what inputs are needed to undergo the planned activities? The horizontal logic shows the progress against each objective. It clearly shows indicators and its means of verification as well as external factors which might hinder the fulfillment of the concerned objectives (Assumptions). In planning for the assumptions killer assumptions have been evaded and encouraged positive assumptions to show that the objective can be achieved. It is advisable that once there is killer assumptions nullify or change the project before committing resources. Under this project Goal, Objectives, Output and activities and Assumptions have been well indicated in Table 4.5.



**Table 4.5: Project Logical Framework**

<b>Hierarchy of Objectives</b>	<b>Objectively Verifiable Indicators (OVIs)</b>	<b>Means of verification (MOV)</b>	<b>Assumptions</b>
<b>Goal (Impact):</b> Borehole drilling for household living in Isyesye Village.	Household Getting clean and safe water for human consumption	Survey and observation reports	Willingness of the people to disclose the way they obtain water
<b>Objective 1:</b> To sensitize 79 House Hold members in Isyesye Village on bore hole drilling project by July 2018			
<b>Output 1.1:</b> Meeting conducted every month	A meeting conducted	Meeting report	Positive response from the Village Community members
<b>Output 1.2:</b> 50 Household community members attended the meeting	50 community members sensitized on bore hole Project	Project progress reports	Community members positively respond to the meeting
<b>Activities</b>			
1.1 Advocacy meeting done to Isyesye Household members	50 Community members attended the meeting	Project progressive report	Readiness of community members to support the Project.

### **4.3.2 Inputs**

In the course of project implementation various inputs employed include human resources inputs from, financial resources inputs and materials input. Human resources were Isyesye members, Officers from Mbeya Water and Sanitation Authority, staff from Nyasa Drilling Company, sector expert from Irrigation Unit in Mbeya Training institute, and other development partners from VEO and WEO.

Financial resource is the major component in the implementation which was used for capacity building, purchase of project equipments and for payment of various expenses such as consultation cost, water and electrical bills, bore drilling permit, and Quality Check Certificate.

### **4.3.3 Staffing Pattern**

The project has one attendant who will be responsible for water check and collection of contribution. Also there is a watchman who will be paid in terms of honoraria hence the project premise is within the Household where the borehole is located. However, the implementation to a great extent was and will be assisted by Isyesye Community members, with assistance from VEO and WEO.

### **4.3.4 Project Budget**

The project budget was TZS.10, 760, 200/= Out of the total budget 9,000,000 cash was a contribution from Isyesye Household members and VEO and WEO contributed TZS.1, 760,200. The rest was a contribution in terms of electrical works from BEROYA Company and Nyasa Company contributed the work force and

drilling. All resources and inputs are in place water filtration machines which will filter water when comes with mad. Costing of items and for project equipments was done in collaboration with Isyesye Village leaders, sector institutions and Nyasa professions. The procurement was done by Isyesye Village leaders and technical personnel from the Mbeya Water and Sanitation Authority. The project budget was developed as table 4.6 indicates.

**Table 4.6: Project Budget - (1st Jan2018-1st July2018)**

Objective	output	Activity	Resources Needed	Qty	Unit Price	Total
<b>1.</b> To sensitize 79 House hold members in Isyesye Village On bore hole drilling project by June 2018	<b>1.1</b> meeting conducted every month	<b>1.1.1</b> To have a meeting	Consultant allowance	1	20,000	20,000
			Pen	10	1000	10000
			½ Rim Paper	1	5000	5000
		<b>1.1.2</b> To organize a day to discuss with VEO &WEO	Allowance for VEO	1	20000	20000
			Allowance for VEO	1	20000	20000
			Bites (Crisps)	50	700	35000
			Drinking water	50	700	35000
	<b>1.2</b> At least fifty household members attended the meeting	<b>1.2.1</b> Conduct sensitization meeting with house hold	Bites (Crisps)	50	700	35000
			Drinking water	50	700	35000
		<b>1.2.2</b> meet with Mbeya Water and Sanitation Authority	New print	2	500	1000
<b>2.</b> Site selection, Surveys	<b>2.1</b> Having a viable drilling site.	<b>2.1</b> Select of the consultant to evaluate the site.	Fare for 2 people	2	10000	20000
			Surveyor	1	180000	180000
		<b>2.2</b> Deployment of hydro geological tools	Transport cost	2	20000	40000
			Electrical cables (100m)Hamad Cable	100	4500	450000
			DPC switch	1	200000	200000
	<b>2.2</b> One professional selected	<b>2.2.1</b> Listing of professionals <b>2.2.2</b> stakeholders meeting for selection	Switch Socket	1	10000	10000
			Allowance for professionals	2	20000	40000
			Drinking water	50	700	35000
			Bites (Crisps)	50	700	35000
<b>3.0</b> Borehole Specifications	<b>3.1</b> Completed bore hole with required specs	<b>3.1.1</b> Selection of pump	Submerged Pump	1	750000	750000
			Drilling cost per metre	100	80000	8000000
		<b>3.1.2</b> Hiring consultant for selection of pump	Consultant allowance	1	50000	50000

	3.2 Consultants	3.2.1Meeting with stakeholders	Bites	50	500	2500	
			Drinking water	50	700	35000	
		3.2.2 Calculating the amount of water required	Pen	2	1000	2000	
			Consultant allowance	1	20000	20000	
4.0 Regulations	4.1 Drilling permit obtained	4.1.1Meeting with stakeholders	Allowances	3	20000	60000	
		4.1.2 Apply for drilling permit	Application fees	1	60000	60000	
			Fare	1	20000	20000	
			Envelope	1	100	100	
			4.1.3 Submission of required documents	Fare	1	20000	20000
		Envelope		1	100	100	
		4.2 Certificate of Quality check	4.2.1 Meeting with Stakeholders	Allowances	10	20000	200000
			4.2.2 Apply for certificate for Quality Check	Fare	1	20000	20000
				Cost for quality Check	1	272000	272000
GRAND TOTAL						10,760,200	

#### 4.4 Project Implementation

The proposed project will entail the drilling and equipping of one borehole, construction of pump house, laying 50mm diameter pipe GI class “B” and 63mm diameter uPVC pipe class “D” and a 1000Litres storage tank on a concrete tower.

The design period will be 7 months, with the initial year (when the new system is expected to be commissioned) taken as 2018, future year 2019 and ultimate year as 2020.

The design of the water supply system was carried out on the basis of the following design Codes and Standards, among others:

- i) WHO Report No. 4 - Selection and Design Criteria for Community Water Supply Projects;
- ii) Ministry of Water and Irrigation – Practice Manual for Water Supply Services in Kenya, 2006.

The above references are used in a complementary manner. Where requirements of two or more codes or standards are found to conflict, the more stringent of them was adopted for the purpose of this project.

**Borehole Drilling:** The borehole will be drilled to a depth 100m. The borehole yield is estimated at 5m<sup>3</sup>/hr for the purpose of design. Assuming that borehole will safely yield 70% the production will  $5.0 \times 0.7 = 3.5 \text{m}^3/\text{hr}$ . Assuming that the borehole will operate for an average of 8 hours.

Thus daily yield is  $3.5 \times 8 = 28 \text{m}^3/\text{day}$ . It is however apparent that the borehole yield will not be able to meet the demand even at the initial stage. The initial demand is  $76.80 \text{m}^3/\text{day}$ .

Once the borehole has been drilled, testing is done in order to:

- i) Confirm yield, efficiency and performance
- ii) Investigate water quality;
- iii) Assess whether abstraction can be sustained in terms of yield and quality;
- iv) Identify potential impacts; and
- v) Characterize the aquifer properties such as transmissivity, hydraulic conductivity and storage.

#### **4.4.1 Project Implementation Report**

The project implementation commenced on January, 2018 for undertaking preliminary stages of the project as it is well elaborated in Table 4.4 which is the project implementation plan and Gantt chart which is Table 4.7 under these guides the activities were executed sequentially which facilitated the effective realization of the set objectives. The responsible persons for the smooth implementation of the project were the CED student, host organization leaders, and selected members from Mbeya Water and Sanitation Authority.

Project implementation executed in a participatory way which involved different stakeholders in order to successfully implement the project. This approach was useful for it gave the way for the participants to get experience from one another on how to

undergo successful project implementation. Furthermore the participatory approach whereby household villagers are fully involved at every stage of implementation ensures project sustainability on the side of management and creativity. These concur with Liftin (2001) who revealed that, local people starts as clients of the project as they go on they become clients of the Project, ultimately they become owners of the project. This means that as they participate thoroughly throughout the project implementation they become experts on how to handle the project. The main areas in which villagers were involved include; identification of the place for construction of borehole sensitization of the community on bore hole drilling project, training on the use of different tools which are used in construction and installation of bore hole.

Other crucial activity was to ensure accessibility of funds for the project equipments. The task was successful achieved in collaboration with different stakeholders who were and are interested with the project which are VEO and WEO. In order for the project implementation to be implemented as it was planned, close monitoring was conducted by CED student in collaboration with the Village leaders. The CED student had to participate in the monitoring exercise in collaboration with the group monitoring team from the starting days to familiarize the group members on the monitoring tasks for the day to day interventions.

Evaluation activities was undertaken in terms of pre-evaluation which helped to detect the project feasibility and viability, intermediate evaluation to see whether the project activities are carried as planned. However, monitoring and evaluation allowed flexibility of activities to suit the prevailed environment of implementation



so as to realize the predetermined objectives and goal. Mid and annual evaluation is expected to be conducted soon after the project take off.

The task for searching the simple machine by the CED student in collaboration with the Consultant from Mbeya WSA and Nyasa Drilling Company in January, 2018. It was the time when we got a real price of the machine and procurement process started. Though the request to village leaders during the meeting on funds to purchase the machine sent since December 2017.

Distinct with the expectation, the constituency fund from VEO and WEO Released in March 2018 which fastened the procurement process.

#### **4.4.2 Project Implementation Gantt chart**

Gaunt Chart has been prepare to simply the intervention process and to indicate series of activities to be performed to ensure that all planned activities are implemented as planned, gaunt chart was prepared showing activities and their respective month to be implemented.

The gaunt chart shows the Objective, expected Output and the concerned activity. However, some of activities. The series of activities is well elaborated in Table 4.7.

**Table 4.7: Project Implementation Gantt chart**

Objective	Output	Activity	Activity Implementation Months						
			1	2	3	4	5	6	7
1. To sensitize 79 House hold members in Isyesye Village On bore hole drilling project by June 2018	1.1 meeting conducted every month	1.1.1 To have a meeting							
		1.1.2 to organize a day to discuss with VEO &WEO							
	1.2 At least one fifty household members attended the meeting	1.2.1 Conduct sensitization meeting with house hold							
		1.2.2 meet with Mbeya Water and Sanitation Authority							
2. Site selection, Surveys	2.1 Having a viable drilling site.	2.1 Select of the consultant to evaluate the site.							
		2.2 Deployment of hydro geological tools							
	2.2One professional selected	2.2.1 Listing of professionals							
		2.2.2 stakeholders meeting for selection							
3.0 Borehole Specifications	3.1 Completed bore hole with required specs	3.1.1 Selection of pump							
		3.1.2 Hiring consultant for selection of pump							
	3.2 Consultants	3.2.1Meeting with stakeholders							
		3.2.2 Calculating the amount of water required							
4.0 Regulations	4.1 Drilling permit obtained	4.1.1Meeting with stakeholders							
		4.1.2 Apply for drilling permit							
		4.1.3 Submission of required documents							
	4.2 Certificate of Quality check	4.2.1 Meeting with Stakeholders							
		4.2.2 Apply for certificate							

## **CHAPTER FIVE**

### **5.0 PROJECT PARTICIPATORY MONITORING, EVALUATION AND SUSTAINABILITY**

#### **5.1 Introduction**

This chapter discusses project participatory monitoring, evaluation and sustainability. Monitoring is the process of looking the implementation of day to day activities and facilitates to make improvements so as to achieve the desired goal. Evaluation is defined as systematic investigation of the worth or merits of an object. Monitoring and evaluation are linked together since monitoring sets benchmarks for evaluation. Thus monitoring and evaluation help to gather information needed to keep the project on schedule and predict problems as well as formulate solutions, measure progress and evaluate program success.

Under this part project progress is determined and it provides chance to the project implementers to see whether the project is in the right track or not. Project flexibility is very important in any project so as to ensure the successful implementation of the project.

#### **5.2 Participatory Monitoring**

Stone, Chauhan and Lissi (1994: 57) define Monitoring as the process of routinely gathering information on all aspects of the project. It provides managers with information needed to; analyze current situation, identify problems and find solutions, discover trends and pattern, keep project activities on schedule, measure

progress objectives and formulate/revise future goals and objectives, make decision on human, financial, and material resources. Participatory monitoring and evaluation therefore; are extremely important for learning about the achievement/deviation from original concerns and problems faced by local development projects or programs being implemented, so that corrective measures can be taken in time.

Participatory monitoring is the process in which the monitoring task done by involving the respective persons. For the case of bore hole drilling the members fully participated in the monitoring their daily activities so as to realize the predetermined objectives. The monitoring was undertaken on all activities arranged to be performed in the project. The essence was to determine the progress of the planned activities. Among the activities which were monitored include; sensitization meeting to the Isyesye Community members on bore hole drilling funds for project equipments procurement, safeguard of project equipments, lobbying and probing for fund collection, arrangement for fetching water license, training on how to run fruits processing machine and running fruits processing machine as a whole. Participatory monitoring was a useful tool for it gave opportunity to respective stakeholders to be aware of all activities undertaken in the project and it helped them to make their useful decision in different aspects

### **5.2.1 Monitoring Information System**

This is in which project activities are collected and reported according to the agreed or planned intervals. The reported information is useful to the project managers to plan, monitor, and undergo evaluation on the intervention of the project. The bore

hole drilling Monitoring Information System to establish data bank collected from different planned activities implemented in a certain period. The collected and kept data helped in the smooth run of the project and to find solution of the impediments occurred in the implementation process. Among the information which was needed by the project were; Number of apples producers and their respective number of fruits trees planted. Different information which were required by the project include; equipment requirement, inventory of project equipment, collection of funds and fenders, different project stakeholders, records on produced products, Required staffs for project daily running, training requirements, raw materials collected, market on the products, customers and members of the project. Accessibility of such information helps managers or leaders to arrange good plan for the project implementation, plan for monitoring and evaluation.

Under this system, a daily record book/sheet was prepared to enable all information to be entered for the use of different stakeholders including the group members themselves. The assigned apples processing project group members were responsible for recording daily project records for project development and for the preparation of the reports for different intervals. Normal intervals in fruits processing project was monthly, quarterly, and annual reports.

### **5.2.2 Participatory Monitoring Methods**

Different methods and techniques employed to ensure maximum participation of the village household group members in monitoring the underlined project activities. O&OD and PRA methods were used in participatory monitoring. However,

observations on the task in question, interview, discussion, and documentation tools were well utilized in the participatory monitoring. Under this approach the group members got chance to encourage one to another and other Isyesye community members including school children on bore hole drilling so as to get safe and clean water.

#### **5.2.2.1 Key Informants Interview**

In the implementation of the project some addition information were needed to some key informants including; Mbeya Urban and Water Supply Authority , and Nyasa Drilling Company ,District officials ( Health officer), Ward leaders (WEO and Councillor) Village leaders, and members from nearby Schools. The information gathered by the researcher in collaboration with village leaders through interview. Through these interviews and discussions it was agreed that the supervisors who are the village leaders should sensitize the house hold on the importance of borehole drilling.

#### **5.2.2.2 Observation**

Observation was another useful way used by Village leaders in collaboration with the researcher, village leaders, Consultant from Mbeya WSA to see if the planned activities were implemented smoothly as planned. Under observation project equipments procured, premises, how the bore hole will be far from the contaminants and the sensitization meeting attendants were well observed and justified for fund collection. Another observation task will include the real project take off and the inauguration activity which are both under construction.

### **5.2.2.3 Documentation**

Different document pertaining bore hole drilling project were to be kept in good order. The documents prepared and kept included; Water Quality Check Certificate, Drilling Permit and purchase of materials and pumps, important letters from Mbeya City Council, Different receipt books and payment vouchers, different minutes for various meetings, daily product records, list of project equipments and list of names contribution to the project.

The project funding records was the necessary document to be kept into good custody for successive implementation of the project. In general all transaction done was to be documented and well-kept by the respective persons. The Village chairperson had to ensure that the group secretary and the treasurer keep all necessary documents for the use of the project members and other project stakeholders. The CED student assisted the group members on the good way of writing and keeping different report in good manner. The CED student in collaboration with district officials, Chairperson of the group designed and prepared a daily record sheet/book for income received and income generated for the scientific run and sustainability of the project.

### **5.2.3 Participatory Monitoring Plan**

The Monitoring plan is going to be formulated by the Fund raising committee and it will be used as a guide in the follow up process.

- i) There will be a weekly financial report and these reports will be reported in monthly CBO meetings.

ii) Monitoring is going to be a participatory in nature involving community leaders and members.

iii) The Monitoring chart.

Focal area and issues, which will be monitored in a checklist, include:

i) Organization and Management

ii) Community participation

iii) Money Management from fetching water to nearby village community members

iv) Operation and Maintenance

v) Hygiene and Sanitation

vi) Linkages and Relations with other stakeholders

vii) What conflict have Community water committees found difficult.



**Table 4.8: Monitoring Checklist**

Organization and Management	<ul style="list-style-type: none"> <li>✓ Are decision made democratically or is it a one- man show.</li> <li>✓ Are tasks shared well among community Newbern –</li> <li>✓ How are women involved in decision making</li> <li>✓ Are meetings regular how effective are the meetings look at the action plan and minutes of the meeting.</li> </ul>
Household participation	<ul style="list-style-type: none"> <li>✓ How often does water and sanitation Committee with the community</li> <li>✓ Active Participation in communal tasks</li> </ul>
Money Management	<ul style="list-style-type: none"> <li>✓ Types of collection method effect ion</li> <li>✓ Bank Account details</li> <li>✓ How much has been collected/ banker</li> <li>✓ Bookkeeping; books available for financial records and how are they written.</li> <li>✓ Regular Financial reporting to community members</li> <li>✓ Account ability regular reporting to the community</li> </ul>
Operation and Maintenance	<ul style="list-style-type: none"> <li>✓ Status of water scheme</li> <li>✓ How often does the caretaker inspect the pump –</li> <li>✓ Stock of spare on hand maintenance record</li> <li>✓ Regular cleaning of water points</li> </ul>
Hygiene, Sanitation	<ul style="list-style-type: none"> <li>✓ What has community/household done regarding H &amp; S action plan?</li> <li>✓ Are people using improved water supply?</li> <li>✓ Have people chapped behavior of pouting water at the river</li> <li>✓ Are people and using cleaning building toilets properly</li> <li>✓ Have practices of disposing of human excreta improved?</li> <li>✓ What are the improved hygiene practices eg. Hand washing bathetic.</li> </ul>
Linkages and Relations with others	<ul style="list-style-type: none"> <li>✓ What support has water sanitation and hygiene committee receive and village.</li> </ul>
What conflict are found difficult	<ul style="list-style-type: none"> <li>✓ What links does CWSHC how with village council</li> </ul>

### **5.3 Participatory Evaluation**

Is the process of gathering and analyzing information to determine whether the project is carrying out its planned activities and it investigate if the project is achieving its stated objectives. Deep a Narayan, 1993 defines participatory monitoring and evaluation that “is a process of collaborative problem solving through the generation and use of knowledge. It is a process that leads to collective action by involving all level of stakeholders in shared decision making” From the definition the key concept is involvement of stakeholders and collective actions towards problem solving or improving the situation. That evaluation to be termed as a participatory evaluation should involve stakeholders at different levels who will work together to assess the project so as to take corrective action required.

Evaluation is a continuous process of assessing the success of a plan. This project will be done under two types of evaluation:

- i) In built or formative evaluation which will be done as implementation proceeds and
- ii) Terminal or summative evaluation which in usually done at the end of the plan period.

Participatory Evaluation will have the following benefits

- i) Evaluation helps to revise the aims objectives and implementation of the plan.
- ii) It helps to re-budget.
- iii) Evaluation explores weaknesses and suggests correcting measures.

Business plan, contribution from Villagers, monitoring and evaluation plans are very important parts of this project work. All these activities are a process and so they pass in review stages, continuously.

Apart from, many other advantages participatory evaluation guides the community members to see the successes and failures and they give room for discussion among stakeholders among many advantages.

In course of action while implementing the bore hole drilling project the community members, livestock keepers, school members, and other stakeholders were involved in the community needs assessment exercise they found that establishment of bore hole drilling were worthwhile for getting safe and clean water for domestic use around the household in Isyesye Village. After they agreed on the project they discussed and set project goal, objectives and activities that need to be implemented. Also they discussed when to conduct evaluation how, when and who will be responsible. With the assistance of CED student they prepared an action plan agreed to evaluate the project after six month (Mid).

### **5.3.1 Performance Indicators**

Performance indicators of the bore hole drilling project fall in two categories qualitative and quantitative based on project objective and project goal. To measure the input indicator members were to examine resources that were utilized in project implementation that include number of hours, money spent while for output indicators involves number of village members, livestock keepers and project staff

trained whereas impact indicators will be measured by examining actual change to house hold members . Those village members are expected to improve their standard of living by fulfilling their basic needs such as ability to have three meals, quality housing and improved healthy. Project goal and project objectives performance indicators were developed as shown in Table 4.9.

**Table 4.9: Project Performance Indicators**

<b>Objective</b>	<b>Output</b>	<b>Activity</b>	<b>Resources Needed</b>	<b>Performance Indicators</b>
<b>1. To sensitize 79 House hold members in Isyesye Village On bore hole drilling project by June 2018</b>	<b>1.1</b> meeting conducted every month	<b>1.1.1</b> To have a meeting	Consultant allowance	Number of participants attended the meeting
			Pen	
			½ Rim Paper	
		<b>1.1.2</b> To organize a day to discuss with VEO &WEO	Allowance for VEO	Number of participants attended the meeting
			Allowance for VEO	
			Bites (Crisps)	
			Drinking water	
	<b>1.2</b> At least fifty household members attended the meeting	<b>1.2.1</b> Conduct sensitization meeting with house hold	Bites (Crisps)	Number of participants attended the meeting
			Drinking water	
		<b>1.2.2</b> meet with Mbeya Water and Sanitation Authority	New print	Meeting minutes
			Fare for 2 people	
<b>2. Site selection, Surveys</b>	<b>2.1</b> Having a viable drilling site.	<b>2.1</b> Select of the consultant to evaluate the site.	Surveyor	Selection criteria
			Transport cost	
		<b>2.2</b> Deployment of hydro geological tools	Electrical cables (100m)Hamad Cable	BOQ
			DPC switch	
			Switch Socket	
	<b>2.2</b> One professional selected	<b>2.2.1</b> Listing of professionals	Allowance for professionals	List of professionals
		<b>2.2.2</b> stakeholders meeting for selection	Drinking water	List of attendees
			Bites (Crisps)	
<b>3.0 Borehole Specifications</b>	<b>3.1</b> Completed bore hole with required specs	<b>3.1.1</b> Selection of pump	Submerged Pump	List of specification
			Drilling cost per metre	
		<b>3.1.2</b> Hiring consultant for selection of pump.	Consultant allowance	List of pumps
	<b>3.2</b> Consultants	<b>3.2.1</b> Meeting with stakeholders	Bites	List of attendees
			Drinking water	
		<b>3.2.2</b> Calculating the amount of water required	Pen	List of attendees
			Consultant allowance	

<b>4.0</b> Regulations	<b>4.1</b> Drilling permit obtained	<b>4.1.1</b> Meeting with stakeholders	Allowances	Acknowledge of receipt
		<b>4.1.2</b> Apply for drilling permit	Application fees	Certificate of application
			Fare	
			Envelope	
		<b>4.1.3</b> Submission of required documents	Fare	Delivery note
			Envelope	
	<b>4.2</b> Certificate of Quality check	<b>4.2.1</b> Meeting with Stakeholders	Allowances	Water analysis Report
		<b>4.2.2</b> Apply for certificate for Quality Check	Fare	Application Report
			Cost for quality Check	

### **5.3.2 Participatory Evaluation Methods**

Participatory evaluation method used two methods being Participatory Rural Appraisal (PRA) and Participatory Learning Action. Both methods were in use depending on available resources, environment, and required information. The PRA techniques used are Key informant Interview, Focus Group Discussion, Direct Observation and Meetings. Main issues to be evaluated were agreed through democratic way during the visit, Planning meeting and monthly meetings. The participatory evaluation will focus on progress in work plan, Implementation of planned activities, Achievement of Objectives, Project success, Impact of the project and Project sustainability. In order to have a clear understanding and flow of in formations, a check list were prepared to guide the discussion during the meeting, Key Informant Interview and Focus Group Discussion during the meeting.

For the case of bore hole drilling Project Key informants were village members, Project Manager(who is the CED students) Watchman . Observation was used to examine the information collected during the meetings. The collected data and information involved investigating project performance in line with participatory evaluation objectives. That is to check whether planned activities were accomplished according to plan then project outcome were evaluated. Based on participatory evaluation exercise the following results were observed.

During the meeting, when discussing about poor “Bore hole Drilling” participants were in a position to give live examples of people who have poor health and how

troublesome is, to their family members for not getting safe and clean water. They also gave data to those who have diagnosed with typhoid from drinking unsafe water. Village Executive Officer and Ward Executive Officer since they mobilizes community members and household members about the project output or outcome. The implementation of second objective (capacity building) was done as planned by 90%.

Unexpectedly, objective of collaborating with other stakeholders to seek advice and support were met as stakeholders showed immediate positive response. Three stakeholders namely Mbeya Water and Sanitation Authority and Mafanikio Primary School played a great role in the implementation of the project and achievement of project objective. The procedure (modus operandi) used to establish the project from CNA, project planning, budgeting, project implementation and evaluation plan are methodologies that contributed to get support from the stakeholders.

### **5.3.3 Project Evaluation Summary**

Table 4.10 indicates the project evaluation summary based on the project goal, objectives, performance indicators, expected outcomes and actual outcome. Based on the project goal, objectives and activities planned have been met with exception of mid and annual evaluation that will be done after three months of project implementation. Generally the evaluation shows that there are strong commitments of various stakeholders from the planning stage to the implementation activities. This indicates that the project is the real need to the direct beneficiaries and community members at large.



**Table 4.10: Project Evaluation Summary**

<b>Objective</b>	<b>output</b>	<b>Activity</b>	<b>Performance Indicators</b>	<b>Expected Outcome</b>	<b>Actual Outcome</b>
<b>1.</b> To sensitize 79 House hold members in Isyesye Village On bore hole drilling project by June 2018	<b>1.1</b> meeting conducted every month	<b>1.1.1</b> To have a meeting	1.1.1 Number of participants attended the meeting	1.1.1Positive Reponses	1.1 A total of 50 members attended
		<b>1.1.2</b> To organize a day to discuss with VEO &WEO	1.1.2 Number of participants attended the meeting	1.1.1 Positive responses	1.1.1 A total of 2 (VEO and WEO) attended the meeting
	<b>1.2</b> At least fifty household members attended the meeting	<b>1.2.1</b> Conduct sensitization meeting with house hold	1.2.1.1 Number of participants attended the meeting	1.2.1 Positive responses	1.2.2. A total of 50 household attended the meeting
		<b>1.2.2</b> Meet with Mbeya Water and Sanitation Authority	1.2.1.2 Meeting minutes	1.2.2 Positive responses	1.2.2.1 A total of 3 experts from Mbeya WSA attended
<b>2.</b> Site selection, Surveys	<b>2.1</b> Having a viable drilling site.	<b>2.1</b> Select of the consultant to evaluate the site.	2.1.1Selection criteria	2.1.1.1 Site obtained	2.1.1 A total of two sites selected
		<b>2.2</b> Deployment of hydro geological tools	2.2.1BOQ	2.2.1 list of BOQ	2.2.1 A BOQ with lower amount selected
	<b>2.2</b> One professional selected	<b>2.2.1</b> Listing of professionals	List of professionals	2.2.1 List obtained	2.2.1 three expert obtained to support
		<b>2.2.2</b> stakeholders meeting for selection	2.2.2.1List of attendees	2.2.2 Positive Responses	2.2.2 A total of 60 members attended
<b>3.0</b> Borehole Specifications	<b>3.1</b> Completed bore hole with required specs	<b>3.1.1</b> Selection of pump	3.1.1 List of specification	3.1.1 Pump obtained	3.1.1 list of selection obtained
		<b>3.1.2</b> Hiring consultant for selection of pump.	3.1.2.1 List of pumps	3.2.1.1 Clear list of pumps obtained	3.2.1 Sub merged pump obtained
	<b>3.2</b> Consultants	<b>3.2.1</b> Meeting with stakeholders	3.2.1 List of attendees	3.2.1.1 Positive responses	3.2.1.1A total of 50 members attended
		<b>3.2.2</b> Calculating the amount of water required	3.2.2 List of attendees	3.2.2 Clear calculation	3.2.2.1.Quantity of water required obtained

<b>4.0</b> Regulations	<b>4.1</b> Drilling permit obtained	<b>4.1.1</b> Meeting with stakeholders	4.1.1 Acknowledge of receipt	4.1.1 Positive responses	4.1.1.2 A total of 50 members attended
		<b>4.1.2</b> Apply for drilling permit	4.1.2 Certificate of application	4.1.2 Certificate	4.1.2 Certificate obtained
		<b>4.1.3</b> Submission of required documents	4.1.3 Delivery note	4.1.3 Documents agreed	4.1.3 Documents accepted
	<b>4.2</b> Certificate of Quality check	<b>4.2.1</b> Meeting with Stakeholders	4.2.1 Water analysis Report	4.2.1 Positive responses	4.2.1 Certificate obtained
		<b>4.2.2</b> Apply for certificate for Quality Check	Application Report	4.2.2 Getting Certificates	4.2.2 Certificate available

## **5.4 Project Sustainability**

Project sustainability is the capacity of a project to continue functioning, supported by its own resource (human, material and financial) even when external source of funding have ended. It is commonly known as a state whereby the project functions will totally depend on its own resources. However, it is very important to the village members to develop its own definition of sustainability, the links between community's own contexts, focus, and the state of affairs.

### **5.4.1 Institutional Sustainability**

The sustainability of bore hole drilling project household members in Isyesye village is most likely to be sustainable since human resource (community members, livestock keepers, project staff, and Mbeya Water and Sanitation Authority staff and other stakeholders) are readily available towards project implementation. Essentially the materials required as inputs are used by the beneficiaries themselves (water). Other material input are in place that once depreciate replacement is within the project's capacity.

Capacity building done to village house hold members in filtration of water using sand filters will contribute to increased water capacity in future. Referring to the information gathered from key informants and focus group discussion during the CAN exercise, it was revealed that despite little amount of water and low price of water per bucket still they appreciated that they gains money to access basic needs. Thus established bore hole Drilling is a liberty since it will enable school children and villagers around Isyesye to be engaged in other socio-economic activities due to

time saved from going around house to house looking for water. Also training to village members and project staff on business management will contribute to project sustainability since they are sure of profit making and employment. The community participation in identifying, designing, planning, implementation, monitoring and evaluation of the project is the key issue that creates sense of ownership that leads to sustainability of the project.

#### **5.4.2 Financial Sustainability**

The bore hole drilling project has started readily with TZS **10,760,000/=** as the starting capital for bore hole drilling. Additional funds will be collected as per agreement with fetchers by charging a certain percentage per liter of 50tsh per bucket. As it was proposed by villagers during the meeting that water collector will form an organization whereby money will be collected from water collection fee. Organization members will get loan that capital investment and pay a reasonable interest that will be used for development of members and the project.

#### **5.4.3 Political Sustainability**

The borehole drilling project is directly supporting the NAPO, the Nation Strategy for growth and Reduction of Poverty II. That being a case, the local leaders at village level, Councilors, Executive Officers at ward level and District Council chairperson and DED are in favors of the project. Efforts done by various stakeholders, development partners to support the bore hole drilling project has created good environment between local government and community members.

## **CHAPTER SIX**

### **6.0 CONCLUSION AND RECOMMENDATIONS**

#### **6.1 Introduction**

This chapter provides an over view of bore hole drilling project in Isyesye Village. It gives the summary of the whole process and steps undertaken since the identification of the project, problem identification up to the project implementation outputs. The areas which have been summarized in this chapter include; Community Needs Assessments (CNA), Problem identification, Literature review, Project implementation, Participatory Monitoring, Evaluation, and ultimately the sustainability of the project. In general, the chapter shows in nutshell what have been discussed in all chapters.

#### **6.2 Conclusion**

The government of Tanzania has placed Water and Environmental sanitation as a key pillar in its poverty reduction strategy. Tanzania has also actively participated in the global efforts to achieve Millennium Development Goals and World Summit on sustainable development. The goals aims at targets on water and sanitation, that is, to reduce by at least half the country's population that is without access to safe and adequate water and sanitation by 2015. This implies that the sector needs to adopt urgent and well-coordinated strategies and actions to ensure that coverage of both water supply and sanitation is accelerated and sustained.

Understanding the link between Poverty water and sanitation is very necessary. Water is essential to life and is part of every cell furthermore is necessary for most

basic functions like respiration and digestion Access to clean and safe water is a major requisite for poverty reduction, improving human health conditions promoting sustainable development .At the same time however, contamination from human activities are threatening the quality of water and human health. Shortage of water causes many defects socially and economically.

Tanzania National Water Policy- NAWAPO consists of three components: Water Resources, Rural water Supply and Urban water Supply and Sewerage activities. Luhumbika (2000) analyses basic facts of water from the Policy as basic natural recourses for economic development, a common use resource, a unique component of our environment, a resource with great pressures and demands. Social economical and sectarian water concerns involve water supply, sanitation, Agriculture, Livestock, Industries, Energy, Mining Environmental water needs, fisheries, Wildlife, Forestry, Transport, Health, and sanitation.

Breaking the water shortage cycle requires community problem identification, implementation and participatory decisions on solution to their problems. Also investment in water supply and sanitation to ensure availability of water supply and wastewater disposing facilities will just supplement community initiatives. Changes in personal hygiene behaviors and practices are the most difficult challenge but it is possible to use water education campaigns to reduce and eventually save the problem at peri- urban areas like Isyesye. A clear choice has to be made between capital intensive and intermediate technologies in peri-urban areas.

Community water supply contribution poses a number of issues in the National Water Policy and strategies. The basic question is on what principles community cash contribution can be appropriately designed.

The study has found out that water shortage contribute to social and economic problems to human beings. Some of these problems are low income, poverty, low nutrition, and water related diseases and malnutrition. Apart from those time wastage by women fetching water and eruption of water related diseases are another outcome of water shortage. This water related diseases include diarrhea, Typhoid, Dysentery, Infectious skin, eye, Schistosomiasis and Malaria diseases.

Among several water problems in urban settlements, which contribute to water deficient, found through the study are poultry and urban agriculture, groundwater pollution, poor sanitation and drainage services, low rainfall intensity, high water demand, lack of water supply network and poor housing.

House hold community members which were the hosts of this study have shown a great interest in participating in identifying problems affecting their lives and suggesting the solutions to solve their problems. The community members have accepted to contribute in kind and in cash, contributing building materials and simu tanks. The majority of the people promise to contribute cash and in kind. It is therefore possible to raise some money as part of the required financial resources for borehole construction if the communities are well sensitized.

Inadequate water and sanitation services to poor people increase their living costs, lower their income, damage their well-being, and even make life more miserable if not risky. Inappropriate school sanitation or total lack of toilets and latrines serving the pupils is a factor that prevents girls from continuing with their education causes low enrolments and lead to low performance academically. Possibly the borehole construction will reduce the cost of living among Isyesye community members. Income generating activities available in the community like poultry, bar, local brew, car wash, horticulture and hotels will be more health and productive.

Women who have been taking the burden of water shortage will have reduced workload. They will also do activities that are more productive and hence get more time to care for the families. Malnutrition level will go down due to the availability of balanced —diet due to rearing of cattle, poultry, eggs and production of green vegetables .The availability of water will control water related diseases along with water education campaign and personal hygiene among community members.

Community Cost Sharing has aroused a Critique with two assumptions. Water supply needs operating and maintenance cost, also free water supply has not ensured effective management of the constructed schemes, which has resulted into poor services to the majority of the rural population. Water is a basic need for human life. If water will be paged to open market poor people will be denied this right. Binamungu (2002) possess issues which are willingness and ability to pay, people's altitude towards paying, and Sources of income of the poor people.



For Water development to match with the current economic growth Tanzania being a country where service of water was seen as a free service, education on the stakeholders will be important so as to march with the current economic growth. The government alone will not be able to meet the demand of water supply for the communities from its own resources except by using capital from investors. In order to trace a source of failure, it is important to follow a certain pattern of the model for any project operation and Management. The model for public-private partnership suggested by Mashauri & Kayombo (2001) is a symbol of operational procedures for better performance and achievement of the goals set. There is no doubt persistent poor performance by MBEYAWWSA, especially increasing failure to provide sufficient and reliable water supply and sanitation services coupled with the inability to maintain existing systems and so call for search for alternatives and interventions. Underground water proposed risks could also be taped with the use of deep wells with depth of about 50 to 100 meters. Improved drainage and methods of dealing with wastewater are the most effective ways to stem the spread of cholera, malaria diarrhea, typhoid, and worms' diseases. Reducing the mosquitoes' breeding sources and ground water management by the Community Councils will reduce almost all types of health and water security risks in great amount.

Monitoring and evaluation are very important parts of sustainability of any development project. The evaluation in this water project will be done in a participatory way as indicated in the action plan. Questionnaire, interviews, observations and pictorials will be the main tools in this exercise. All stakeholders of this project will do these important activities.

Towards Village level Operation and maintenance will solve the global problem of maintenance. In the attempt to solve this problem UNDP recently launched the a strategy termed Village Level Operation and Maintenance (VLOM) Blanchard (1984) .This aimed at full responsibility of the community for the operation and maintenance of its own water supply. They should eventually result in a reduction of government expenditure.

Readiness of the villagers to pay and take care of the water supply will largely depend on factors such as the extent to which the community is involved in all phases of the water supply projects. This will impart a number of benefits including; sense of ownership of the water supply schemes, availability and means of income for borehole maintenance, monitoring and evaluation processes.

### **6.3 Recommendations**

The income rising for borehole construction will be successful if managerial and financial management skills are imparted to community and Village leaders.

- i) Collaboration between Village leaders and local government will promote community members' awareness and participation.
- ii) Municipalities should conduct and finance regular seminars and meetings among village leaders to facilitate sharing of experience and suggesting ways in which community members can solve their own problems through community initiatives.

- iii) All development projects designs have to be gender sensitive so as to reduce the burden of poverty to vulnerable like women and girls. Organizations should involve women in all processes in all development projects.
- iv) Community workers working at the municipalities in the city are in a position to assist Village and NGO for technical assistances instead of remaining in the offices.
- v) Due the pathetic poverty situation of poverty in urban settlements, financial mobilization and capacity building of Village leaders is very necessary .The government has to incur some cost by providing monthly allowances to theses leaders so that they can be able to meet their ends while working to mobilize other community members.
- vi) Community capacity building and empowerment is essential for economic development.
- vii) In order to attain Millennium goal of gender equity and equality community Based Community work in urban settlement is very difficult and so there is a need to sensitize people on the advantages of contributing to public goods for their own development.
- viii) The link between Village leaders will enhance community participation in development.

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## APPENDICES

### APPENDIX 1. Questionnaire

Dear respondent,

You have been selected in the above titled study which is being carried out as part of an education research in partial fulfillment of the requirements for the award of a Master's of Community Economic Development of Open University. Your co-operation in filling this questionnaire will lead to the success of the survey.

Responses shall be treated confidentially and apply only for education purposes.

Date of Survey: .....

Name of Respondent: .....

Signature of Respondent:.....

### BACKGROUND INFORMATION

1. SEX: (i) Male (ii) Female

2. AGE: (i) (10-18) ☐ (ii) (19-25) ☐ (iii) (26-40) ☐ (iv) (41-60) ☐  
(v) (61 and above) ☐

3. MARITAL STATUS: (i) Single ☐ (ii) Married ☐ (iii) Divorced  
(iv) Widowed ☐

## 4. Details of respondents

Members of Household	Number	Sex	Age	Employment				Education level	Water consumed/ day in liters
				Formal	Informal/ part time	Self employed	None		
Head of the House/Father									
Spouse/ Wife									
Sons									
Daughters									
External Family members									

Hint on level of education: (i) Primary ☐ (ii) Secondary ☐ (iii) Vocational ☐  
 (iv) Tertiary ☐

## 5. What are the sources of the water that you consume as a household?

(i) Borehole water ☐ (ii) Rain water ☐ (iii) River water ☐ (iv) Stream water ☐ (v) Well water ☐

State any other sources of water that you use?.....

## 6. What is the overall number of 20 liter jerry cans of water that you use as a family? Considering all sources of water?.....

## 7. How many 20 liter jerry cans of borehole water do you use as a family in?.....



8. Is the amount of water you use as a family sufficient for you? (i) Yes ☐  
(ii) No ☐
9. Would you consume more amounts of water given the right conditions? If so  
How many more liters would you consume?.....
10. Is there any variations in amount of water consumed in dry and wet seasons? If  
yes, by what amounts.....
11. What are the major hindrances in use of more water for your household?  
.....
12. Do you boil borehole water before drinking? (i) Yes ☐ (ii) No ☐  
If yes, why? .....
13. What negative things have you found with the water itself/ Quality?
14. (i) Taste ☐ (ii) colour ☐ (iii) Odor ☐
15. State any other thing that you dislike about the water? .....
16. 14. What human activities are being carried out about 30m from the borehole?
17. (i) Toilet establishment ☐ (ii) Animal farm ☐ (iii) Agricultural practices ☐
18. (iii) Grave yard ☐ (iv) Petrol Station ☐
19. State any other activities .....
20. What challenges have you faced or identified with the use of borehole water  
resources?
- (i) Quantity ☐ (ii) Quality ☐ (iii) Distance ☐ (iv) Seasonality ☐  
(v) Fees  
(vi) Restrictions to the amount of water consumed per household ☐  
(vii) Management ☐ (viii) Congestion. ☐  
If management state areas of concern.....

State any other challenges? .....

21. 16. What are your observations about the quality of borehole water, comparing the dry and wet seasons.....

.....

22. What suggestions do you have for improving borehole water quality and services?

(i).....

(ii).....

(iii).....

(iv).....

## **APPENDIX 2: Application Letter for Borehole Drilling in Isyesye Village**

Wananchi wa Kijiji Cha Isyesye  
Kata ya Itezi  
Mbeya

Mkurugenzi Mtendaji,  
Idara ya Maji Mbeya  
P.O.BOX  
Mbeya

Ndugu,

### **YAH: OMBI LA KUCHIMBA KISIMA KATIKA KIJIKI CHA ISYESYE**

Husika na somo la kichwa cha habari hapo juu, Sisi wancani wa kijiji cha Isyesye tuna tatizo kubwa la ukosefu wa maji safi na salama ya kunywa kwani eneo hili ni makazi mapya na lipo kisheria ,kutokana na khali hiyo tumeamua kuchanga pesa kupitia kikundi chetu kijulikanacho kama Tupendane na kuweza kupata kiasi cha shilingi million kumi. Hivyo kutokana na ukosefu wa maji katika kijiji chetu tumeamua pesa hiyo itumike kwa ajili ya kuchimbia kisima cha kisasa cha maji ambacho kitahudumia wakazi wote wa kijiji hiki.

Kwa barua hii tunaomba kibali chako kama mhusika mkuu uliyepewa mamlaka ya kusambaza maji katika manispaa ya mbeya cha kuturuhusu tuweza kuchimba kisima ili tuondokane na adha hii kwani kama utambuavyo maji ni uhai. Tunatanguliza shukurani zetu,

Kwa niaba ya wanakijiji wa Isyesye, ni mimi  
Mwampalila

Mwenyekiti wa kikundi/Balozi