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SOUTHERN NEW HAMPSHIRE UNIVERSITY

MASTERS OF SCIENCE IN COMMUNITY ECONOMIC DEVELOPMENT  
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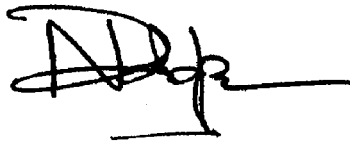
A PROJECT PROPOSAL FOR A BOREHOLE WATER SUPPLY  
AT MACHIMBO, VITUKA WARD,  
TEMEKE MUNICIPALITY,  
DAR ES SALAAM.

KIRENGA DIALISTA APPIA

A PROJECT SUBMITTED IN THE PARTIAL FULFILMENTS FOR THE  
REQUIREMENTS FOR THE DEGREE OF MASTERS OF SCIENCE IN  
COMMUNITY ECONOMIC DEVELOPMENT IN THE SOUTHERN NEW  
HAMPSHIRE UNIVERSITY AND OPEN UNIVERSITY OF TANZANIA

**CERTIFICATION**

Undersigned certify that he has read and hereby recommend for acceptance by The Southern New Hampshire University and Open University of Tanzania a project paper entitled A Project Proposal for a Borehole Water Supply At Machimbo, Vituka Ward ,Temeke Municipality, Dar es Salaam, in partial fulfilment of the requirements for the degree of Masters of Science in Community Economic Development ( CED)



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Mr. Deus D Ngaruko

## DECLARATION AND COPYRIGHT

I, **Dialista Appia Thomas Kirenga**, declare that this project paper is my 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.

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## **ACKNOWLEDGEMENT**

This assignment has been accomplished through collaboration and assistance from a number of individuals. My utmost and sincere gratitude goes to my all lecturers. Special appreciation should go to my Supervisor Mr. Ngaruko D.D.P who has been most helpful in expounding my thinking and improving the presentation of the issues academically. I would especially like to thank Program Director and course instructor Mr. Michel Adjibodou, who also assisted me academically during my course of doing this work. I would like also to thank the CED Programme coordinator Madame Rukia Masasi for her encouragement and patience.

This project work could not be possible without the acceptance and welcome I got from Vituka Machimbo Development Association Community Based Organization. The assistance, cooperation and commitment of the CBO leaders and members of VMDA made this work very possible. Without the good relationship with Local government leaders it could be impossible to get full participation from the community members. Their cooperation brought a lot of success.

Every academic work is subject to financial implications. Financially I got a support from The Principal, Water Resources Institute, Mr Benedict Michael, who supported me with tuition fee and other supportive material, through the Ministry of Water and Livestock development.

When a mother or wife is occupied by academic work, a husband and children especially in the family suffer a lot. I am so grateful to my family for being so tolerant during the time of my master's degree studies. More important I hope my husband Mengi and my children Tonga and Elson will forgive me as this has taken me from family activities. Their support is a key to my survival.

While all these have any gratitude for their support, I take full responsibility for any errors, omission, or inadequacy in the views and results presented here.

## **DEDICATION**

I dedicate this work to my beloved husband **Engineer Prof. Mengi E.Kaseva**;  
my lovely children **Tonga and Elson** and my dear mother **Mrs. Elieshi Gadi Kirenga**  
They all displayed a highly valuable sense of patience during my career progression  
and are always  
a source of encouragement through out my life.

With Love

## **ABSTRACT**

The main objective of this study was to write a project proposal for a borehole construction for poverty alleviation for a Community Based Organization namely Vituka Machimbo Development Association (VMDA). The conceptual framework was tested through a survey of 120 community members 64 males and 37 females in Machimbo area at Vituka ward Temeke Municipality Dar es Salaam. 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 CBO leaders and local government leaders. The proposal prepared as a result of this study will enable the government and donors to top up the 5% of the total cost of the borehole construction which will supply water to community members and therefore reduce poverty in the community.

Indeed the study has gradually evolved an appreciation of the need to take a much more holistic approach to study on the water security of boreholes in high density and low-income settlements in peri urban areas in Dar es Salaam city. This would mean grounding theoretical frameworks much more on solutions to water problems in Dar es Salaam for poverty alleviation.

## **LIST OF ABBREVIATIONS**

<b>CBD</b>	Central Business District
<b>CBO</b>	Community Based Organization
<b>DAWASA</b>	Dar es Salaam Water and Sanitation Authority
<b>IMF</b>	International monetary Fund
<b>IPTRID</b>	Funded Program for Promoting Technology and Research in Irrigation and Drainage
<b>MoAC</b>	Ministry of Agriculture and Cooperatives
<b>MWLD</b>	Ministry of Water and Livestock Development
<b>NAWAPO</b>	National Water Policy
<b>NEMC</b>	The National Environmental Management Council
<b>PRSP</b>	Poverty Reduction Strategy Paper
<b>PUI</b>	Peri-Urban Interface
<b>RWH</b>	Rain Water Harvesting
<b>TASAF</b>	Tanzania Social Action Fund
<b>TDS</b>	Total Dissolved solids
<b>UNCHS</b>	United Nations Center for Human Settlement (Habitat),
<b>UNDP</b>	United Nations Development Program
<b>UNEP</b>	United Nations Environment Program
<b>UNESCO</b>	United Nations Education Scientific Organization
<b>UWSAs</b>	Urban Water Supply Authorities
<b>VLOM</b>	Village Level Operation and Maintenance
<b>VMDA</b>	Vituka Machimbo Development Association
<b>WRI</b>	Water Resources Institute
<b>WSP</b>	Waste Stabilization Ponds
<b>WSS</b>	Water Supply and sanitation

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## **CHAPTER ONE**

### **Introduction**

#### **1.1 Background information**

Water is one of the essential commodities to human life; all living organisms, plants and nature in general depend on water for their survival. About 60% of human body is made of various types of fluids, which contain water. Some studies have shown that water supply has never sufficed the world demand. The UNESCO report of 1990 revealed that about 85 million people in urban areas around the world were without adequate water and hygienic sanitary facilities. Provision of water supply and sanitation systems in urban centers of many developing countries like Tanzania is a challenge that has generally remained unmet.

As such most expanding cities in developing countries example Dar es Salaam in Tanzania are faced with the problems of water shortage, and in many cases there are gross irregularities in urban water supply system. There are communities where only a few public standpipes serve more than a thousand inhabitants. Some studies example Kyessi (2000) has shown that in a number of unplanned settlements in Dar es Salaam city, residents have organised illegal tapings from the water mains because the water authorities have not provided them with adequate water supply services. Low-income communities, and particularly unplanned settlements example Vituka Machimbo which is a case study area for this research work, are usually given the lowest priority in water provision as compared to other urban communities.

In many poor urban communities, irregular water supply or extreme low-pressure cause long queues at public standpoints. As a result, people especially women are forced to fetch water of poor quality from streams and ponds thus highly risking their lives. Alternatively they have to depend on mobile water vendors who sell water in small quantities and at prices usually higher than the cost of water supply through homes connections in the middle and high-income areas. Kironde (1999) has reported that, in Dar es Salaam city the main sources of water for vendors are public taps, private taps, surface water sources, shallow wells and that the price per 20 liters bucket ranges from Tshs 20.00 to 500.00 (US \$ 0.019 to 0.47).

## **1.2 Need for provision of adequate and potable water supply in low income areas**

The severe water shortages that much of the urban population faces are serious environmental problem. Often the underlying cause is not a scarcity of fresh water but the governments' failure to ensure that available water is supplied efficiently and equitably, a competent organizational structure for maintaining and expanding the water system is often lacking. Improved provision of water supply services in low income areas like Machimbo Vituka can lead to reduction of water related infections and parasitic diseases and some vector-borne diseases. This can lead to large reduction in deaths rates, especially for infants and young children. Nutritional status also improves when less food is lost to diarrhea and intestinal worms. Also provision of adequate and potable water supply will result into less time and physical effort needed by women to collect water and perform other domestic chores. In monetary terms efficiency in the provision of water supply will lower the overall cost for those who prior to improved supplies had to rely on expensive water vendors.

### **1.3 Statement of the problem**

For many years now Vituka community members have been suffering because they have to fetch water very far from their residential areas. Although there are few private boreholes, which are normally considered to be safe sources of water bacteriologically, (UNDP 1995), they are however operated only in the morning and evenings. During the afternoon the community members have to travel far to search for water. Women and children are the ones who suffer most from lack or poor water supply in Vituka community. According to UNICEF (1994), women and children in rural Tanzania for example spend 260 kilocalories, which is equivalent to one tenth of daily nutritional intake of an adolescent to fetch water from a distance of 1 kilometre with a 20-litter bucket. During water crisis community members in Vituka have been forced to buy unsafe water from pushcart water vendors. Vending and selling water is common in unplanned areas in Dar es Salaam city. This is because these areas are more poorly supplied with public water than the planned areas. There is also compelling evidence that residents in unplanned low income areas like Machimbo Vituka pay more for water than residents in planned settlements.

### **1.4 Project Objectives**

#### **1.4.1 Overall Objective**

The overall objective of this work was in collaboration with the Community Based Organization (CBO) to develop a community borehole water supply project proposal on for water supply, from the community initiative phase, to the planning, design, construction and the operation and maintenance phases. The CBO with which this project was developed is called VMDA (Registered in 2001 with registration number 10810) as shown in appendix vii.

The borehole project is meant to reduce the problem of shortage of water at Vituka Machimbo community, located in Vituka ward, Temeke Municipal, Dar es Salaam.

#### **1.4.2 Specific Objectives**

Involvement of the community is a key element to ensure successful project design and implementation. When the community is fully involved and informed about all stages of the project and also has contributed to the project through a wide range of ideas and activities, then the project will attain a high degree of commitment from the beneficiary community. The specific objectives of this assignment were therefore as follows:

- 1) With the assistance of the community members to determine and establish the coverage of public or private water supply in the case study area.
- 2) Through community involvement to determine socio economic problems that are contributed or associated with the water shortage or poor water supply in Vituka ward.
- 3) To determine various water problems, which contribute to poor or lack of water supply in Vituka Machimbo settlements.
- 4) To investigate various ways through which VMDA CBO and community members can contribute in identifying problems affecting their lives and suggest solutions to solve their problems and implementation strategies.

#### **1.5 Project Significance**

Among others, successful implementation of the borehole project is expected to raise standard of living of the residents in the case study area by raising their income and also prevent water related diseases and malnutrition as a result of water availability among the needy community members. The project will also assist in the creation of employment opportunities among young men and women who will be employed as borehole operators.

## **1.6 Project Outcomes**

Details on the expected outcome and borehole project outcome in Vituka Machimbo ward are discussed below.

### **1.6.1: Outcome 1**

#### **Skills, change of attitude and Sense of ownership imparted to the community members**

##### **Indicators**

- Initial benefits and outcome of this project will be the change of participants' (community members) knowledge, attitudes and skills on how they can identify their problems, suggest solutions and implement the project to solve their local problems.
- Immediate outcome will be the changes of behaviour that result from participant's new knowledge, attitudes or skills such as willingness to contribute and take part in all decision making processes of the development activities.
- In the Long term, meaningful economic status changes such as raised income due to the ability to create income-generating activities as a result of water availability.
- This project will also impart sense of ownership of the public water projects, which is quite essential in terms of project sustainability.
- Increased experience for VMDA leaders in dealing with the whole community instead of dealing with CBO members only. The Design, Implementation, monitoring and evaluation of the project will involve the community as a whole.
- Increased good collaboration between local government leaders, CBO leaders and municipal government leaders in the process of mobilizing the communities so as to improve health and well being of Vituka Machimbo community through provision of clean and safe water.

### **1.6.2 Outcome 2**

**Reduction of poverty through increased income and saving.**

**Indicators:**

- Reduced Income spent for buying water from vendors
- Reduced time consumed by girls and women and children for fetching water.

### **1.6.3 Outcome 3:**

- **Reduction of water- related diseases and malnutrition**

**Indicators**

- Reduced cases of water related diseases
- Improved nutrition standards.
- Reduced health hazards associated with water related problems and diseases

### **1.6.4. Outcome 4:**

- **Social impacts**

**Indicators**

- Improved girls' academic performance in schools .The time they spend in fetching water will now be directed to studies.
- Reduced women's workload on fetching water, as they will get time to attend evening classes so as to learn new skills especially on micro enterprise and work effectively on their Small and Medium Enterprises.

## **1.7 Mission Vision and Programs of VMDA CBO**

### **1.7.1 Mission and Vision**

Vituka Machimbo Development Association is located at Vituka Ward ,Machimbo Subward in Temeke Municipality. The mission of the CBO is to alleviate poverty through community Self help projects .its mission is to promote economic and social development activities with a view to alleviating poverty.

### **1.7.2 Programs and activities**

The programs and activities include environmental and health programs, income generating activities and awareness creation on gender equality. The CBO also lobby and advocate for favorable policies and other development issues including civic education. (See also plate 11,12 and 13 in appendix I).

## **1.8 Project rationale**

The needs assessment in the case study area, which was done through questionnaire, has indicated that 90% of the people living at Vituka Machimbo area have no reliable water supply. The area has no tap water supply network at all. The community members through questionnaire and discussions in the meeting expressed their opinion about desirable improvement in water supply services in the area. In the absence of water supply network in the area the only solution was found to be a borehole. Rainwater harvesting was also considered to be an option for water supply but as this option depends so much on unpredicted weather, it was thus considered to be unfavorable in this case study area.

## **1.9 Scope and Limitations**

There are wide ranges of urban environmental problems and issues that must be addressed if sustainable development is to be achieved in the case study area. Key environmental problems in Vituka include lack or poor accessibility, lack of proper sanitation facilities, poor solid waste management, lack of storm water drainage systems, etc. Due to time constraints, this study has specifically focused on the project design of public borehole for water supply in order to improve health and alleviate poverty in Vituka Machimbo Community at Vituka Ward. The focus on water supply service has been prompted by the fact that during consultation with the community members, water supply were ranked highest in terms of environmental and health problems in Vituka Machimbo. This study has gone further and looked at the expected benefits as per community members and leaders' views. This study will also report on the findings, data analysis and reports from various other sources.

## **1.10 Action Plan**

In the course of implementation of this project various activities in the case study area were carried out. This is because designing a water supply project in low-income areas like Vituka requires information on several aspects of community life. As such the design of a community-support programme to promote the project like water supply project and bring about changes will need to take into account such matters as local beliefs, traditional water use, current levels of knowledge in the community about water related diseases, identification of CBOs in the community, familiarization with the community members and leaders etc. This study was scheduled to last between December 2003 and May 2005. The activities, time schedules, required resources, indicative costs estimates and responsible persons for carrying out various activities are detailed in appendix ii.

### **1.11 Structure of the report**

This report consists of six chapters. Chapter one presents general introduction to the study. This includes background information and description of the needs for provision of adequate and potable water supply in low-income areas, statement of the problems that this assignment has attempted to address, study objectives, expected outcome and project rationale, scope and limitations and finally the action plans towards implementation of the borehole project at Vituka ward.

Chapter two is about theories and general literature review especially in relation to various aspects of water supply in urban areas like Dar es Salaam.

Chapter three presents detailed methodology of the study while chapter four presents results and discussion of findings obtained from fieldwork. Data analysis, which is presented in this chapter, was carried out essentially by using SPSS (Statistical Package For Social Scientists) software computer program.

Chapter five shows project implementation plan and in the final chapter (chapter Six) conclusion and recommendations are discussed.

## **CHAPTER TWO**

### **Literature Review**

#### **2.0 Introduction**

There will be **Policy**, **Theoretical**, and **empirical** literature Reviews. Policy review will look on what Tanzanian policy governments say in relation to water and poverty reduction. Theoretical Review will deal with sources of water and factors contributing to shortage of water in Dar es Salaam city. Social economic problems associated with shortage of water in the city and at Machimbo area will be explored and discussed. Empirical review will look at the existing situation on environmental water and sanitation issues, which cause water shortage, and its effects on economy and environment.

#### **2.1 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 uses, 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.

- **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.

As highlighted by many other authors, 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.

- **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.

- **Involvement of communities in planning, design and Construction**

The goal in this objective is to impart a feeling of ownership of sustainable water supply scheme. In order to motivate the communities into full and effective participation in planning and managing their water schemes, thereby creating a sense of ownership. This will gradually build up their capacity. It is essential that communities should supervise designs and construction of contracts. Communities may call on their district authorities for the assistance in letting contracts including their preparation and supervision. To ensure that communities participate fully in the planning, design, construction, monitoring and evaluation the following will be undertaken:

- i) Design manuals will be reviewed and disseminated
- ii) Communities will be trained to acquire skills in letting and supervision of the design and construction contracts.

- **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. 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.

VMDA Borehole construction project is trying to address community participation on Policy issue on:

- Community participation on Water Scheme,
- Involvement of Vituka Machimbo community in planning, designing and Construction.
- Water scheme community ownership, operation and maintenance

## **2.2 Theoretical Review**

In this chapter an overview of hydrological source of Water and major issues like demand and supply, pollution, loses and problems of water in Dar es Salaam as described by various researchers and scholars are discussed. Since the project, which this study will write a proposal on is situated in Yombo, Vituka Ward, Temeke district in Dar es Salaam region, Dar es Salaam water sources and supply, shortage and problems of water in Vituka Machimbo will be analyzed and discussed. Prior to that however, a general description of the source of water in our planet is presented.

### **2.2.1 Where does water come from?**

Water is colourless, odourless, and tasteless substance. All the water on earth is part of natural hydrological cycle of the earth's weather systems. Water is in continuous motion

within the cycle powered by the energy of the sun. This is a natural cycle of the earth's weather systems, which is of a primary importance for all life on earth. People alter the cycle by abstracting water for drinking, household use, industrial use growing crops and other purposes. However this water still remains within the hydrological cycle and will eventually be circulated by one route of the components of hydrological circle, Centre for ecology and Hydrology Natural Environment and Research Council (2002).

The components of hydrological cycle are rainfall and snow (precipitation), evaporation, soil moisture, surface water resources and groundwater resources. The two components that are resources available for human use are surface water and groundwater resources. Surface water comprise of rivers, rainfall, evaporation and soil moisture. Groundwater on the other side includes water from rocks and those, which is obtained hydro geologically (from the ground) Peavy et al (1995).

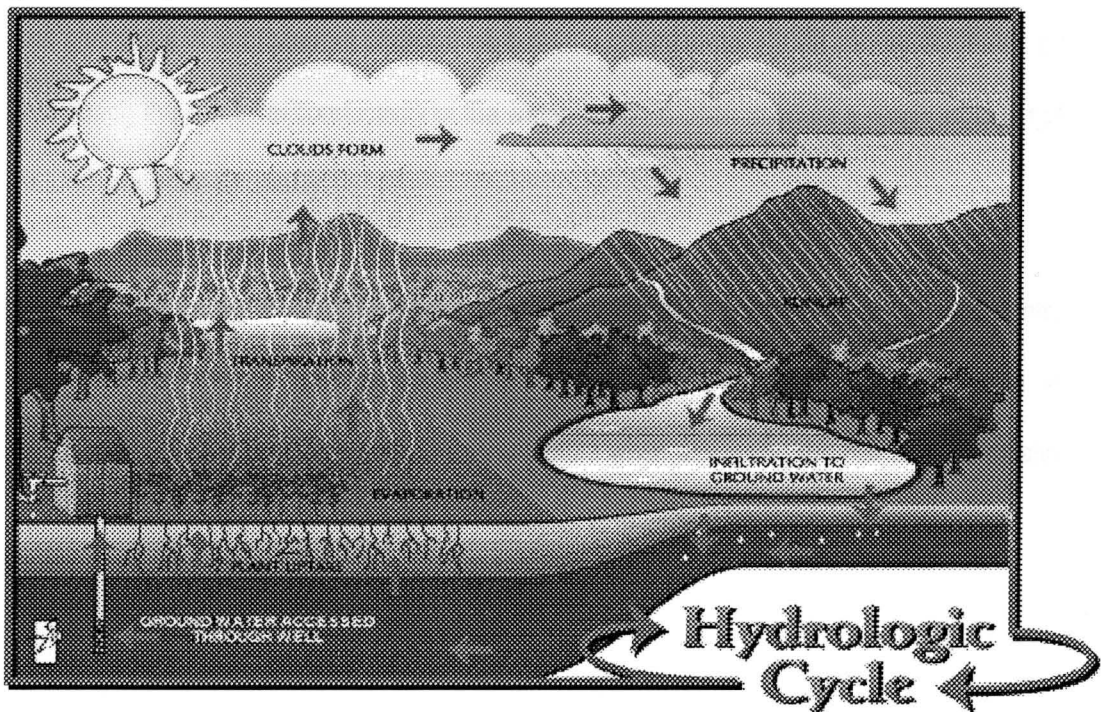


Figure 2.1 Hydrological cycle

Source: [danpatch.ecn.purdue.edu/epados/ground/src/cycle.htm](http://danpatch.ecn.purdue.edu/epados/ground/src/cycle.htm) - Centre for ecology and Hydrology Natural Environment and Research Council (2002).

### **2.2.2 Ground water Sources and borehole types**

People are able to get groundwater when they drill or dig a borehole. Drilled water moves up to a certain level called water table. The rock below the water table is saturated and this is the water that people use when they take water from a well or a borehole. Borehole differs in sizes. Some are 1 to 7 meters deep (these are also known as shallow wells). Those of 8 to 25 are deep wells (they are also referred to as boreholes). It is recommended that the higher the depth the better for water quality and quantity for human consumptions.

### **2.2.3 Groundwater quality**

Groundwater is often safe to drink without treatment. This makes it cost effective and thus suitable for small scale. All ground water contains natural soluble minerals derived from the soil and rocks. A total amount of dissolved solids in groundwater (TDS) can be estimated by measuring the electrical conductivity of the water, which is often used as a rough indicator of natural groundwater quality.

Groundwater moves slowly through the aquifer and can therefore filter or remove pollutants. This however depends on the aquifer, and the type of pollutants present in water. A hydrologist needs to take into account many factors when assessing the risk of groundwater contamination. However, water laboratory analysis is needed to check for these elements.

## **2.2.4 An overview of Water issues in Dar es Salaam**

- **Background information**

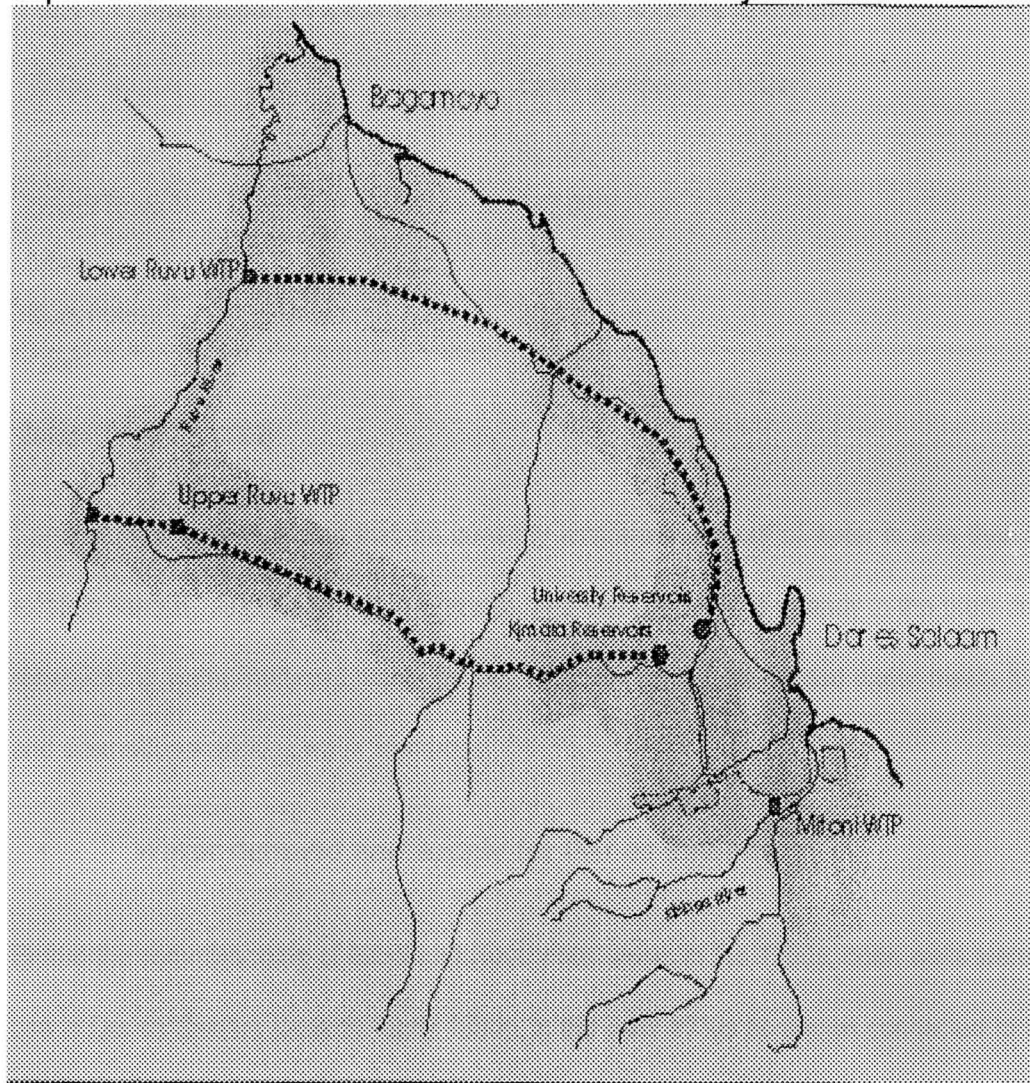
Dar es Salaam city covers an area of about 1,350 km<sup>2</sup>. According to the 2002 preliminary National Population Census data in 2002, the city population is 2.5 million. Dar es Salaam is the largest and most important commercial and industrial center in Tanzania. The city contributes about 18% of the National Gross Domestic Product (GDP).

It has been estimated that between 70–80% of the city population live in informal housing areas (Kyessi 2000). It is impossible to avoid water or give it low priority. Sokile C.K et al (2004) comment that most Tanzanians are poor and the poor people are severely hit by the scarcity due to lack of access, storage and general sustainability. Despite the high needs of water, people cannot afford to buy enough water due to the majority of the people having low amount of income per month.

- **Water sources for Dar es Salaam city**

Water supply for various uses in Dar es Salaam city is abstracted from Ruvu and Mtoni rivers as well as from ground water sources. Mtoni water source is located about 10 km from the city center, while Ruvu River (upper and lower) is located about 60 km from the Dar es Salaam city center. Map 2.1 indicates the location of the three surface water sources for the city of Dar es Salaam.

**Map 2.1** Location of the three surface water sources for the city of Dar es Salaam



Source : Mcrest (1996)

There is varying information about the water sources capacity, utilization and actual supply in Dar es Salaam city. Table 2.1 presents the most recent information from DAWASA, which indicate that lower Ruvu is the main supplier ( $182,000\text{m}^3/\text{day}$ ) while the abstraction from Mtoni is only  $9,000\text{m}^3/\text{day}$ .

**Table 2.1: Abstraction of water from various water sources in the city.**

Water source	Existing capacity (m <sup>3</sup> /day)
Upper Ruvu	82,000
Lower Ruvu	182,000
Mtoni	9,000
Bore holes	35,000
<b>Total</b>	<b>308,000</b>

**Source: DAWASA, (2002)**

Some studies have indicated that the currently abstracted amount of water is less than the existing capacity essentially due to high silts, and that DAWASA is already in the process of rehabilitating water treatment plants as well as ensuring that the treated water meets local and international drinking water standards.

#### ▪ **Water demand and supply for Dar es Salaam.**

Before the commissioning of Mtoni and Ruvu water works in the 1950s, open wells were in use in Dar es Salaam since the early 1890s. In the early 1930s boreholes connected to the water supply system were commissioned. As the city population increased, over-pumping led to the incursion of saline water into the borehole system. In the 1952, Mtoni surface water works was commissioned to substitute boreholes. Later 1959, two additional water supply works were constructed at Upper and Lower Ruvu.

The existing capacity of different water sources to supply water to Dar es Salaam city (both from surface and ground water sources is about 308,000m<sup>3</sup>/day (see Table 2.1). Out of this however substantial amount of water is lost through leakages and wastage. Water demand

is between 300,000 and 360,000 m<sup>3</sup>/day (Kyessi 2003; Kyessi and Kironde 1999). Table 2.2 indicates water demand and supply for Dar es Salaam city between 1991 and 2001. Another study (Elmcrest 2000) taking into account 53% leakages and wastage has established water demand for Dar es Salaam city to be 361,293, 314,421 and 499,866 (m<sup>3</sup>/day) for the years 1995, 2000 and 2015, respectively (Table 2.3).

**Table 2.2: Water demand and supply for Dar es Salaam in 1991 and 2001**

Use category	Demand (m <sup>3</sup> /day)		Supply (m <sup>3</sup> /day)	
	1991	2001	1991	2001
Domestic	107,400	240,000	27,600	55,400
Industry	35,800	80,000	9,200	18,000
Institutional	17,900	40,000	4,600	9,000
Commercial	17,900	40,000	4,600	9,000
<b>TOTAL</b>	179,000	400,000	46,000	91,400

Source: Mbilinyi, 2001 and Kyessi 2002

**Table 2.3: Projected daily water demand for Dar es Salaam city**

Use category and wastage	Water demands (m <sup>3</sup> /day)		
	1995	2000	2015
Domestic	113,641	144,654	271,367
Industrial	15,133	18,786	32,126
Institutional	9,735	13,928	26,470
Commercial	9,570	11,070	17,770
Sub-total	148,079	188,438	347,733
Leakage/wastage	53%	45%	20%
<b>Total Amount</b>	166,089	84,971	87,500
<b>Average demand</b>	314,168	273,409	434,666

Source: Elmcrest (2000)

▪ **Public private water supply in Dar es Salaam**

Originally all water services were provided more or less for free, i.e. the charges were so low that they could not meet supply costs (operation and maintenance). The government therefore provided water services freely as social services. Under socialism, provision of free services in the country was therefore seen as a mechanism for fair distribution of wealth (Water Aid 2001). Recent trends in service delivery in urban areas show that despite substantial investments and improvements in service coverage since independence, the supply falls far below demand. Past investments and programmes in urban areas have not satisfied consumers' demands.

According to Semboja and Therkilsen (1995) population with access to water supplies increased from 39% in 1960 to 49% in 1990. If anything, increased socio-economic differentiation over the last two decades and cuts in government expenditure on social services has increased demand for better services particularly among the better offs. At the same time, this has further widened service deficit gap and restrained service access among the poor. This particularly is the case among poor households who cannot afford alternative options including those offered by the private sector.

The overall performance of DAWASA particularly in ensuring adequate supply of water has been poor. Subsequently there are many private individuals who get water from DAWASA and other sources and then distribute to customers in various neighborhoods in the city. Most of these are small informal water vendors operating with push and pull carts with a number of jerry cans (between 6 and 8) or plastic buckets each measuring between 20-25 liters. Most of the vendors are young people aged between 25-30 years who have resorted to water vending activities because they have no other employment opportunity (Jelled 2000).

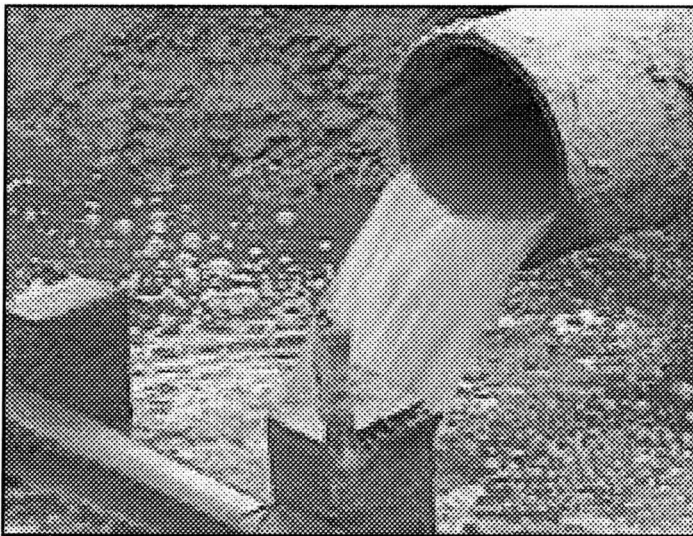
- **Leakages and wastage as an accounted for water**

Between 35% and 53% of the water pumped from the three water works is lost through leakages and wastage (Kyessi and Kironde, 1999 and DCC, 1995). Elmcrest (2000) has described these leakages and wastage as an accounted for water which includes leakages from the pipes, illegal or unregistered connections, unauthorised use of water for irrigation, fish rearing, resale of water or water use for construction purposes. In 1995, out of the 100,520 connected private water consumers, only 57,858 (58%) were registered. None Of the 76,700 kiosk operators were registered. Based on 1995 conditions, only 23% of water produced was paid for by users (Kyessi and Kironde 1999). 53% of the water produced from the three sources is unaccounted for and therefore yields no revenue.

- **Ground and water surface Pollution**

Although groundwater is normally effectively purified by the straining action of the rock as water percolates through it, soluble impurities are so readily removed. In some cases ground water is polluted by a great variety of sources. According to Pandey and Carney (1999), the main sources of groundwater pollution are: Land disposal of solid wastes (sanitary land fields), Sewage disposal on land, Agriculture activities-Fertilizer, pesticides, irrigation returns, animal lots etc., Industrial wastes, Domestic wastes-cesspits, sewer pipes, soak away pit, Liquid leakage's-petroleum spills etc, Mining activities-acid mine drainage etc and salt-water intrusion (from the sea). Dickin Daniel (2003) reported that Tanzania's national environment agency has warned that most of the country's water supply will become dangerously toxic unless drastic anti-pollution measures are taken. An official of the National Environmental Management Council (NEMC) stated that:

"Untreated industrial waste is being pumped into the country's rivers, creating a potentially devastating future crisis. Most of the towns in Tanzania where we found industries located do have the problem of toxic pollutants. Mr Baya further commented that most of those industries do not have treatment facilities, and discharge their untreated effluent down from the processing industries into the environment". Most industrial areas are already contaminated. So the population of this country is at risk due to toxic pollutants. One place where such pollution is happening is Keko Mwanga B, which is a very heavily populated area of Dar es Salaam. A huge industrial oil terminal dominates the area. This is a major concern for the people who live there—explain Shameji Ibrahim, the chairman of the area's Local Government. The Chairman further said that "People are eating food that is grown using this water-so the chemicals are entering people's bodies. It may take a long time for the effects to become apparent, but I think this will happen in my community a lot in the future" Figure 2.2



indicate water contamination from chemicals and fertilizer industry in Keko Mwanga B, Dar es Salaam (Dickin Daniel 2003)

**Figure 2.2: Water Contamination by chemicals and Fertilizer in Keko Mwanga, Dar es Salaam.**

**Source: Dickin Daniel (2003).**

The most serious risk to groundwater therefore is by human activities, which include mining or industrial chemicals and effluents, which sink into the ground and dissolved into the groundwater or agriculture pest sides and fertilizer that are applied on the ground. Also leaking sewers and latrines can allow harmful microorganisms to enter the groundwater. It is therefore recommended that toilets have to be situated down gradient from wells or boreholes.

- **Control of ground water pollution**

Water pollution is the discharge by man of the substances into the aquatic environment the results of which cause hazards to human health, harm to living resources and aquatic ecosystems, damage to amenities or interfere with other legitimate uses of water. For a discharge to be termed polluting there must be an evidence of actual harm or damage: Centre for ecology and Hydrology Natural Environment and Research Council (2002).

When establishing methods for the control of water pollution, standards can be based either on the quality required in the receiving water or they can be applied directly to the effluent without reference to the receiving water. Since the main water pollutants are human beings water education programs are very important in all sectors to facilitate pollution control.

### **2.2.5 Water as a social good**

Until 1991, when the Water Policy was launched, water was treated as a social good, thus effective costing of water supplied to consumers became a political issue. In fact, up to the early 1990s, provision of land for a public water kiosk was considered a prerequisite input for approval of layout plans. Water supplied from such public kiosks was often for free.

Until 1997, Tanzania's water supply and sanitation business which is managed by the National Urban and Water Authority (NUWA), a state-owned institution established by an Act of Parliament in the early 1980s. When the law of establishing NUWA was repealed, the Dar es Salaam Water and Sewerage Authority Act was enacted as part of the government's economic liberalisation programme.

The 2002 policy upholds the social principle in the sense that water is considered a public good and a basic need and right for all, however in recognition of the financial investments required for water development, water for productive purposes, is treated as an economic undertaking requiring efficient management, self-sustaining through financing by the water users themselves (URT 2002:28). Another important feature of the pre-2002 Water Policy is that because the services were provided without active participation of the beneficiaries in planning and implementation, it was not properly operate and maintained and hence service was unsustainable. Besides it recognised the need to involve private actors in WSS.

A new water policy was also adopted to give more powers to people, especially in rural Tanzania, to start and manage their own water supply projects. The earlier policy had placed that responsibility on the government. "The new policy will help us improve the water supply system in urban centres such as Dar es Salaam by allowing private enterprise to invest in the sector," Water and Livestock Development Minister Edward Lowassa said. Most sewerage systems in the country are dilapidated due to years of neglect caused by lack of foreign currency to import spare parts. The rapidly increasing population has worsened the situation.

## **2.2.6 Types of water shortage**

Water shortage can be viewed in three different ways:

- Inadequate availability of the water needed for domestic use.
- Inadequacy water availability for crops and livestock production in low rainfall areas,
- Inadequacy due to inadequacy of fresh surface water to supplement.

All these three ways causes water shortage of water in Dar es salaam

Demand for water in Dar es Salaam far outstrips supply, with two- thirds of the 90 million litres needed daily coming from pumped supplies. Plans are in place to install 173,000 water meters into homes and businesses, to reduce the amount of people illegally connected to the supply network, and expand the existing network by 500km over the next five years. The African Development Bank, the World Bank and the European Investment Bank are providing funding. Polluted water supplied by leaking distribution pipes and shallow wells are considered the main sources of cholera and diarrhea disease.

## **2.2.7 Social economic factors which cause water shortage.**

### **▪ Rapid and Realities of Urbanization in Dar es Salaam**

In managing urban agriculture in Dar es Salaam it is important to consider realities of urbanization Sawio Camillus (1998). These major concerns of rapid urbanization are the followings:

- Inaccessibility of clean drinking water;
- Inadequate food supplies and lack of better housing;
- Soil and water pollution; and
- Increasing production of solid and liquid wastes.

Simbeye Finnigan (2003) reporting on the Move to privatise water supply in Tanzania shows how Tanzanian leaders acknowledge imbalance between population growth and economic development on the failure to improve social services quoting one of the leaders said;

“The problem of water in Dar es Salaam is mainly caused by population growth. The current infrastructure was meant to serve not more than a million people; today there are more than over two million people in Dar es Salaam. It’s evident that the current system is over-stretched,” said Dar es Salaam Regional Commissioner Yussuf Makamba. The Dar es Salaam Water and Sewerage Authority (Dawasa) can supply 60 million gallons of clean water per day, which falls far short of the 90 million gallons needed daily by the city.”

There is therefore a great challenge to development planners on the realities of urbanization and mainly on water supply and sanitation in the city. Assessing the water-management situation in Tanzania, who was The Deputy Minister for Water and Livestock Development, Mr. Limbu said that unfortunately, despite its many positive aspects, the realities of urbanization forced many city dwellers to live in unplanned or “squatter” communities where water services and infrastructure built in the 1970s were deteriorating rapidly.

Rapid urbanization brought other problems, he continued, including an imbalance in water coverage 68 per cent for general use and 10 per cent for sanitation there is inadequate investment in water and sewage management programmes. Cities like Dar es Salaam, Tanzania's capital, suffered from poor billing and revenue collection and inadequate water sources both in terms of quality and quantity. Dr Festus Limbu by then the Deputy Minister for Water and Livestock Development, presented a report in the conference organized

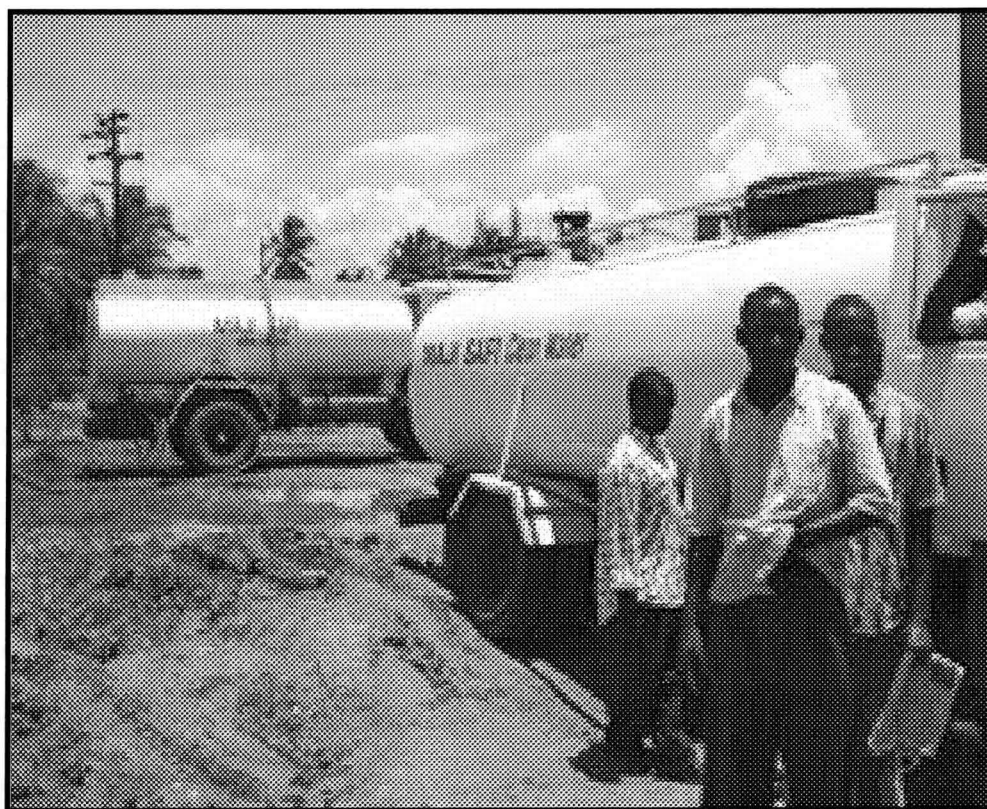
jointly by the United Nations Centre for Human Settlement (UNCHS/Habitat), the Department of Economic and Social Affairs, the United Nations) - Environment Programme (UNEP), and the United Nations Foundation for International Partnerships.

- **Lack of infrastructure and inadequate water service**

The city of Dar es Salaam suffers from a lack of water infrastructure and inadequate water service. The capacity of the system is not proportional to the increasing demand from the population and the industrial, commercial and institutional sector. For most residents of Tanzania's commercial capital Dar es Salaam, the announcement of private sector participation in the provision of water was nothing new.

Years of decay and neglect have meant that the vast majority have relied on the private sector for their daily supply. On any given day, young men pushing wheelbarrows stacked high with 20-litre water jerry cans can be seen weaving their way through congested traffic.

Another common sight is that of women carrying buckets of water on their heads as they shuttle across the city to and from water points. Also, at various corners around the city, water tankers sell it to the needy. The Dar es Salaam Water and Sewerage Authority, a semi autonomous government agency, has only about 98,000 direct customers in a city of about 3 million. Figure 2.3 indicates water tankers in the city.



**Figure 2.3** Tanker Water vendors in Dar es Salaam.

Source: IRINE NEWS.org Dar es Salaam, 5 Dec 2003

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 DAWASA 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 DAWASA 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 Dar es Salaam 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 DAWASA 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.

The level of water pollution in different streams in Dar es Salaam was also assessed (NEMC 1994, Muster 1997, Qamara & Othman 1996, Sawio 1998). The contamination with heavy metals such as lead, cadmium and chrome) was within the Tanzanian standards for irrigation

water. The two rogue samples had higher concentrations of lead (Qamara & Othman 1996). Biological agents discharged from households and industries were also present in the water. Only in few samples were the concentrations higher than recommended levels (Muster 1997, Sawio 1996). One sample contained coli bacteria (Muster 1997). Kimaryo Jacob L. (1992) suggest that in Tanzania, like in many other countries, the government has intervened in the way land is owned, used and developed as a strategy for ensuring Improved quality of the urban environment, public intervention in land in Tanzania has been mainly aimed at arresting land related urban problems of shortage of built space and build able land, and the associated problem of proliferation of squatter settlements; and creating a better urban environment. It has not therefore concentrated on the pollution created by urban Agriculture.

#### ▪ **Poor housing**

The settlements are overcrowded and offer very poor water supplies and sanitation. Houses are made from whatever is available (See Appendix I plate 1, 3, 6 and 8) Many are traditional building designs using wood, daub with grass roofs. Others people use concrete blocks, corrugated iron and whatever is at hand. The main obstacles to preventing the spread of disease are poverty and the unplanned way the settlements which have grown.

Petty trading and low-level employment are the main sources of income. Houses are put up wherever there is space, so roads become blocked, shallow wells get dug next to pit latrines and wastewater flows onto footpaths.

Access by open refuse trucks is often impossible when the roads are churned up during the rains, so solid waste ends up crudely dumped on open land. Over 95 per cent of all roads have no storm water drainage so they quickly become impassable or pockmarked with puddles of water, and they become ideal breeding grounds for mosquitoes.

## ▪ **Urban Agriculture in Dar es Salaam**

Kitilla Martin D.& Mlambo Anasteria (undated) show that in the Tanzanian context urban agriculture is commonly referred to as "farming activities in the built-up areas where open spaces are available as well as livestock keeping in the built-up and peri-urban area. Other scholars define urban agriculture as: " an industry that produces and markets food and fuel, largely in response to the daily demand of consumers within a town or city or metropolis, on land and water dispersed throughout the urban and peri-urban area, applying intensive production methods, using and re-using natural resources and urban wastes, to yield a diversity of crops and livestock" (Smit, et al.; 1996:3). Urban agriculture also had been referred to at times as intensive metropolitan agriculture.

### • **Characteristics of Urban Agriculture**

Livestock is an important component of urban agriculture in Dar es Salaam (Table 2.5). In 1987/88 there were 5,700 dairy cattle ranging freely in residential areas; about 13,500 pigs; 237,000 broiler chickens; 445,000 layers; over 100,000 local free-range chickens and about 8,100 ducks. Urban agriculture is an adaptive and mobile land use and is found on sites of various types) as in Smit, J. et al., (1996 (Table 2.4) shows various farming systems in urban areas.

**Table 2.4 Farming Systems Common in Urban Areas**

<b>Farming System</b>	<b>Product</b>	<b>Location or Technique</b>
<b>Aquaculture</b>	<b>Fish, seafood, vegetables, seaweed &amp; fodder</b>	<b>Ponds, streams, lagoons, wetlands, cages, estuaries, sewage</b>
<b>Horticulture</b>	<b>Vegetables, fruits, compost</b>	<b>Homesteads, parks, rights-of-way, containers, roof tops, wetlands, hydroponics, greenhouses</b>
<b>Livestock</b>	<b>Milk, eggs, meat, manure, hides and skins</b>	<b>Zero grazing, hillsides, cooperatives, open spaces around houses, peri-urban area</b>
<b>Agro restry</b>	<b>Wood fuel, fruits &amp; nuts, compost, building materials, fodder</b>	<b>Street trees, homesteads, steep slopes, green-belt, wetlands, orchards, forest parks, &amp; hedgerows</b>
<b>Other ystems</b>	<b>House plants, medicinal herbs, beverages, flowers, insecticides</b>	<b>Ornamental horticulture (floriculture), roof top containers, roadsides, rights-of-way, urban forests</b>

Source: Smit, J. et al., (1996): 108. The Urban Agriculture Network

In Dar es Salaam, urban agriculture has received attention on various policy levels and is somehow accepted as a feature in the city. The recognition of urban agriculture is reflected in several laws and regulations like Local Government Act (Section 80) of 1982. the Town and Planning Ordinance (CAP 378, 1992) and the Agricultural and Livestock Policy by the Ministry of Agriculture and Cooperative (MoAC 1997).

Farming and livestock keeping in the city of Dar Es Salaam is undertaken either in the backyard, near homes, in vacant lots around the city, and in the peri-urban areas. Substantial farming takes place in the valleys and swampy areas. The sizes of the plots increase as one move away from the center to the periphery while intensification moves in

the opposite direction. Crops include vegetables (spinach, cabbages, tomatoes etc.); fruits (papaya, oranges, and quaver); paddy; maize; cassava; sweet potatoes; and bananas. Table 2.5 below shows the growth in animals kept in the city.

**Table 2.5: Livestock Numbers in Dar es Salaam, 1985 - 1993**

Year	Dairy cattle	Layers	Broilers	Local fowls	Ducks	Pigs	Goats
1985	3,318	221,920	146,205	88,720	4,900	6,795	1,361
1986	4,200	292,000	180,500	93,389	6,800	8,601	2,617
1987	5,278	390,000	194,500	98,304	8,100	10,454	3,820
1988	7,105	445,000	237,000	103,341	10,449	13,383	5,764
1989	8,597	551,800	282,083	108,508	13,479	15,658	8,531
1990	10,402	664,232	335,624	113,933	17,388	18,946	12,626
1991	12,586	824,448	399,393	119,630	22,431	22,925	18,686
1992	15,229	1,027,275	475,276	125,611	28,936	27,739	27,655
1993	18,286	1,225,392	565,579	131,891	37,327	33,564	40,930

**Source: Mlozi, 1995:65**

The livestock sector in Dar es Salaam has expanded turn-over of 4.7% considerably Current cattle population is over 23,000 head; there is a million day-old-chicks (DOCs) per annum from the large scale incubators (approximately 3.7 million table birds and 0.5 million layers ). Dairy milk production amounts to about 95,000 litres per day, and 6,000 trays of eggs and 11,000 Kg of poultry meat per day. (Mlozi, 1995)

Getting land in the city of Dar Es Salaam has always been difficult. The urban poor have consistently sold their land to the rich on the pretext that they do not have sufficient funds to develop it themselves.

For poorer people, about 70-75% (CARE 1998, Kogi-Makau 1998) of the household budget is spent on food. The peri urban area has scattered homesteads, but is not as dense as the urban area. Dar es Salaam's coastal plain and climate (with 1000 mm annually in wet seasons from March to May and from October to December) do not offer very favorable conditions for intensive agriculture (Sawio 1998). Nevertheless, urban agriculture is widely practiced (Mvena et al. 1991).

A large number of cultivators in the open spaces acquired their plots during the economic crisis in the first half of the 1970s. The government encouraged people in the city to cultivate every available piece of land. Following a decline in farming in the latter half of the 1970s, it has increased again in recent years (Stevenson et al. 1994).

There are various types of urban agriculture. These include Interurban production which includes any agricultural activity which takes place in the continuously built-up residential, institutional or industrial areas in the city. Another type is Peri urban production; agricultural activity which takes place at the fringes of the continuously built-up areas.

Tap water is available to a number of households and used for productive purposes. Many areas with easy access to water are already occupied; access to these locations is therefore limited. Competition arises from other informal entrepreneurs, e.g. sand miners or hollow block producers. Dar es Salaam's tap water supply has been problematic in recent years. Many areas do not have a permanent supply.

Water is scarce in the dry season, as the public water-supply system can hardly keep up with the requirements of the increasing population. Access to a reliable source of water, which varies tremendously between wards, determines the potential of the agricultural enterprise. Where there is no water supply, farmers produce under rain fed conditions.

Commercial production is carried out in locations with enough surface water for continuous production (rivers, open drains), as systems depending on tap water or shallow wells produce at a risk. Supply of drinking water is guaranteed through local water sellers, but purchasing water for irrigation or collecting it from distant sources is not economic.

- **Livestock Keeping**

Peri-urban and urban livestock keeping is an essential livelihood activity for many, particularly vulnerable groups such as female-headed households, widows or the elderly, but it is not one that is recognised too often, livestock keepers are actually harassed or ignored by city officials. And yet, a recent study of five cities in Ethiopia, Kenya, Uganda and Tanzania has revealed that with increasing demand for land in cities for housing, urban livestock keeping appears to be favoured over crop production as it requires less or no land and provides better returns.

However, despite the environmental and public health concerns related to the problems of livestock waste, water availability and zoonoses that urgently need to be addressed; most city planners continue to disregard the existence of these livestock and the relevance of this livelihood activity to the urban poor.



**Figure 2.4 : Livestock keeping in Dar es Salaam.**

**Source : New Agriculturist on Line (2003) leaving out the livestock? Refusing to take notice,**

The study conducted by the DFID Livestock Production Program found waste management to be a major problem. Also the disposal of waste was fairly arbitrary. Inevitably, waste mismanagement also means a problem of disease and living in such close proximity to animals always brings a risk of zoonoses, such as bovine tuberculosis, brucellosis and cysticercoids. Water availability is yet another critical issue facing urban authorities. Cities often struggle to provide sufficient water to the people and this is without taking into account increasing number of livestock. In many slum areas municipal water has to be bought, so livestock only have access to other water sources, which are usually contaminated. Community competition over water is common and frequently leads to conflict.

- **Poor Sanitation and drainage**

Public health initiatives will need to centre on improving sanitation. Most pit latrines are crude and makeshift. Over half have no roof or pit cover, a third has no doors and nearly all lack a vent pipe. Most latrines are shared, overused and fill up quickly, especially during the rainy season when the water table is high. Residents often avoid the costs of emptying them by taking advantage of flooding to flush them out. The lack of proper roads often means that, in the settlements, they are difficult to empty because motor traffic cannot get through.

- **Groundwater Pollution in Dar es salaam City**

During rainy season many households harvest rainwater at the same time, ground sources are replenished increasing water supply among households that depend on ground water sources such as deep and shallow wells.

However, raised water table due to recharge of ground water adversely affects sanitation in low lying low income settlements, where on-site sanitation especially traditional pit latrines (without lining) are the most dominant sanitation system. In fact over 90% of the urban population depends on pit latrines.

During rainy season, pit latrines and even septic tanks in low lying areas over flow. Studies conducted in some informal settlements (e.g. Ukonga and Majumba Sita) revealed polluted ground water sources, especially shallow wells Edmund J (2003)

### **Measures, which have been taken to minimize Groundwater Pollution at Ukonga , Majumbasita Case Study**

#### **The pilot project of ecological and sanitation project in Majumbasita**

The EcoSan (Ecological Sanitation) toilets have been introduced by EEPCO

Two types of EcoSan pans has been used, the seat and squatting pan based on the, principle ecological sanitation both have a urine-separating or non-mixing system that enables the separate storage of urine and faeces. The urine is lead through a pipe from a urine collector into a special container. The faeces, also collected in a separate container, are then mixed with ashes, soil or any other suitable material available. By not mixing the urine with faeces, which contain most of the pathogens, the bad smell from the latrines is very much reduced. It also means that the treatment of the two ingredients can be done in a proper way - urine to the fields as fertilizer, and faeces kept under control to minimize the effects of pathogens and intestinal parasites, and later used in the fields as soil conditioner. Reaching November this year the project will have more than 95 EcoSan toilets, about 17% of households have requested for the built in toilet. All household units constructed are double-vaulted with urine diversion. So far 45 toilets have been built at the household level and public toilets based on the same principle at Karakata primary

**Source: Edmund J (2003).**

Groundwater pollution in urban areas is a growing environmental problem in the world. In developing countries, it commonly results from indiscriminate disposal of municipal and industrial wastes, extensive use of on-site sanitation systems and urban agriculture.

In low-income countries (like Tanzania), the situation is aggravated by rapid urbanization, which is characterized by inadequate provision of water supply, sanitation, solid waste and drainage infrastructure. In Tanzania, about 30% the whole population and 42% of the inhabitants in major urban areas, depend on groundwater. However, exploitation is not controlled and no groundwater quality monitoring mechanism has been installed. However, crude practices of waste disposal are threatening the quality of the aquifers. About 90% of the inhabitants use on-site sanitation systems, industrial effluents are inadequately treated and solid wastes crudely dumped or buried in the ground. Despite the importance of groundwater in the city, water quality and exploitation are not monitored. Thus, there is very little field performance data on quality characteristics of the aquifers.

Domestic wastes, industrial effluents and leach ate from solid wastes disposal sites are the major sources of groundwater pollution in Dar es Salaam City. Groundwater quality has deteriorated, more than 35%, 40% and 20% of samples from the boreholes failed to comply with the national standards of drinking water in nitrate, faecal coli form and chloride contents. Pollutant specific maps (nitrate, TDS, chloride, petroleum hydrocarbons) for the city have been produced, which show spatial variation of the contaminants.

#### **2.2.9 Impact of wastewater disposal on ground Water**

The effluent from the septic tanks and pit latrines that is allowed to percolate into the soils represents a potential source of ground water pollution. As such the on-site sanitation systems in Dar es Salaam city is now considered as diffuse sources of ground water pollution. Although septic tanks are designed to operate without threatening groundwater resources, in many case however the septic tanks and other on-site excreta disposal systems experience functional and operational problems that are largely based on poor

design and or citing requirements. Excessive septic tanks and pit latrines densities in many unplanned and pre-urban areas have degraded ground water quality with high concentrations of nitrates, bacteria, and organic matter concentrations. In areas with high water table such as Sinza, Mlalakuwa, Kiwalani, Manzese and Majumba sita, the sewage is disposed of directly into groundwater i.e. below the ground water table line with the vicinities of the pit latrines or soaks away pits of the septic tanks. It is obvious that such practices lead to serious faecal and organic pollution of unconfined aquifers and may render the ground water unfit for human consumption. Public health and environmental effects observed in the affected areas also include contamination of piped water (Chaggu *et al.*, 1996).

A Study on the number of cases for the top ten diseases reported at the Magomeni Health Centre in Dar es Salaam city (Mbuligwe, 1995) indicated a very high incidence of malaria (36.8%) and diarrhea (7%) in areas with malfunctioning ST systems. Similarly, many cases of cholera epidemic have been reported in the city over the past one-year whereby between 20–30 cholera patients are currently admitted at the special cholera patients treatment wards in the city. Table 2.6 shows the percentage of the reported cases of water related diseases in Dar es Salaam city between 1991 and 1995.

**Table 2.6 : Water related diseases in Dar es Salaam city**

<b>Diseases</b>	<b>% of the total reported cases</b>		
	<b>1991</b>	<b>1994</b>	<b>1995</b>
Diarrhea	9.3	11.89	12.06
Typhoid	-	-	0.01
Dysentery	-	0.35	0.02
Infectious skin	3.7	6.76	7.5
Infectious eye	6.3	4.22	4.68
Schistosomiasis	-	1.28	2.09
Malaria	24.8	37.22	35.45
Total	44.1	61.72	61.81

Source: Mwaiselage, (2003)

Rehabilitation Project Funded by the World Bank. Through the project, the community will realize improved roads, storm water drainage and sewage disposal. These improvements were deemed incomplete without adequate and reliable water supply. It was aimed at the outset to set up a low cost project that would be simple and easy to operate and maintain. It was also decided to involve the community in all phases of the project so that they don't feel ignored and also install in them a sense of ownership. Irish Aid provided the necessary funds for the project. These funds were to be used in investigation to establish borehole sites, survey work and design of the system. Material for construction of the project as well as supervision costs was to be met by this fund. DAWASA were involved as partners in this project and were required to provide expertise in project preparation, design and supervision of construction work. DAWASA appointed me as the expert in this project.

The community in their part was involved in choosing the route where the various water supply lines would pass and picking appropriate sites for water kiosks. They also provided labour for excavation of trenches and backfilling.

Two boreholes were sunk. The first borehole had a yield of 3.5m<sup>3</sup>/h and was designated to serve one neighborhood with a population of 3000 people. The system designed for this area involved 2 storage tanks of 15m<sup>3</sup> capacity each tucked on the roof of the pump attendant's quarter. These tanks feed a distribution system with 5 kiosk points spread out in the neighborhood. This system was commissioned in September 1997. The second borehole has yield of 6m<sup>3</sup>/h and is designated to serve seven neighborhoods with a population of 12,000 people. The designed system for this area involves a 65m<sup>3</sup> brick reinforced tank on raiser and distribution system with 11 kiosk points spread out evenly in the various neighborhoods. The system was commissioned in February 1999. The total cost

construction of the 2 systems is US\$76; 812. The systems served by the two boreholes are independent of each other. Each borehole supplies its own area. Neither are they linked to the DAWASA water supply system. Since outlet lines from the tanks are metered, it will be easy to know how much water is fed into the target area from these supply tanks. Every kiosk is also metered therefore all the water consumed at the kiosks is known. In this way unaccounted for water through leakage and theft can be established.

An attendant selected within the neighborhood operates each kiosk. The attendant opens the kiosk around 6.30 am each day and closes around 6.30 pm. The attendant sales water throughout the day and at closing time takes down the last reading while opening up gives the total amount of water sold at that kiosk for that day. Upon closing the attendant submits his collection to a clerk at the TDF office. The price of water is set at US\$1.5 per 1000 litre. This price was set in consideration of the people's ability and willingness to pay. The average monthly collection per kiosk is US\$108.7. The kiosk attendant receives a pay of 10 per cent of the total monthly collection that he makes

Apart from selling the water, the kiosk operator also oversees cleanliness by ensuring that washing of clothes and utensils is not done around the kiosks and also that order is maintained during the process of fetching water. A water committee comprising of 15 members with about 2 representatives from each neighborhood has been formed. This committee will oversee the day to day management of the system in conformity with the Ministry of Water policy on management of community water supply as well as report to their respective areas all deliberations on water.

When a defect is detected in the system it is reported at the TDF office. The situation is made known to the technical committee, which appraises the situation and prepares cost estimated of material for repair. These are presented to the finance committee, which endorses procurement of materials using funds from the collected revenue. Electricity bills are also settled with money from the revenue collected. The rest of the money is available for other activities that will be agreed upon by the TDF Committee. The systems were designed to supplement DAWASA supply. In that they have performed splendidly. The women now spend less time searching for water than they did before with the fulfillment of CIP projects, of road storm water drainage and sewage disposal. Tabata will be a very attractive place to live in now that availability of water is assured. Already people from other parts of the City, institutions and Government Ministries are showing interest in the project with the aim of learning from it. Cost wise these installations are also better off.

The 1<sup>st</sup> phase for the rehabilitation and improvement of the DAWASA system to provide reliable supply would require an investment of US\$22.5 million. For a population of 3 million this is an investment of US\$7.5 per capita. The two systems installed at Tabata serve a population of 15000 people. At a cost of US\$76, 812 the investment per capita would be US\$5.1.

Despite these fine achievements, problems exist. Some kiosk operators have been discovered to tamper with the meters to facilitate embezzlement of revenue. Another operational problem is the ease with which meters fitted prior to the kiosks break down. Efforts to repair these meters have not been very successful. Another version of meters is now being tried and so far it is working well.

Although the system is not able to completely bridge the gap left by the DAWASA supply it is able to realize its objective of alleviating the water problem situation of Tabata. When there is no DAWASA supply the system serves the community. It has been shown above, that a system derived from a local source with an investment of US\$5.1 per capita, can be much cheaper compared to a system drawing its water from a distant source like the Ruvu river 80 km away that would require an investment of US\$7.5 per capita. The guaranteed availability of water has made life much easier to the community particularly women and children who used to spend a lot of time searching for water. Now they invest this time in other valuable undertakings.

Community participation has been able to create a sense of ownership into the minds of the people. They are quick to report any leaks or illegal connections in the system and are prepared to participate in any development project linked to the water system.

The system has been able to function in a sustainable manner with the revenue collection being ploughed back to run and maintain the system.

### **Therefore Tabata Water Supply scheme successes stories indicators**

- i) Project has created employment for Youth that are engaged as operators
- ii) Distance of fetching water has been reduced from 2 to 1.kilometer.
- iii) Quality of water has improved as before residents were fetching water from Unimproved source
- iv) Vendors prices have dropped from 300 to 20 for a twenty litres
- v) Conflicts with DAWASA are non existent since the systems are not linked.

### **Hanna Nasif Community Water Supply**

- Twelve young people have been employed and Water vendors have has gone down from 50 to 20 T.shs.

- The distance of fetching water has been reduced and well prepared Water Education programs geared to sensitize community so as to acquire new skills, to improve water management knowledge and development of ethical values amongst both water vendors and consumers have been prepared and implemented.

#### **2.2.11 Research needs**

There is a need for a broad information base on urban groundwater water supply quality. Accurate citywide data on the extent of production and the number of households involved is still lacking. Additional research is needed on environmental aspects, especially pollution and health risks for consumers, analyzed in relation to issues regarding the city's waste disposal and sewage systems and environmentally safe industrial Production. The role of urban agriculture in recycling organic waste should be further explored. Only a close interaction between research and decision-making can fully exploit the potential of the findings.

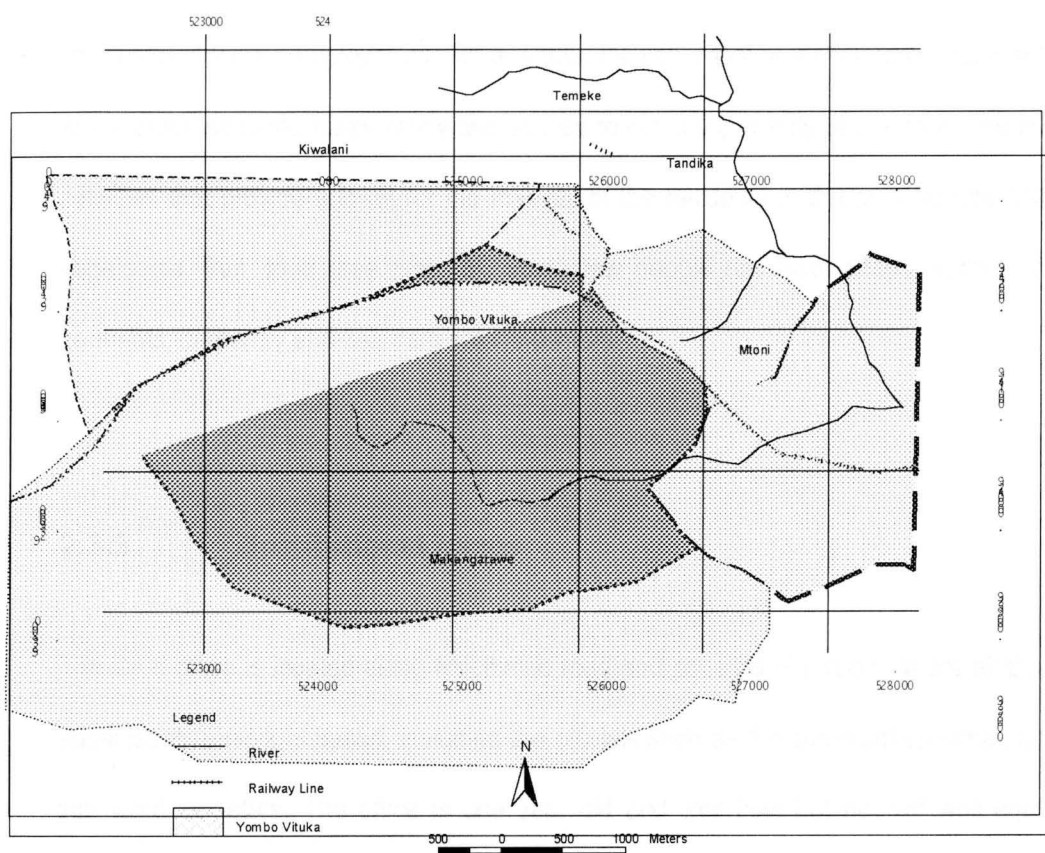
### **2.3 Empirical review for the case study area in Machimbo.**

The empirical review will look at the description of the existing situation at Vituka Machimbo community.

#### **2.3.1 Context**

Machimbo is situated in Vituka ward. Open spaces account for only 1.86% of the entire ward. Machimbo in Vituka ward is located in Temeke Municipality at a distance of about 15 km from the Temeke Municipal headquarters and 8 km from the Central Business District (CBD). It is bordered by Kiwalani, Temeke and Tandika wards on the North, Mtoni ward on the eastern part and Makangarawe on the south and western sides (see also Map 2.2)

**Map 2.2 Yombo Vituka**



Source: Community Infrastructure Program (CIUP) 2004

## 2.3.2 Machimbo Vituka baseline information

### 2.3.2.1 Population and housing

The total population in the Machimbo Vituka area is 120,000. Out of this the population of men is 64% and women is 36%. The population density has been established to be 10 people per ha and number of household in the sub ward area is 1,040. See appendix I (Plate1, 3, 5 and 6) Machimbo unplanned settlements.

### **2.3.2.2 Income and employment**

About 40% of the households are self-employed in the informal sector; the other 23% have some sort of formal employment with a regular income. Most of the informal sector activities are undertaken along major artery and access roads in the vicinity of the area. The informal activities that provide a living for the majority of the residents in the area include selling of vegetables, fruit, food (see plate 8). Some few people run retail shops, selling of used garments, carpentry and hair care salons centers.

### **2.3.3 Institutional issues**

The ward office is located along Machimbo road and consists of a room where all the ward administrative work is based, including the officials such as the sub-ward chairman and the sub ward secretary. The office is one year old and well built but not yet well equipped. Available facilities and equipment consists mainly of 10 tables and 15 chairs, a quantity that is minimal, taking into consideration the volume of activities in the office. The sub ward is under the leadership of an elected sub ward Chairman and is assisted by an appointed Sub ward Secretary.

The supreme decision making organ is the Sub Ward Development Committee, which comprises the Chairperson as the head of Sub Ward, 5 elected members and the Sub Ward Executive Secretary. The sub-ward has three sub committees, namely Security and defense, Health and environment sub-committee and social services. The major responsibility of the sub ward development committee is to identify community problems. set priorities, plan, implement, coordinate and follow-up on all the development projects/issues

within sub-ward area. The defense and security committee is responsible for general security and safety of the sub ward residents and their properties, (See sub ward office location in appendix I Plate 14).

There are other Community Based Organizations (CBO) and NGO in the sub ward. CODIV is a CBO known as Concern for Development Initiative. It deals with environment and security. There is also an NGOs namely (YVDA) Yombo Vituka Development Association. This NGO deals with orphan's welfare. The community consists of two government primary schools, (see Plate 15 and 16) in appendix I and a health center which really have no water supply and is in a high need of water.

### **2.3.3 Existing water supply in Machimbo Vituka**

None of the houses is connected to DAWASA (now City Water Services or CWS) water supply pipe network. Water supply in the area is in general intermittent and the pressure is low. Apart from domestic uses water in the study area is also used for dairy farming, poultry, institutions such as schools and dispensary. The Community water Supply owns no boreholes, while individuals within the project area own 3 boreholes (See appendix I plate 2) private borehole at Huruma Machimbo area.

Some households use shallow wells as a source of water for bathing, washing clothes and other forms of cleanliness. Ground water table in the area is about 1.5 m below the ground. There are also water vendors who sell water to customers within the sub ward area. The overall water quality is good but the laboratory tests have not been carried out to ascertain the quality. An analysis of the existing water supply in the sub ward area is presented in Table 2.7

**Table 2.7 : Existing Service Level water supply**

Water supply	% of population reached
House/Yard connection	0
Water Kiosk (Dawasa)	0
Water Kiosk (private)	2
Public tap (DAWASA)	
Public tap (private operator)	0
Water vendors	5
Shallow wells	2

Source: Survey Data( 2004)

The existing water situation at Machimbo community is pathetic as no Dar es Salaam Water and Sanitation water supply network exist .This may lead to use of water from unsafe sources.

### **2.3.5 Existing sanitation systems in the area**

There is no sewerage system in Machimbo Vituka area. The most widely used sanitation system is private pit latrines. This system is used by about 88 % of the subward population. In general households residing on the same plot share the pit latrine. Incidences of water borne diseases are common in the subward due to defective sanitation facilities. Very few people (2%) use waterborne systems (septic tank- soak way pit systems), mainly because of the costs involved and due to unreliable piped water supply in the project area. Details of the existing sanitation system in the area are shown in Table 2.8

**Table 2.8: Sanitation base data in Vituka ward**

<b>Facility used</b>	<b>% of population</b>
Full sewerage	-
Septic tank	2
VIP latrine	-
Pit latrine	88
Neighbors latrine	10
Public toilet	-

Source: Survey Data (2004)

Most households use traditional methods to empty their pit latrines when they are full. For most people the use of dislodging trucks is prohibitively expensive (at least Tshs. 25,000/- per trip), also some households cannot be accessed by dislodging trucks. In areas where the water table is high, emptying using service trucks requires more trips to have the pit completely emptied.

Therefore most residents do not hire the emptying trucks, as it would mean very high cost. As a result traditional methods of dislodging are the most commonly used in the area. The most common traditional method of emptying especially in areas, which cannot be accessed by trucks, is known as '*kutapisha*' the cost is negotiable, but it ranges from Tshs. 40,000/- to 80,000/-. This method entails digging a new pit adjacent to the filled one and then frees the waste into the new pit.

### **2.3.6 Solid waste**

There is no organized solid waste collection in Vituka. The common type of solid waste that is generated in the subward area was observed to be domestic solid wastes and market waste. The composition of domestic waste was observed to be predominantly food leftovers, food preparation remains, ashes, sweepings, old cloths, news paper, obsolete appliances, plastic and packaging materials. Market waste is produced along the major road

### **2.3.7 Environmental health**

The area is generally in an unhealthy environment. Outbreak of diseases such as malaria, cholera and typhoid is common. See appendix ii plate 1. Overcrowding and poor housing in some areas at Huruma area.

Other consequences are poverty and a low life expectancy. At present the people of Vituka often use the open drains to discharge their wastewater. Hence, the existing storm water drains also function as open sewers. See Plate 4 and 5 which shows poor roads which can be source of mosquito breeding (see Appendix I Plate 6,8 and 9).

In places where no drain exists, residents splash wastewater haphazardly on the open ground. At some locations, stagnant water causes mosquito breeding, leading to spread of malaria in the sub ward area.

## **CHAPTER THREE**

### **Methodology**

#### **3.0 Introduction**

- **Research Design**

The research design which was used in this study is cross sectional survey.

- **Units of Enquiry**

Units of inquiry included both adult men and women ranging from 18-80 years old, Ward and sub ward community and CBO leaders, CBO members, community members, heads of two primary schools, and a health officer in charge of a health centre at the community.

#### **Types of Methodologies**

Various methodologies were used while undertaking this study. These methodologies which included (desk study) literature review; site visit and physical observations, site meetings and discussions and questionnaire survey and analysis were also used in the process of developing a borehole project for Vituka community.

#### **3.1 Study area**

The audience of this project is members of Vituka Machimbo Development Association and the entire community members. The project will be implemented in Vituka Machimbo area (Vituka Ward Temeke District, Dar es salaam, Tanzania) and is expected to last for nine months.

VMDA is a community Based Organization that is situated in Vituka Ward, Temeke District, Dar es Salaam Tanzania. The Total population of this community where this CBO is situated is 120,000 people. There are two primary schools, one secondary school, 1 health Centre, 1

NGO, and an interested group Caring for Orphans namely Mori Youth Development Association. The CBO has a very good human resource with diversity of professions and capabilities. Currently the CBO has no budget due to financial constraints. The CBO has a Bank account and it needs a financial assistance in order to run its project.

### **3.2 Sampling methodology**

The sampling frame was obtained from the local government leadership where samples were picked randomly. In each house hold both parents were picked except for the few single headed households. The number of participants who took part in the study was 100. Among them there were 30 CBO members and 15 CBO and local government leaders, 50 community members, 1 Health Centre officer, and 2 Heads of primary schools around the community.

The selected population was only adults above 18 years old. The sample size was 10% which is an accepted sample size. The interview was conducted in two primary schools within Machimbo community namely Ukombozi and Yombo Vituka. Also Dr Isabela Samwel Ipopo (Dr Incharge of Malawi Dispensary) was interviewed.

### **3.3 Data Collection instruments**

The questionnaire consisted of both closed and open ended questions. The majority of them (about 22) were closed questions and the open ended were only two. The questions were both in Kiswahili and English language for simplified community communication purposes. Other instruments included interviews, personal observations and documentary review.

The surveys methodologies and measuring instruments used included Literature review and Data collection from the survey. Another method was documentary review. This involved search for information from community water experts, collection of information from other CBOS reports, City Water reports, Interviews from local and government leaders, Statistical analysis, observations and group discussions. With the collaboration from the chairman of the Vituka Machimbo Community based Organization the interview was conducted in two primary schools and in Malawi dispensary. The interview was also done to the leaders of other Community Based Organization (CBOs) which have carried out the same project so as to see how they succeeded on mobilizing the communities, difficulties they faced and how did they try to overcome them.

Apart from mobilizing the community oral interview was conducted to Temeke Municipal Council community Based Officers to see the strategies they have used to mobilize the communities and possibilities of getting a supplement of donations from external, internal, and from the government. The kind of questionnaires, which were used were close and only few were open-ended questions. This aim at saving time and simplifications to respondents in answering them

### **3.4 Data Coding Methodologies**

Statistical Package for Social Scientist (SPSS) Programme was used in Coding and entry of Data. Descriptive analyses tools which have been used were frequencies, Tables and cross tabulation .Also Microsoft Project was used for the activity scheduling and resources allocation.

The data coding methodologies and interview are grouped as shown in Table 3.1

Table 3.1 Data coding methodologies and interview schedule.

	Primary Data	Selected Data	Percentage	Secondary Data
<b>1 Questionnaires</b>				
CBO members	120	30	30%	30%
Community Members	50	50	50%	50%
Leaders (Local Government & CBO)	17	17	100%	17%
<b>2 Interview</b>				
Primary school Head Teachers (Ukombozi& Yombo Vituka Primary Schools)	2	2	100%	2%
Malawi Dispensary Health Medical In charge	1	1	100%	1%

## **CHAPTER FOUR**

### **Results and Discussion**

#### **4.0 Introduction**

The study results from 24 variables, which were obtained during community members' responses. All the variables were useful for writing the plan for borehole construction aiming at reducing women work load, increase girls academic performance, reducing the risks of water related diseases, community participation, awareness creation and change of attitude in community development activities. The analysis of the results also looked at the relationship between variables through cross tabulation. The variables are further discussed as follows:

#### **4.1 Places of living of the Respondents within Machimbo sub ward**

Within Machimbo sub ward there are eleven sub locations. 100 residents responded to the questionnaire. This represents approximately 10% of the total population (120,000 people) residing in this sub ward. The percentage of the response in relation to the sub locations indicates that the respondents come from different sub locations namely Msikitini, Kanisani, Miteda, Vituka, Yombo, Cable, Amani, Machimbo Huruma, Malawi and Maandazi road.

## 4.2 Gender distribution at Machimbo

Of all the respondents, 64% were male whereas women were 36 %.( Table 4.1).This indicates that the majority of the respondents in the case study area were male. This also suggests that fetching water responsibility which is largely carried out by women is shouldered by the minority of the population at the case study area. The project therefore will be sustainable as women will not accept any mismanagement of this water supply as water burden lie on them compared to men.

**Table 4.1 Gender Distribution at Vituka Machimbo Community**

	<b>Gender</b>	<b>Frequency</b>	<b>Percent</b>	<b>Valid Percent</b>	<b>Cumulative Percent</b>
<b>Valid</b>	<b>Female</b>	<b>36</b>	<b>36.0</b>	<b>36.0</b>	<b>36.0</b>
	<b>male</b>	<b>64</b>	<b>64.0</b>	<b>64.0</b>	<b>100.0</b>
	<b>Total</b>	<b>100</b>	<b>100.0</b>	<b>100.0</b>	

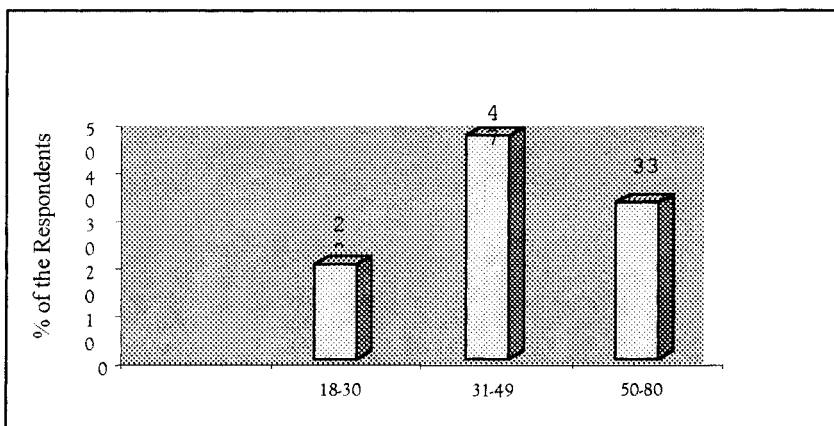
Findings of this study also suggest that the percentage of men being big the labour and financial contribution will be available as economically most men are far better than women.

## 4.2 Age of the respondents

All the respondents were Tanzanians ranging between 18 and 80 years old. Water shortage at Machimbo affects all categories of age. The majority of the respondent (42%) had 31 – 49 years old .This group is big enough to provide financial and labor contribution in relation to project resources requirements. Table 4.2 and Figure 4.1indicate ranges of age in the case study area.

**Table 4.2 Respondents' age at Vituka Machimbo**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-30	20	20.0	20.0	20.0
	31-49	47	47.0	47.0	67.0
	50-80	33	33.0	33.0	100.0
	Total	100	100.0	100.0	

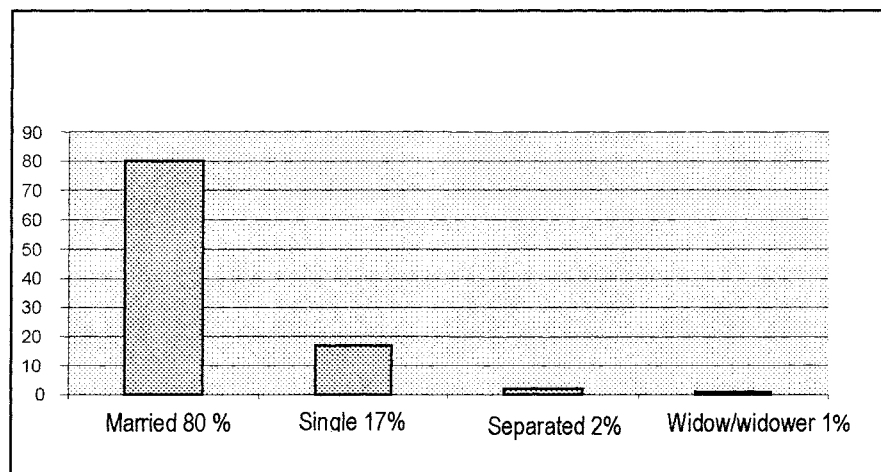
**Figure 4.1 Ages of the Respondents**

#### **4.4 Marital status of Machimbo sub ward residents locations**

80% of the respondents were married. Only 17% were single, 21% were separated and 1% was widows. Married people are expected to have children and dependants and therefore their water requirements is very high .The project is therefore important to rescue these families from water related diseases. Table 4.2 and Figure 4.2 indicate the percentage of marital status at the community.

**Table 4.3 Marital Status of the Community.**

	Marital Status	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Married	80	80.0	80.0	80.0
	Single	17	17.0	17.0	97.0
	Separated	2	2.0	2.0	99.0
	Widow/widower	1	1.0	1.0	100.0
	Total	100	100.0	100.0	

**Figure 4.2 Marital Statuses at Machimbo Community.**

Water shortage problem is serious to widows and separated especially female headed household, as their financial positions cannot sustain household requirements comparing to houses with both parents.

#### **4.5 Number of people in the household.**

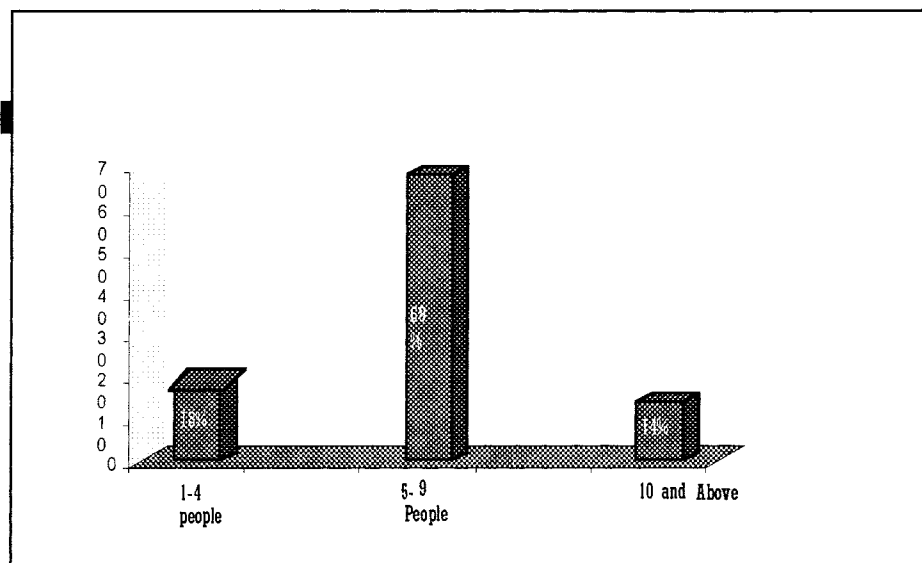
The number of people in the households ranges from 1- 4, 5-8 and 9 and above. The majority of the household in Machimbo have 6 people and above. Various studies have shown that the higher the number of people in the house the higher the water requirements.

This shows that there is as possibility that the residents may be forced to spend the available resources for buying water at the expense of other essentials.

The first category indicates that 6% consists of 1 – 4 people. Second group had 5-8 people that hold 59%. 9-12 were the third group, which is 14 %, and more than twelve people were 21%. Result further indicates that water demand in Machimbo is 200 litres per person per day. If each family will buy water for 100 Tshs per 20 litres, half of the household budget will go to water and this will hinder other developments activities such as school fees, health and food.

**Table 4.4 People per household**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-4	18	18.0	18.0	18.0
	5-9	68	68.0	68.0	85.0
	Above 10	14	14.0	14.0	95.0
	Total	100	100.0	100.0	



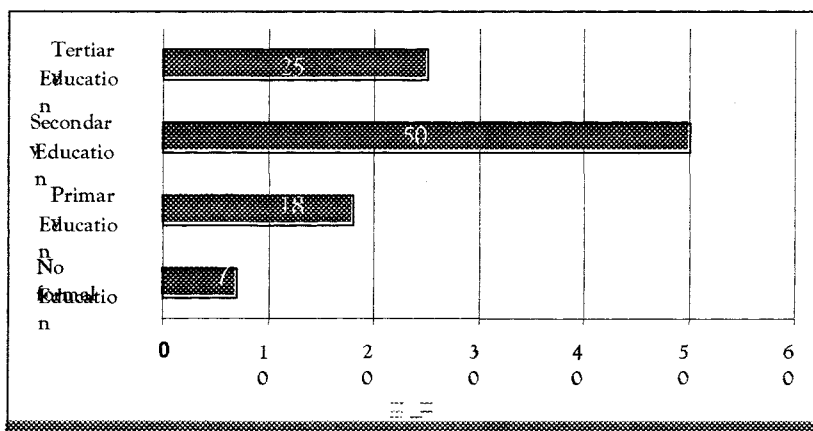
**Figure 4.3 People per Household**

#### 4.6 Education Level of the respondents.

Almost 25% of all the respondents have attained tertiary education and 50 % have secondary education. People with no formal education were 7% and those with primary education were 18%. Community sensitization and participation is expected to be positive as the majority of the community people are educated hence understand the importance of water supply. Table 4.5 and figure 4.4 indicate the level of education of the community members.

**Table 4.5 Education level**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid NO formal Education		7.0	7	
Primary Education	18	18.0	18.0	25.0
Secondary Education	50	50.0	50.0	75.0
Tertiary Education	25	25.0	25.0	100.0
Total	100	100.0	100.0	



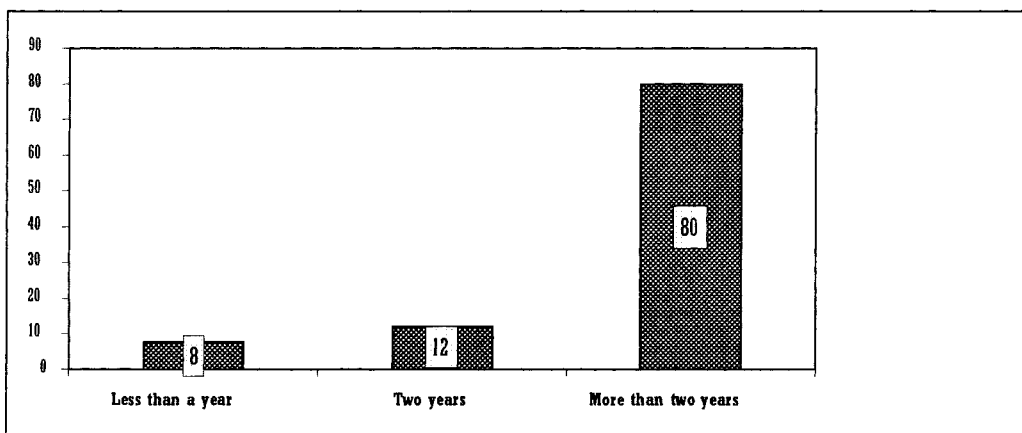
**Figure 4.4 Education Level of the respondents at Vituka machimbo community**

#### 4.7 Period of Stay of the respondents at Machimbo Community

In urban settlements residents normally rent houses or rooms before they can build their own houses. In Vituka Machimbo area the majority of the residents have stayed at the community for more than two years as indicated in Table 4.6 and figure 4.5. Most people have permanent houses and therefore they will be willing to contribute whenever there is a request for operation and maintenance cost. The sense of ownership of the project will also be possible and realistic.

**Table 4.6 Period of Stay at the Community**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than a year	8	8.0	8.1	8.1
	Two years	12	12.0	12.1	19.2
	More than two years	80	80.0	80.8	100.0
	Total	100	100	100.0	
Total		100	100.0		



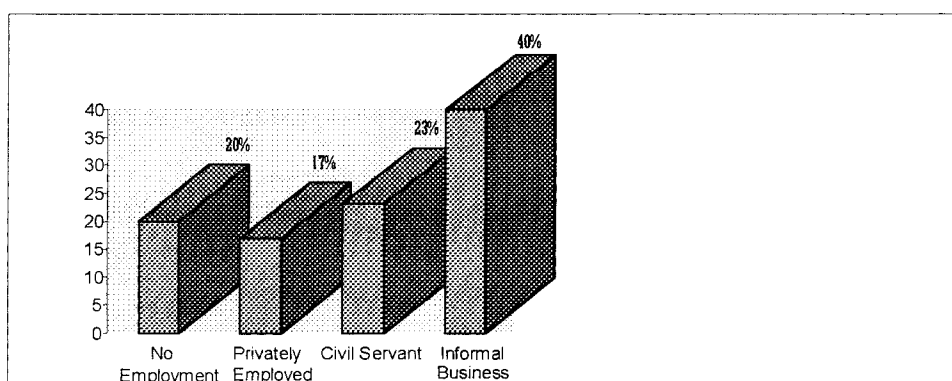
**Figure 4.5 Period of Stay At Machimbo**

#### 4.8 Water impact to Employment and income generating activities

Data collected shows that people with no employment were 20%. Privately employed were 19% and civil servants were 23%. Majority of the people (about 38%) are employed in informal sector. Result of the economic activity of the respondent show that 42% were petty businessmen and women as well as food vendors. Farming, Livestock & Poultry keeping consist of 24%. The availability of water will raise employment opportunities in horticulture, catering services, floriculture and in livestock. Table 4.7 and Figure 4.6 show the employment status of Machimbo residents.

**Table 4.7 Employment Status at Machimbo Community**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No Employment	20	20.0	20.2	20.2
	Privately Employed	17	17.0	17.2	41.2
	Civil Servant	23	23.0	23.2	66.6
	Informal Business	40	40.0	40.0	100.0
	Total	100	100	100.0	
Total		100	100.0		



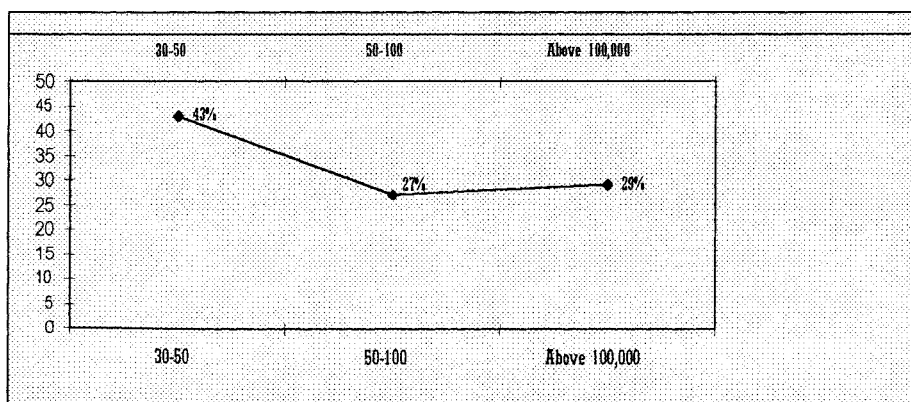
**Figure 4.6 Employment Status at Machimbo**

## 4.9 Income per Month of the respondents

The majority of the people have low income per month. (Below one dollar per day). Water cost also reduces this amount of money. These people fail to buy adequate amount of food, also they spend a lot of time looking for water. Table 4.8 and Figure 4.7 indicate monthly income of the people at Machimbo.

**Table 4.8 Incomes per Month**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	30-50	43			43.4
	50-100	27	27.0	27.3	70.7
	Above 100,000	29	29.0	29.3	100.0
	Total	99	99.0	100.0	
Missing	System	1	1.0		
		100	100.0		



**Figure 4.7 Incomes per Month**

#### **4.10 Means of Spending Money**

Among main ways of sending money, buying water take a high percentage (35%) compared to all other domestic requirements such as house rent, children school fees, hospital fees, transport charges, and savings. This project will alleviate poverty through savings.

#### **4.11 Expertise relevant to Water in Machimbo**

In the community there are Contractors, civil Engineers, Car washers and Brick makers who amount to 16%. Tailoring, Banking and electricians consists of 5% Security officers and students consist of 6%.

These professions can help to minimize water problems at Machimbo Community. They can facilitate water education campaigns; assist in building boreholes and storage tanks in case of rainwater harvesting.

#### **4.12 Economic activities available at the community**

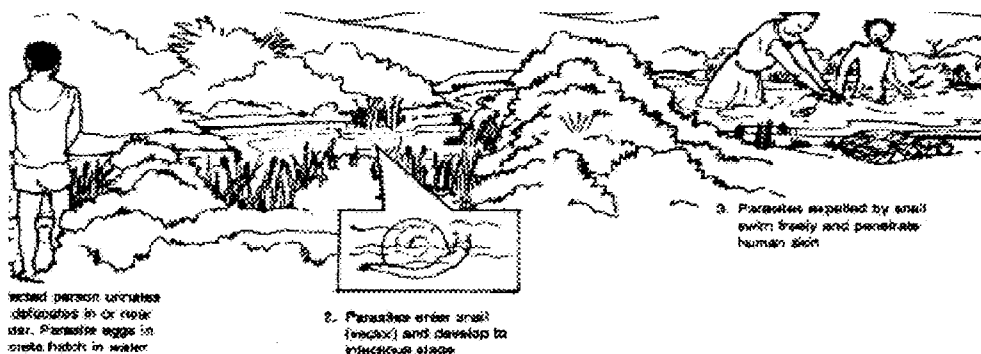
In Machimbo community there are bars and local brew businesses, restaurants and health Care clinic. Other activities include urban agriculture, garage and car wash centers. These activities need a lot of water in order to develop. These water users will contribute to the project by buying water. Therefore the sustainability of water is possible.

#### 4.13 Water shortage, a leading community problem

Among various problems in the community, water has been mentioned as a number one problem that needs quick attention so as to alleviate poverty

#### 4.14 Water related Diseases due to shortage of water

There are two major classifications of water related diseases. There is infection diseases caused by biological agents (pathogens) and water chemistry related diseases such as those, which are linked to high fluoride levels in drinking water. Water borne diseases are infectious diseases spread by pathogens. The common diseases are typhoid and cholera. Water Washed include diseases caused by lack of enough water for personal hygiene. Transmission occurs from person to person in the domestic environment, which might be reduced if water was more available to improve personal domestic clean-li- ness.

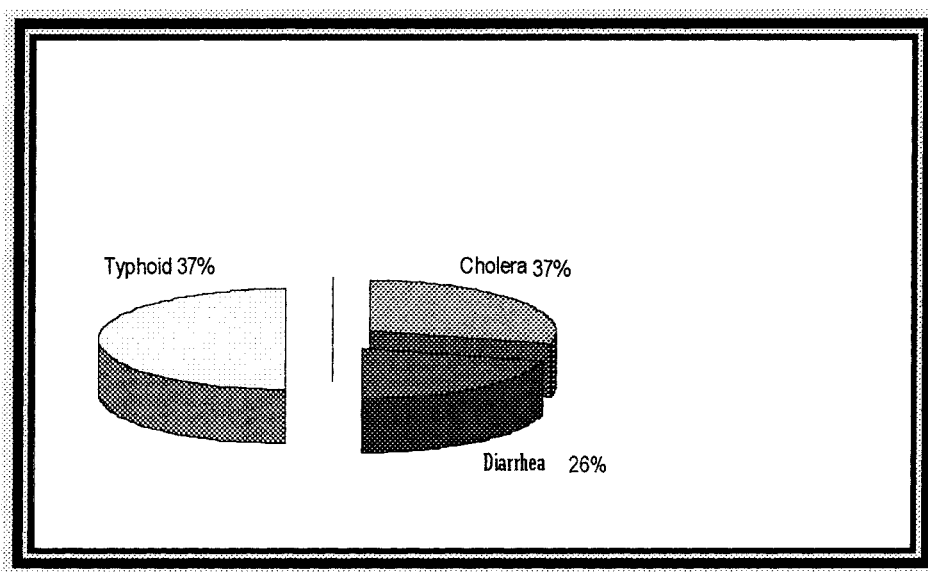


**Figure 4.8 The spread of Schistosomiasis**

**Source: Water For the World: Means For Disease Transmission Technical Note No.DIS.I.M.I**

Water based diseases are all worms infections. Several of them are due to flukes or trematodes whose larvae depend on aquatic snails. For example, schistosomiasis can find

their way through the human skin. Water storage jars are breeding sites for the yellow fever mosquitoes. This water-related insect vector disease is the urban problem as they cause malaria. This happens where water has to be fetched to the house and stored. At Machimbo 37% of the respondents reported cholera as the major problem, whereas 37% were affected by typhoid and 26% were suffering from Diarrhea as shown in Figure 4.9.



**Figure 4.9 Water related Diseases at Machimbo Community.**

The head teachers of Yombo Vituka and Ukombozi primary schools were also interviewed on diseases and water issues and problems associated by water shortage in their schools. At these two primary schools, pupils are involved in bringing water to school for sanitary purposes. Water brought by young kids cannot be enough for sanitation purposes and this indicates the possibilities of eruption of diseases.

When interviewed the doctor from Malawi dispensary outlined three major diseases, which affect Machimbo people to be worm, eye and diarrhea. Thus, the basic reason why water is given the highest priority in the National Strategy for poverty alleviation is because of its

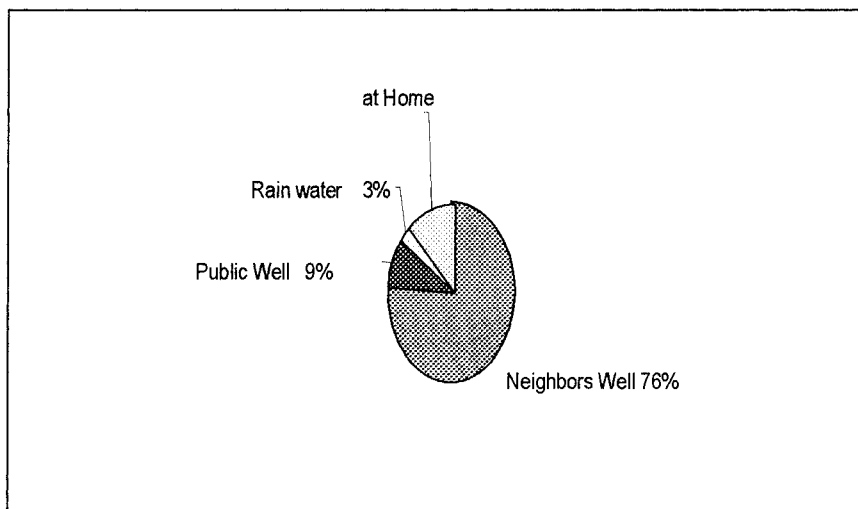
direct links to health and productivity. Water quality is one of the factors that reduce eruption of the diseases in the community. . Binamungu D (2002) suggests bacteriological analysis to be done at the community wells in order to monitor water quality.

#### 4.15 Sources of Water at the Community

In the community there is no surface water supply. 76% of the people depend on neighbors wells which are drilled in small plots along septic tanks (Table 4.9). These neighbors' wells are opened at the morning for some few hours and at the evenings. For the people with no enough storage they get trouble during the day. This is why the community sees the need to have a safer borehole, cheap and reliable water supply.

**Table 4.9 Sources of water at Machimbo Community**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neighbors Well	76	76.0	78.4	78.4
	Public Well	6	6.0	6.2	84.5
	Rain water	3	3.0	3.1	87.6
	At Home	12	12.0	12.4	100.0
	Total	97	97.0	100.0	
Missing	System	3	3.0		
Total		100	100.0		



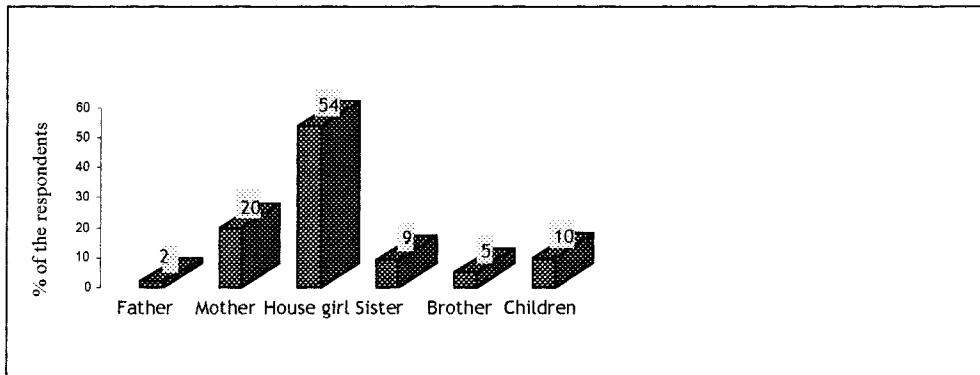
**Figure 4.10 Sources of Water of the respondents**

#### 4. 16 Fetching water Responsibility

In Tanzania, domestic activities are responsibilities mainly for women, girls and children. As reported by 54% of the respondents, house girls reported to be main responsible persons who fetch water. Mother follows by 20% and sister by 9%. Figure 4.2 indicate how water is burden to house girls and women at Machimbo area.

**Table 4.10 : Fetching Water Responsibility**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Father	2	2.0	2.0	2.0
	Mother	20	20	20	20.0
	House girl	54	54.0	54.0	54.0
	Sister	9	9	9	9
	Brother	5	5	5	5
	Children	10	10	10	10
	Total	100	100.0	100.0	



**Figure 4.11 Fetching Water Responsibility**

The majority of the women in Machimbo also have the responsibility to income generating activities on top of family care .The construction of a borehole will reduce women and girls workload.It will also reduce time wasted on fetching water. They will therefore increase the number of hours that can be used in productive activities, attend evening courses which will lead to the gain of some of other income generating activities. More women will decrease

absenteeism at work places. More time of the women will be used to take care of the families and so reduce malnutrition cases. There will also be an increase of nutrients absorptive capacity and food efficiency as there will be a possibility of urban farming especially horticulture.

#### **4.17 Excreta disposal, Quality and Sources of Water at Machimbo**

Being in Urban settlements with plots, which are half an acre from one another, Machimbo residential houses are so close with septic tanks and pit latrine all over around. Results from the sewerage system used by the respondents shows that the majority of the respondents (about 68%) use pit latrines. Septic tank is used by only 20% of all the respondents and 7% of the respondents had no pit. Respondents with both septic and Pit latrine were 4%. 1% use neighbor's pit.

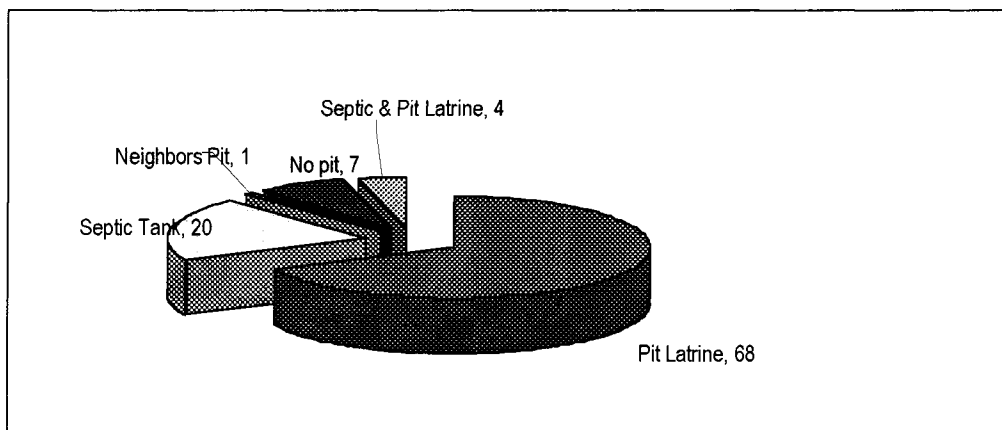
The main source of water is from neighbor's wells, which are drilled only 25 meters below the ground. 76% of the respondents get daily water from the neighbor's wells. Only 5% take water from public wells and 3% practice rainwater harvesting. Only 2% of the respondent have water supply at their homes. Urban Water Supply Authorities (UWSA) normally carry physical and chemical analyses of their waters before and after treatments ( Mwilawi 1996) . Bacteriological tests are performed by only a few UWSAs (UWSs report 2000, Sanaa 1980)

This situation is indicating that these types of water sources are likely to be unsafe for human consumption. There is a need therefore to construct a safest type of borehole, which has adequate length, scientifically free from pollution and health hazards. Majority of the

people use pit latrines due to shortage of water. If the water will be available, they can opt to septic tanks, which are more hygienic compared to septic tanks.

**Table 4.11 : Types of excreta disposal at Machimbo Community.**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Pit Latrine	68	68.0	68.0	68.0
	Septic Tank	20	20.0	20.0	88.0
	Neighbours Pit	1	1.0	1.0	89.0
	No pit	7	7.0	7.0	96.0
	Septic & Pit Latrine	4	4.0	4.0	100.0
	Total	100	100.0	100.0	



**Figure 4.12 Types of excreta disposal available at the Community**

Type of excreta disposal has a great relationship with the shortage of water. People with septic tanks and who are affected by cholera were 1%, Diarrhea 0% typhoid 2%. There is therefore a relationship between the rate of diseases and type as excreta disposal. People using septic tanks can have lower chances of getting water related diseases compared to those using pit latrines.

#### 4.18 Proposed Water supply Solution

Since the purpose of the project is to provide potable water for human consumption, a choice was made in favor of boreholes by 51% as opposed to tap water supply, which was 14%, and rainwater harvesting was proposed by 20% of the population as indicated in figure 4.13.

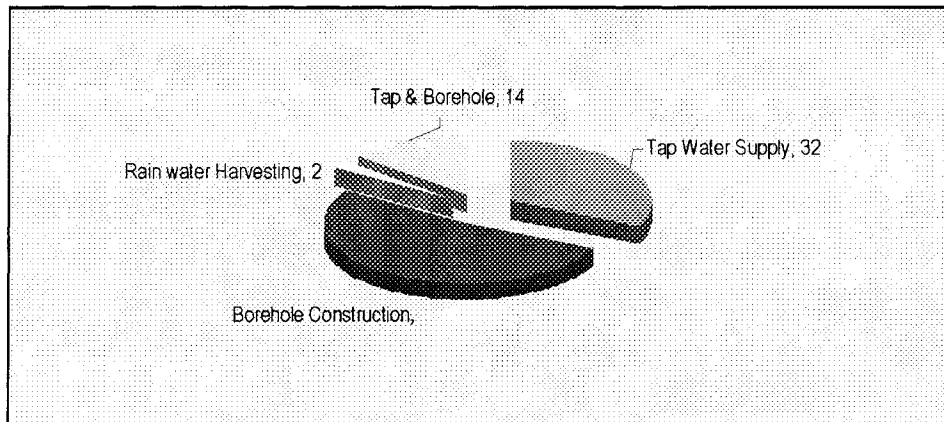


Figure 4.13: Proposed Water Solutions For Vituka Machimbo Community.

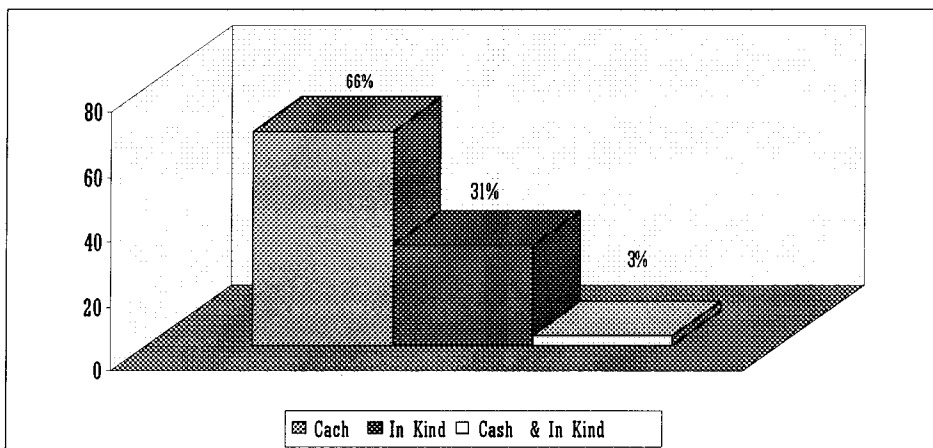
Groundwater is appropriate at Machimbo Community due to the fact that there is no tap water network available at Machimbo. In case of lack of adequate rainfall in Dar es Salaam it is not possible to rely on rainwater harvesting Technology.

#### 4.19 Nature of contribution for borehole construction

Almost all the people accepted to contribute in cash and in kind. 66 % accepted to contribute in cash, 31% in kind and 3% promised to contribute both in cash and in kind. According to the study results the community is estimated to contribute to 1,116,000 T Shs and all the people were ready to contribute.

**Table 4.12 Nature of contribution for a borehole Construction**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Cash	66	66.0	66.0	66.0
	In Kind	31	31.0	31.0	97.0
	Cash & In Kind	3	3.0	3.0	100.0
	Total	100	100.0	100.0	

**Figure 4.14 Nature of Contribution for borehole Construction**

## 4.20 Amount of cash promised to be contributed

Both low and high-income community members accepted to contribute in cash. The total amount according to the employment status and age group was the criteria used to calculate the actual amount of contribution from the analysis the community is expected to contribute 1,116,000 T Shs. Figure 4.13 shows amount of cash community promise to contribute.

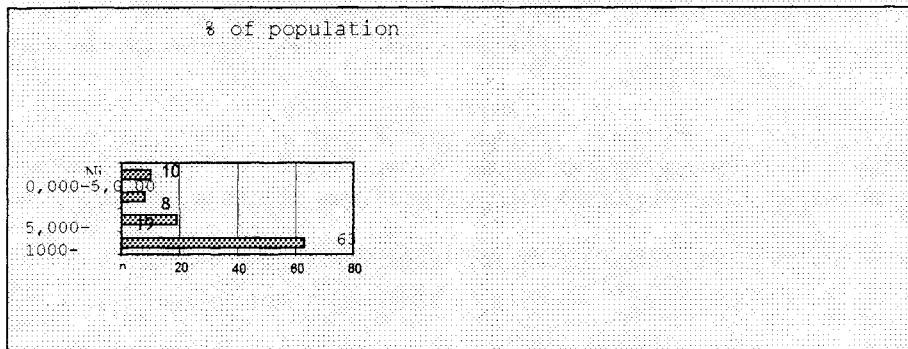


Figure 4.15 Amount of cash to be contributed

## 4.21 Cross Tabulation Summary of Survey results

### 4.21.1 The relationship between age and Income Per month

The relationship between age and Income per month shows that the group with income level of Shs 30,000-50,000 is young people of 18 to 30 years. No one among this group has the income above 100,000. However the middle age group indicates a great ability of income capability than the old age group.

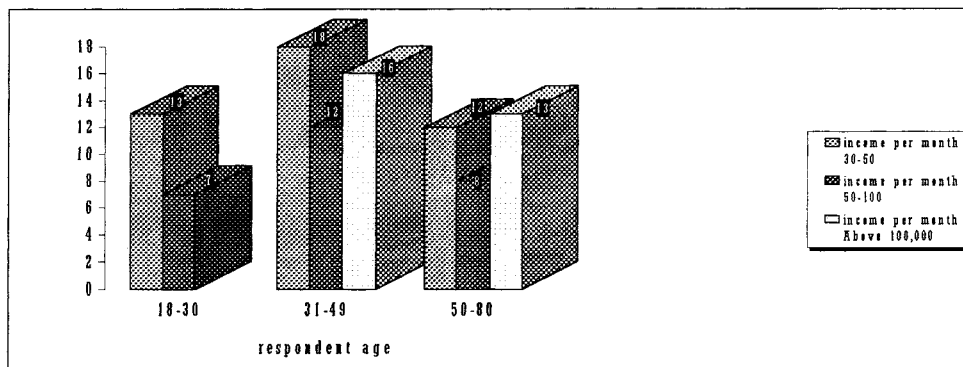


Figure 4.16: Respondent age and income per month Cross tabulation

This is an indicator of the poverty at the community among the younger working group. The borehole construction will create employment through informal businesses as water will be available. All the three income categories of people were willing to pay though in different levels due to different economic activities.

#### 4.21.2 Income per month and amount of cash contribution.

The majority of the people in the study are low-income earners with an average of between Tshs 30,000 to 50,000 Tshs. 34% of the people with 30,000-50,000 income level promised to contribute TShs. 1,000 - 5,000.

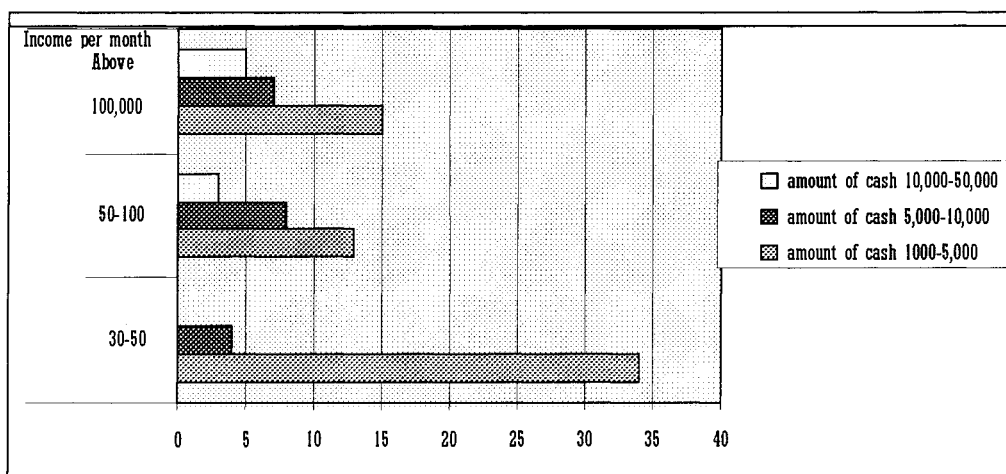


Figure 4.16 Relationship between Income per month and Cash contribution

The study therefore established that people are willing to contribute despite their low incomes. The observation shows a high need of community mobilization in development activities especially to the middle income earners.

The amount of cash contribution does not necessarily go along with the economic status. The operating and maintenance of the project will not also meet any huddles due to the sense of ownership indicated by willingness to contribute.

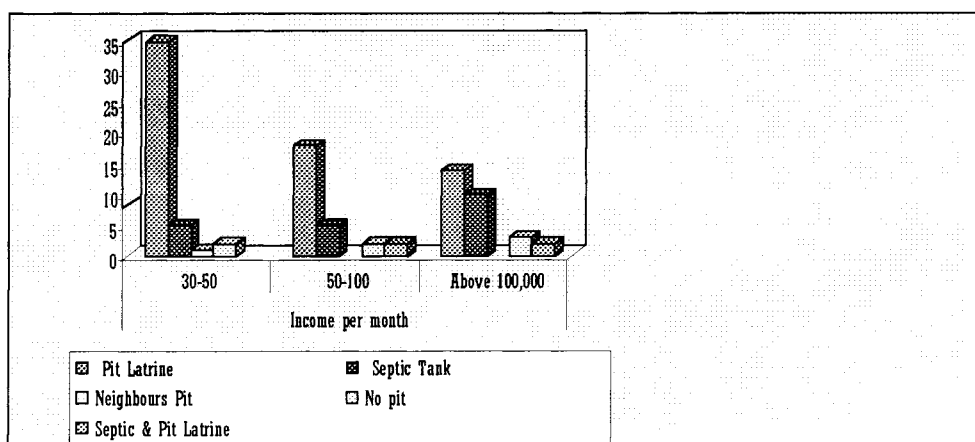
### 4.21.3 Income per month and Excreta disposal type

Other key indicator, which shows that the level of poverty is high, is types of sanitation services in the community. The study shows that the highest numbers of people who use pit latrine are low-income earners. Some of them are using neighbor's pits. None of the high-income earners use neighbors pit.

The use of septic tank requires a lot of water for sanitary purposes compared to pit latrine, something which causes low income earners not to opt for septic tanks. Hygienically septic tanks are better than pit latrines.

**Table 4.13 Income per month and Disposal Excreta Cross Tabulation**

Count		Excreta Disposal system					Total
			Septic Tank	Neighbors Pit	No pit	Septic pit Latrine	
Income	30-50	35	5	1	2		43
	50-100	18	5		2		27
	Above 100,000	14	10		3	2	29
Total		67	20	1	7	4	99



**Figure 4.17 Incomes Per Month**

There are many social economic problems associated with inadequate water supply in peri urban areas especially in Dar es Salaam city. Some of these problems are water related diseases, low income due to high water cost, workload to women, low academic performance among girls at school and poor excreta disposal system. All these problems have resulted into poor economic development.

Machimbo community members are low-income inhabitants who are ready to contribute to the solution of water shortage in their area. The sensitization is highly needed as the promised contribution shows that though some members are high-income earners the amount of contribution does not differ from that of middle level income earners.

The possibilities therefore of constructing a borehole at Vituka Machimbo community are very high and the community members have promised to contribute 10% of the total cost which will be needed in constructing a borehole.

Borehole construction is a valid solution to Machimbo Community water supply. Due to lack of adequate rainfall in Dar es Salaam it is uneconomical to rely on Rainwater harvesting Technology.

## **CHAPTER FIVE**

### **Implementation Plan**

#### **5.0 Executive Summary**

This project implementation plan is divided into two main parts. Part one entails at explaining the components of a business plan. Part two shows the fund raising, monitoring and evaluation plan. This business plan will indicate the location, aim, and objective, expected output, resources and risk analysis's, required resources and expected output and financial contribution from the community, Part two on the other hand indicate fund raising interventions, monitoring plan and participatory evaluation plan.

### **Part I**

#### **5.1 Bore hole business plan**

The project objectives are; reduction of women workload and water related diseases, increased income and improved nutrition standard skills, change of attitude and sense of ownership imparted to the community members. All these will not be achieved if the borehole will not be constructed. The business plan therefore is an important tool and a guide which will facilitate the implementation of the plan for constructing and drilling a borehole.

##### **5.1.1 Project title**

Borehole construction is a project that has been selected by Vituka community aiming at solving water shortage at Vituka Machimbo for poverty alleviation. Water demand for one day at Vituka machimbo per day is 1,200,000 litres. The borehole is expected to provide at

least half the required amount due the recharge characteristics of the geological features of Machimbo Vituka. At least two boreholes are expected to be able to provide such amount of water. The location: The Project premise will be at the open space within Vituka Machimbo community. The project title will be **Vituka Machimbo Borehole Construction**.

### **5.1.2 Project Plan Objective**

The main objective is to reduce water shortage by constructing a borehole.

#### **Other objectives**

- To introduce community participation among the community members in deciding, identifying, implementing and evaluating development projects at the community.
- To create sense of ownership of development projects at the community.
- To reduce social economic problems associated with water shortage
- To create employment among young men and women through borehole operations

### **5.1.3 Resource analysis**

#### **5.1.3.1 Available resources**

##### **i) Plot of Land**

There is a plot of land available at the community (an open space), which has been requested but not yet officially given to the CBO by the authority.

##### **ii) Human Resources**

There are a number of individuals in the community who can assist in the design of the Borehole. Local government leaders may assist on mobilization of the community and on lobbying and advocacy of the policy on how to get a plot available in an open space in the community.

### **5.1.3.2 Required resources**

#### **i) Financing**

Funds will be requested from Tanzania Social Action Fund TASAF and Water AID. Also the community has promised to contribute financially and through labour.

#### **ii) Technical analysis**

Water Engineers for the design of the tank will be requested from the municipal council, city water, and Water AID Dar es Salaam. Water Laboratory Technicians for water quality test will be hired from Water Resources Institute and Ministry of Water and Livestock Development.

#### **iii) Equipments and facilities analysis**

Water Drilling Machines will be hired from the municipal council while Water Resources Institute water laboratory will be useful for water chemical and bacteriological analyses.

#### **iv) Human resources**

Two people will be needed as borehole operators and kiosk attendants.

Another two will be security guards who will take care of the pump during the night.

Therefore there will be four personnel.

### **5.1.4 Risk analysis**

There can be electrical error on pumping mechanism. Pump operators should get training from City Water so as to be able to detect dangers and overcome them before the destruction. The safety will be under community as everybody is expected to be a guard assisting employed security guards. The bylaws will be formed by the community on washing or bathing near the borehole or water kiosk for water security against pollution.

### 5.1.5 Expected output

One borehole is expected to provide 60,000 litres 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.

Daily	60,000 litres x20 Tshs	12,000/=
Monthly	12,000x30 days	360,000/=

### 5.1.6 Financial plan

Borehole construction Cost is 10,000,000.

The community will contribute hundred percent of the total cost for three years in order to raise 10,000,000.

### 5.1.7 Cost analysis of the proposed bore hole Construction

Activity	Recourses Needed	Cost
Consultation	Consultation fees	1,000,000
Pilot hole Drilling	Excavations Machine & Expertise	1,500,000
Drilling	Drilling machine personnel	1,000,000
Bore hole Construction	Building material & Labor	4,500,000
Project Handover/ Inauguration	Invitations, drinks & Bites	1, 500,000

**Total Cost 10,000,000.**

### 5.1.8 Financial Analysis

The following is the financial control.

- **Revenue Side**

Expected output	a ) 360,000
Electricity tariffs	b) 30,000
Salaries for four people	200,000
Operation and Maintenance cost ( OMC)	30,000
Net Profit ( Income –Costs )	100,000
360 – 260= a – b	

## Women loan

In order to generate more income 50% of the money, which is 50,000, 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 5.000/= only.

### 5.1.9 Proposed community contribution

The proposed contribution has to be obtained by looking at the people who can contribute in age wise, willingness to contribute and categories of contribution.

1) Age of the working group	18-50 actual no x total population 40% x 120,000 = 48,000	48,000
2) Employed people	30% x 48,000 = 14,400.	14,400
3) No of people ready to contribute	5% x 14,400 = 21,600.	21,600.
5) Actual number of the people who are ready to contribute	50% x 21,600 = 10,800	10,800
6) Contribution categories		
a) 50% will contribute 5,000/=	10,800 x 50% x 5,000 = 270,000/=	270,000/=
b) 45% will contribute 10,000/=	10,800 x 45% x 10,000 = 486,000/=	486,000/=
c) 5% will contribute 75,000/=	10,800 x 5% x 75,000 = 405,000/=	405,000/
Total	a) + b) + c) =	1,161,000/=

Total expected contribution is expected to be 1,161,000/=

### 5.1.10 The criteria of the contribution and cost of the borehole

- Total cost

According to the Drilling agency of the Ministry of Water and Livestock Development the cost of the drilling and construction of the borehole will produce 3000 litres of water per hour can cost 10,000.000.Tshs.

- **Contribution criteria**

Water Aid is currently implementing a water supply borehole projects at Temeke Municipality. On September 2004 Water aid conducted a Meeting with Sub ward leaders informing them on the project, and suggested that the policy of water Aid requires at least 5% of the total cost to be contributed by the community members, while the rest 95% will be taken care of by the Water Aid Project. In this regard the community will be able to get a borehole of the cost of 10,000,000. Meanwhile the CBO is expecting to get a technical assistance from Temeke Municipality which will reduce the cost again by 20%.

**Basing on these criteria the following is the contribution analysis.**

**THE TOTAL COST**

The total amount of the cost will be 10,000,000.

Community members will contribute 100% which will be 10,000,000.

According to the study the number of people who can contribute and the proposed contribution shows that the community has the ability to contribute in installment

Since the community cannot raise this amount so quickly, the contribution can be done for three years .Tin the first year they can contribute 4,000,000 million and the rest two years they can contribute 3,000,000 in each year.

### **5.1.11 Conclusion**

Borehole construction is possible under community participation. Both VMDA community based Organization and Local government leaders can facilitate financial and labour contribution for Borehole Construction. This project needs close supervision and an intensive business management for its sustainability. A case study of Tabata Development Fund community Water supply management will be taken as Models to run this project.

## **Part II**

### **5.2 Fund raising, Monitoring & Evaluation Plan**

#### **5.2.1 Fund Raising Interventions**

- The CBO members in a meeting have formed a 5 people committee one person from each sub-location which will collect contribution from the community.
- The Health and Environment committee will meet the local government so as to have a dialogue with Temeke Municipality, water AID and TASAF on how to get more financial, technical and Managerial assistance for the take off of the project.
- The exercise of awareness creation and collection of funds expected to commence on January 20th.5-2005.

#### **5.2.2 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.
- There will be a weekly financial report and these reports will be reported in monthly CBO meetings.
- Monitoring is going to be a participatory in nature involving community leaders and members.
- The Monitoring chart is indicated in appendix ix.

## Programme Planning Cycle

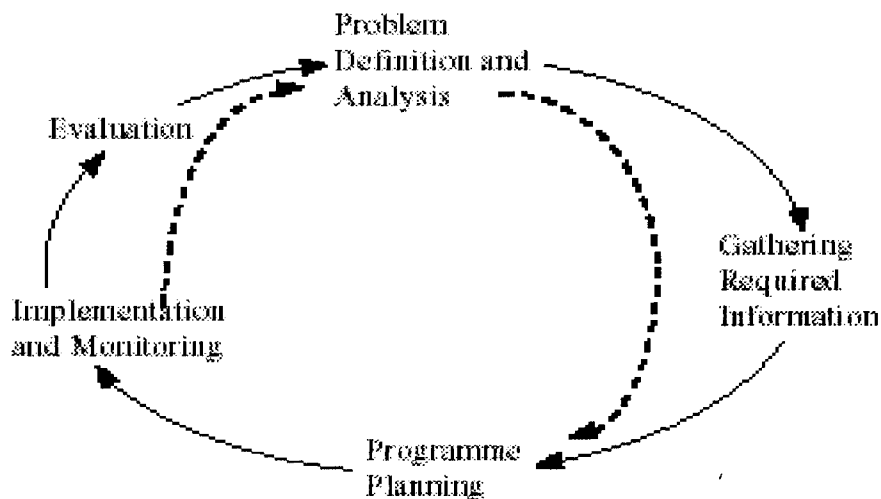


Figure 5.1 Monitoring & evaluation in a Planning Cycle.

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

- Organization and Management
- Community participation
- Money Management
- Operation And Maintenance
- Hygiene, Sanitation And (HIV/AIDS)
- Linkages and Relations with other stakeholders
- What conflict have Community water committees found difficult

Table 5.1 Monitoring checklist

Focal Area	Issues to look for
Organization And Management	<p>Are decision made democratically or is it a one- man show.</p> <p>Are tasks shared well among community Newbern</p> <p>-How are women and other vulnerable groups involved in decision making</p> <p>-Are meetings regular how effective are the meetings look at the action plan and minutes of the meeting.</p>
Community participation	<p>How often does water and sanitation Committee with the community</p> <p>-Active Participation in communal tasks</p>
Money Management	<p>Types of collection method effect ion</p> <p>-Bank Account details</p> <p>How much has been collected/ banker</p> <p>-Bookkeeping; books available for financial records and how are they written.</p> <p>- Regular Financial reporting to community</p> <p>- Account ability regular reporting to the community</p>
Operation And Maintenance	<p>-Status of water scheme</p> <p>-How often does the caretaker inspect the pump</p> <p>-Stock of spare on hand maintenance record</p> <p>-Regular cleaning of water points</p>
Hygiene, Sanitation An (HIV?AIDS)	<p>-What has community/household done regarding H &amp; S action plan.</p> <p>-Number of H and S HIV/AIDS meetings held in the community</p> <p>-Are people using improved water supply?</p> <p>-Have people chapped behavior of pouting water at the river</p> <p>-Are people and using cleaning building toilets properly</p> <p>-Have practices of disposing of human excreta improved?</p> <p>-What are the improved hygiene practices eg. Hand washing bathy etc.</p>
Linkages and Relations with others	<p>What support has water sanitation and hygiene committee receive and village.</p>
What conflict are found difficult	<p>-What links does CWSHC how with village council</p>

### **5.3 Participatory Evaluation Plan**

Evaluation is a continuous process of assessing the success of a plan.

This project will be done under two types of evaluation:

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

#### **Participatory Evaluation will have the following benefits**

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

Business plan, fund raising, 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 Based Organization to see the successes and failures and they give room for discussion among stakeholders among many advantages.

## **CHAPTER SIX**

### **Conclusion and Recommendations**

#### **6.1 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 countries 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 solve the problem at peri-urban areas like Machimbo. 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.

Vituka Machimbo Development Association CBO and 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 sim 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 Vituka Machimbo 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) posses 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 DAWASA, 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.

## 6.2 Recommendations

- The income rising for borehole construction will be successful if managerial and financial management skills are imparted to community and CBO leaders.
- Collaboration between CBO leaders and local government will promote community members' awareness and participation.
- Municipalities should conduct and finance regular seminars and meetings among CBO leaders to facilitate sharing of experience and suggesting ways in which community members can solve their own problems through community initiatives.
- 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.
- Community workers working at the municipalities in the city are in a position to assist CBO and NGO for technical assistances instead of remaining in the offices.
- Due the pathetic poverty situation of poverty in urban settlements, financial mobilization and capacity building of CBO 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.
- Community capacity building and empowerment is essential for economic development.
- 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.
- The link between Community Based Organizations will enhance community participation in development.

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