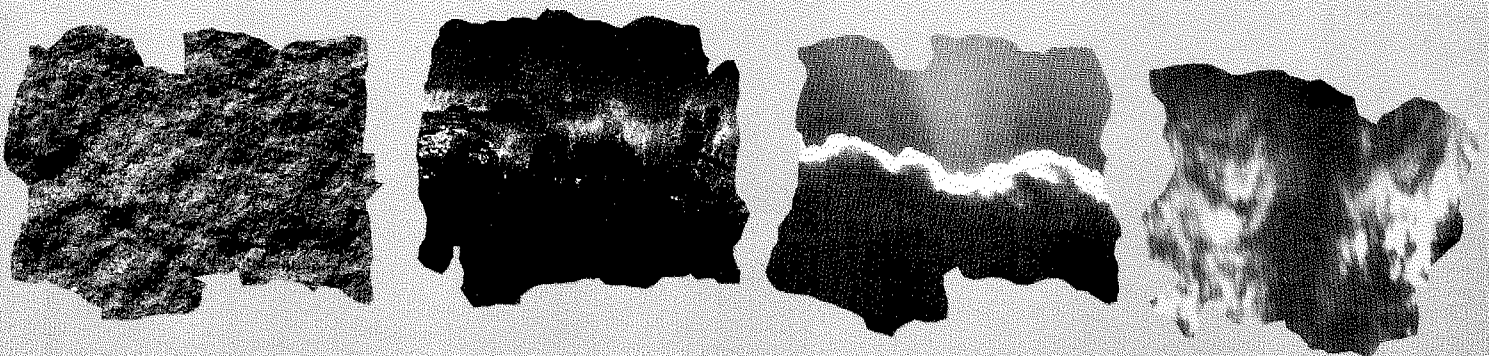


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COMMUNITY INVOLVEMENT IN WATER PROVISIONING: THE
CASE STUDY OF DAR ES SALAAM

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**COMMUNITY INVOLVEMENT IN WATER PROVISIONING: THE CASE
STUDY OF DAR ES SALAAM**

by

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ABBREVIATIONS

ADB	African Development Bank
AWEC	Annual Water Supply Experts Conference
BOT	Build-Operate-Transfer
CBO	Community Based Organization
CDA	Community Development Agency
CDC	Community Development Committee
CINARA	Universidad del Valle/Instituto
CIP	Community Infrastructure Program
CUE	Centre for Urban Environment
DAWASA	Dar Es Salaam Water Supply Authority and Sanitation
DIT	Dar Es Salaam Institute of Technology
DCC	Dar Es Salaam City Council
DCC	Dhaka City Corporation
DRA	Demand-Responsive Approach
DSM	Dar Es Salaam
DSK	Dustha Shashya Kendra
DWASA	Dhaka Water Supply and Sewerage Authority
ESA	East and Southern Africa
ICF	International Christian Fellowship
IDWSSD	International Drinking Water and Sanitation Decade
IHS	Institute for Urban and Development Studies
ILO	International Labour Organization
IRC	International Reference Centre
KWDIC	Kibera Water Distribution Infilling Component
LBD	Locally Based Demand
LIFE	Local initiative Facility for the Urban Environment
MLD	Millions of litres per day
MoW	Ministry of Water
NCC	Nairobi City Council
NEMC	National Environmental Management Council
NGO	Non-Governmental organization
NUWA	National Urban water Authorities
NWSDP	National Water Supply and Drainage Board
O&M	Operation and Maintenance
PDF	Participatory Development Fund
PHAST	Participatory Hygiene and Sanitation Transformation
PPP	Public private Partnership
PSP	Private Sector Participation
PVC	Polyvinyl Chloride
SANAA	The Autonomous Water and Sewerage Authority
SDC	Swiss Agency for Development and Co-operation
SDP	Sustainable Dar Es Salaam project
TAS	Tanzanian Shillings
TBS	Tanzania Bureau of Standards
TDF	Tabata development Fund
TNWSP	Third Nairobi Water Supply Project
UCLAS	University College of Land and Architectural Studies
UDSM	University of Dar Es Salaam

Abbreviations

UEBM	Executive Unit for Marginal Settlements
UN	United Nations
UNCHS	United Nations Centre for Habitats and Settlements
UNDP	United Nations Development Program
UNICEF	United Nations Children Funds
USAID	United State Agency for International Development
UWSAs	Urban Water Supply and Sewerage Authorities
UWSDs	Urban Water Supply and Sewerage Departments
WASA	Water and Sanitation Associations
WASH	Water and Sanitation for Health
WAU	Wageningen University of Agriculture
WHO	World Health organization
WSP	Water and sanitation Program
WSSCC	Water Supply and Sanitation Collaborative Council
WSS	Water Supply and Sanitation
WWO	Water works Ordinance

EXECUTIVE SUMMARY

Traditionally, in Tanzania water supply services have been delivered via a centralized system. The government has been implementing a water supply programme that supports its citizens with adequate, safe drinking water as a free commodity. Its positive health and environment externalities seemed to justify the view of both government and communities that free water is a fundamental right of the people.

However, inadequate resources constrained government's ability to fulfil this goal and coverage and quality of services suffered. The civil servants (usually engineers) from the Ministry of water are responsible for water delivery. Engineers devised schemes based mainly on technical considerations such as viability of water sources and area, population to be served rather than seeking advice from intended users. Staff managed systems with little effort to identify or address user's preferences. Not surprising this approach created few incentives for users to assist government in maintaining or financing water services.

With many years of attention being paid by the government to the water supply problems, there still remains a great deal to be done. Water supply services has not been a success in Tanzania both in urban and rural areas. The government has to admit that the burden to provide safe water is heavy, and calls for change in strategies for delivery of this service. Some new strategies for water supply delivery, particularly the community participation should be promoted.

This report concentrates on domestic water supply to poor communities in Dar Es Salaam city. The overall objectives of this study has been to gain better understanding of the factors which contribute to the success or failure of local community participation in domestic drinking water provision. It is the assumptions of this study that when communities are given the chance to participate in improving their water supply situation, they can successfully contribute to sustainable solutions. Full involvement of communities in all stages of implementation and management is a pragmatic approach to the present problems. However, this approach should not divest government's responsibility for continuing and evolving support because communities rarely have the sustainable capacity to manage their own infrastructure in complete independence of the government or NGOs. Communities, irrespective of their income status, can play a significant role in improving water supply services in ensuring cost recovery and thereby sustaining investment in water supply system.

Water supply services in the city of Dar Es Salaam, is provided by DAWASA (a state owned parastatal) on behalf of the government. The functioning of DAWASA is very poor, and has failed to deliver efficient water services to the residents over a very long period. The provision of adequate water services to the rapidly growing city population is increasingly becoming a problem, which needs to be addressed by the entire community, government, and NGOs. The challenge facing DAWASA is how to supply sufficient water of good quality. On the one hand demand for water is rising exponentially due to continuing population growth and rising standard of living, while on the other hand, DAWASA has to cope with water shortages. Furthermore water supply distribution system in Dar Es Salaam is in a deplorable state due to insufficient upkeep.

The empirical study was conducted in four settlements in Dar Es Salaam. Detailed studies were carried in two of these settlements, Mburahati and Ubungo-Kibangu,

from where primary data through informal discussions, conversations, questionnaires and interviews was collected and used to answer the research questions. Focus groups discussions from communities were also used to obtain necessary information. Written papers, published reports and other relevant literature were also reviewed to obtain secondary data. The other two settlements, Hanna Nassif and Tabata, were visited and studied as referent situations by author because these settlements managed to improve their basic social services through community participation.

Water supply and sanitation are inextricably linked. An improvement in one, impact on the other. Poor sanitation always leads to a contamination of water sources leading to the need for additional resources for treatment and protection. The inadequacy of these services impacts negatively on public health and well-being. The capacity to ensure the effective functioning of both water and sanitation services, requires the participation of both communities and the services providers.

Community participation, which holds the key to sustainable solution particularly in low-income areas, has not been initiated. Community participation, however, is not a spontaneously automatic process. It requires an initiative to launch it, and management to organize it. The initiative to start discussion of the possibility of community participation will often come from an individual within the community who already plays a prominent role in one of these organization such as schoolteacher, religion leader or may come from outside body such as the municipality. Communities can participate only through community institutions (CBOs) which are entry points through which a first approach to communities can be made. Initiating active community participation is dependent on factors both internal and external to the communities.

The study provides the recommendations to ensure participation of the communities in providing water supply services which includes formation and registration of CBOs, support (technical and financial) by DAWASA and local authority in building grassroots community participation. In addition legalization of the activities of water vendors as an informal private sector to enable them work hand in hand with service providers, could help improve water delivery services to these communities.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background/context

Water has become a major issue of concern on global environmental agenda. Over the past two decades a number of international declarations have sought to ensure access to safe water and sanitation with environmental sustainability. A range of criteria and financing mechanisms has been proposed for the mobilization and allocation of financial resources. Yet millions of people do not have access to basic levels of service and there are concerns about water scarcity and environmental degradation impacting fresh water resources. There is increasing competition between agriculture, industry and domestic sectors for fresh water, which is a finite resource in a given environment.

At a global level, demand for water is increasingly steadily, with a general trend toward diversification of use away from agricultural activities. Currently, about 70% of world's fresh water resources are used for agriculture and industrial purposes. Moreover, with increasing population and improved living standards, domestic demand for water has grown significantly in all parts of the world, including Africa (Biswas 1993). Although the African continent is still the least irrigated and least industrialized region of the world, sustained efforts continue to be made to provide safe and reliable water sources in rural and urban areas throughout the region, both for domestic consumption and for agriculture purposes.

In the Africa Statement of the Water and Sanitation Africa Initiative, which was accepted after the African Consultative Forum in Abidjan Ivory Coast (1998); African Water Professionals called on political and civil leadership of Africa for urgent actions for promotion of water and sanitation services. Lack of access to these most basic of services necessary to sustain life, lies at the root of many Africa's current health, environmental, social, economic and political problems. The sector professionals statement "Our vision is of an Africa in which all citizens have access to safe and affordable water and sanitation services in the shortest possible time".

In Africa today over half of the population is without access to safe drinking water and two third lacks a sanitary means of excreta disposal. It is the situation in which the poor are adversely affected to disproportionate degree. Thousand of children in Africa die annually from water and sanitation related diseases. There are severe problems of environmental degradation. For women and children collecting water is physically stressful and time-consuming and often results in children not being able to attend school.

Despite significant improvements during the International Drinking Water Supply and Sanitation Decade (1981-1990) progress has now stagnated. More people are today without adequately services in Africa than in 1990. In comparison with other regions

Africa in general has had a particularly difficult time in holding on to the gains of the past.

Tanzania in East Africa like other African countries, has high urban growth rate. Dar Es Salaam City, the capital city of Tanzania is potentially the main engine of socioeconomic growth in the country. It has an area of 1543.26 square kilometers and estimated population of 3.0 million (1997 Census) or a quarter of the country's urban population. The city is growing at 8% annually which makes it one of the fastest growing cities in Sub-Saharan Africa. The outcome of this is ever-increasing haphazard and unplanned urban growth in main urban centers coupled with inadequate living standards. About 70% (according to study by the Urban and Housing Indicators Program 1995) of the city population live in squatter settlements which are densely populated, with marginal access to piped water supply, sanitation, drainage or basic services. People in these areas are prone to health risks and hazard due to overcrowding. Cholera outbreak since 1990(see appendix IV) are a general indicator of the severity of the health risks faced by this population. However, in water supply services both, the planned and unplanned areas of Dar Es Salaam face many problems. Dar Es Salaam city is divided into three municipalities(Kinondoni, Ilala, and Temeke) with several wards in each.

Water supply to the city of Dar Es Salaam is the responsibility of DAWASA (Dar Es Salaam Water and Sewerage Authority) a government owned parastatal. DAWASA, is the public organization (National Parastatal) the only institution entrusted by the United Republic of Tanzania with an authority to provide water services in all areas of the city of Dar Es Salaam (i.e overall responsibility for the services as far as water supply is concerned). This includes operation, maintenance, management as well as capital investment for expansion of services.

DAWASA is entrusted by the government to provide water supply and sanitation services to the public effectively as well as efficiently. The roles of DAWASA are as follows:

- i) Supply portable, safe, and adequate water (ensure maximum coverage) to all citizens of Dar Es Salaam city.
- ii) Improve and expand water systems (distribution network and production water plant) in order to maintain smooth supply.
- iii) Repair and maintenance of distribution system to protect environmental destruction and ensure proper use of water.
- iv) Establishing new water sources.
- v) Providing and ensuring efficient and effective functions of sewerage and sanitation systems in Dar Es Salaam. This includes maximum coverage, repair and maintenance of the systems. However, DAWASA has never done it

because of a conflict with Dar Es Salaam City Council that existed for more than three years now. The latter is demanding to the government that sewerage and sanitation works must fall under it.

One of the main problems in water supply provision by DAWASA to the city of Dar Es Salaam is its inability to deliver and maintain basic infrastructures services for the growing population. The traditional supply orientation of the government has tended to produce an overemphasis on facilities rather than a focus on services and emphasis on public sector provision rather than on effective approaches to complementary partnership. This is contributed to the popular misconception that communities in low-income urban settlements are unable or unwilling to pay for water related services. The effect of this are most severely felt in low-income urban areas which often remain outside the reach of basic civic services. The result is an increased burden of health care, a lowering of the quality of urban life and reduced urban productivity.

In reality communities in low-income urban areas pay many times more for far inferior services than their counterparts in the more affluent neighborhoods. An active involvement of the user community in the planning and provision of water supply service could contribute to greater equity and financial viability in the service and would in turn attract greater private sector participation in the sector.

In addition to contributing to service provision communities can also be important partners in improving the efficiency in the sector. Informed and motivated community groups can help reduce wastage of water and the large unaccounted-for losses from public distribution system. Communities action may not only complement the economic and regulatory measures taken by water authorities and service provider but could also be an important determinant of the success of such measures.

1.2 Problem statement

In Dar Es Salaam most of the citizens are not served with individual connections to the system, because the network has not been expanded to accommodate the rapid urban growth. In other areas the existing network is so weak that very low pressures and empty pipes are common. The distribution system is degenerating and because of leaking water is subjected to contaminants, domestic sewage, industrial wastes, surface run-off, untreated waste water, waste from industries and unmanaged solid waste contaminate drinking water and ground water. Also water turbidity is very high in treated water from treatment plants, especially when rainy season begins.

Most of urban communities in Dar Es Salaam have to rely on standpipes, private water carriers, or private wells for their domestic water supply. In most areas slum dwellers buy water from vendors or collect it from communal water points which are often highly unsanitary, more than 75% of slum dwellers have no access at all to clean water (Government of Tanzania and UNICEF 1992). In other areas like Tandale, Mburahati, Manzese and Buguruni water connections are shared by numerous families, and hygienic conditions are inadequate. The poorest families are forced to purchase water

from more prosperous neighbours who have access to water connection. So, generally in squatter areas in Dar Es Salaam there is a considerable water contamination, making these areas to be endemic for water borne diseases such as cholera, typhoid fever, diarrheas, hepatitis.

To combat the problems of water supply in Dar Es Salaam, the government has tried to take some measures. In 1996, the ministry of water formulated a technical task force to find devise and means of solving domestic water problem. The team came up with an idea of using ground water as a temporary measure. Initially the team planned to drill about 400 boreholes and connect them in the distribution systems of DAWASA. However, only 200 boreholes were drilled and only 40 boreholes were connected to the system.

The government through its ministry of water has also been trying to start small-scale water supply projects aimed primarily at satisfying domestic needs, but most of them have failed. These projects often have been developed in response to specific political agendas and, consequently, selection criteria for their location have been neither rigorous nor need driven. Projects have commonly been started with inadequate information bases concerning the needs, preferences and level of commitment of the community (Harnmeijer 1993). Because political capital is at stake, there has often been no real attempt to gauge the interest and commitment of potential beneficiaries. Most of these projects depend on the donors; consequently when the donors have withdrawn, most of the time, there has been little interest at the community level in maintaining the system.

Moreover, the cost of continuing maintenance and repair have sometimes not been accurately judged by donors, which means that community members may be unable or unwilling to make necessary financial contributions to keep the new system smoothly functional. The communities were not maintaining these systems because they considered this is the continuity responsibility of the agency that had installed the system. Community provided the labor to install pipes, but they considered maintenance as being the duty of the agency (water 1996).

1.3 Objective of the study

The main objective of the research will be: To promote the insight and better understanding in factors which will contribute to success or failure of local community participation on their domestic drinking water supply.

This objective will be achieved through the following sub-objectives:

- i) Identify factors that affect the involvement of the communities in water supply.
- ii) Make an analysis of the existing situation of domestic water supply in four selected communities and possible solutions (view from communities) for their water supply.

- iii) Identify the resources available in each community that can be utilized to improve their domestic water supply.
- iv) Make analysis on the performance and strategies undertaken by DAWASA towards improving the poor conditions of water supply in the selected communities.

1.4 Research questions.

The questions which will guide the researcher to be able to identify the problems, analyze problems and situations and generate solutions and subsequently draw up the recommendations for achievement of expected objective include:

- i) What are the factors affecting the involvement of the community water supply management in a positive and negative way?
- ii) Is there a willingness and capacity of the community to use the available resources (financial, knowledge, labor) to improve their domestic water supply?
- iii) What are the consequences and risks to public health and well being brought about by poor water situation in these communities?
- iv) Is it possible for community members in the selected communities to meaningfully participate in improving the domestic water supply? Can they improve the performance of water supply system?

1.5 Scope of the study

To carry out a similar research to the whole city was difficult due to limited period of the research. The study to answer the research questions was confined to two different communities: Mburahati, Ubungo-Kibangu. Mburahati is unplanned area and lacks most of the basic public infrastructures. Ubungo-Kibangu is planned area but it is not serviced and therefore presents the same characteristic as Mburahati. Tabata and Hanna Nassif also in Dar Es Salaam were used as the case studies where the communities have been involved in improving their infrastructure services. In Tabata residents worked with an Irish donor to improve the domestic water supply and other public infrastructures (section 3.2.4.1). The study conducted here was to find out the approaches adopted to empower local community through its CBO. Case study of Hananasifu in Dar Es Salaam shows how the community participation can be applied to upgrade the environmental conditions in unplanned settlements (section 3.2.4.2). The objective of the project were to contribute to basic improvement of the living conditions and access to basic urban infrastructural services through the provision of water supply system, storm water drains and gravel roads.

This study covers only the domestic water supply other users are not the main focus.

1.6 Methodology

To answer the raised research questions various research methodologies were adopted in order to obtain data and information required for carrying out the research.

Data collection techniques

To get a better understanding of the problems and potentials for community management in domestic water supply the different approaches were used in the research, and these include:

- i) Personal observation
- ii) Focus group discussions
- iii) Questionnaires
- iv) Use of key informants
- v) Secondary data(Interviews, record reviews, reports, literature review)

Personal observation

This involved short visits to the communities.. Through physical survey to the selected communities the following research items could be studied:

- Location of the sources
- Distances to sources from households
- Conditions of the sources.
- Who fetches water, was it the women, men or children?
- The time spent per day a person spend fetching water?
- Possibilities of contamination of drinking water

Focus groups discussions

The organized group discussions were utilized in order to get the views from common people in the selected communities, regarding the domestic water supply situation(quality and quantity) as well as the service they receive from DAWASA. More discussions mainly were on: experience of water usage in cooking, laundry, bathing and health. The discussions were directed towards getting the same information as that contained in the structured questionnaire.

Two group discussions were held with residents from each community. About 6-10 constituted each group. From these organized group discussion the majority of them were women (80%). The major reason for this was that most men go out for work

during the day, also women were more informative than men because most questions were on water usage in homes. One organized group at Mburahati constituted more males (5) and three females, this was because the discussions were on Sunday when people do not go out for work. But it was learnt that females in this group were acquainted with the subject matter than men.

By estimation the age range of the group members between 30 – 50 years old. Informal discussions indicated that the majority had not attended school at all. Question taken from the questionnaire was used to introduce discussion to the group. Few participants helped to identify the problems and need for the community to participate in improving the quantity and the quality of domestic water supply.

Informal discussion was also conducted with water vendors using pushcarts, selling water in 20litre containers in Mburahati. The discussions were very brief mainly covering issues of supply, pricing and working conditions of the water vendors. Five water vendors were interviewed. Two of them young boys of 11 and 14 years old, one was pushing and the other one pulling the cart. The two young boys had obtained water about 5kilometers away from their home, and they had spent about 6 hours carrying 4 containers, which they were going to sell. All the water vendors complained street water vending is a heavy job, and nearly all interviewees mentioned having suffered from chest pains from pushing cart. The price depends on the availability of water and normally ranges between 20TAS – 250TAs per container. The customers are many, and the gross income per day ranges between TAS500 – 4,000TAS. Most of these vendors have established their trade very well and usually has customers to deliver to regular basis, so they honor these stable source of income with sometime a discount price or to deliver one container free.

Questionnaires

Short questionnaires was designed for use in communities to provide data on: existing facilities with respect to water supply, attitude of the community and their views on water supply.

Use of key informants

Key informants are people within the community who are knowledgeable about the group, such as tribal elders, traditional chiefs, government officials and the leaders of the women's groups.

Some of additional important information was available from government offices. Informal discussion with people who have come in contact with the communities was also helpful.

Interviews with selected housewives yielded a wealth of information on water supply. This is because women are most affected by improvement in water and sanitation facilities. Thus it was important to obtain their views.

The researcher made interviews with the officials from the following institutions:

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DAWASA, DCC, CIP, MoW, TDF. Some of the information obtained from these interviews include: Understanding the existing situation of domestic water supply generally in the city of Dar Es Salaam, and particularly in the selected communities for the research (Mburahati, Ubungo-Kibangu and Tabata). More information from DAWASA offices was the role and functions of DAWASA, problems being encountered by DAWASA and the efforts being made to improve the situation. .

Water quality parameters the bacteriological, physical, chemical were obtained from the department of quality control Ministry of Water and also from DAWASA in the section of water quality control. The records for cholera and other water related diseases were obtained from Dar Es Salaam City Council (City Health Office).

From the MoW a document which contain the National water policy and laws legislative frame work etc. was reviewed. DAWASA being a parastatal organization under this Ministry, more discussion about DAWASA was held and the steps which the government is taking to solve problems within DAWASA.

More interviews were made with staff in CIP and TDF. The CIP stand for Community Infrastructure Program and TDF for Tabata Development Fund. The CIP is a community-based program supported by UNDP in the City of Dar Es Salaam. This organization has coordinated and worked with two communities in Dar Es Salaam (Tabata and Kijitonyama). These two communities through CBO's, the infrastructural services like water supply and sanitation have been improved.

Discussions with TDF chairman provided the following information: background of the project, achievements and constrains, lessons learned by the community of Tabata and problems being encountered in running the project after being handled to them by the donor.

Secondary data

Records reviews

The researcher reviewed documents available for water supply in the city of Dar Es Salaam. Also review was made to various reports, which have been prepared for the purpose of implementing programs, and projects related to community water management.

Literature review

In order to have an insight knowledge of community water management, and in particular domestic water supply the literature review has been undertaken. This was very helpful in familiarizing with what is going to be done on this research and possibly what remains to be done. For thorough literature review, the researcher will make use

of library references, which will be useful in providing information on the study, publications relevant to the research subject, through internet and lecture materials.

Universities of Dar Es Salaam, University College of Land and Architectural Studies(UCLAS) IHS and WAU libraries have been very useful in providing useful information on this research. Other relevant information was obtained from publications on water supply found at MoW library .

Some related projects were reviewed including researches, which have been done using participatory action research (PAR) approaches in domestic water supply. Many studies have been done on community involvement in improving domestic water supply as some will be discussed later.

1.7 Organization of the thesis

This dissertation is made up of seven chapters. Chapter one gives the introduction and research formulation. The introduction outlines the general current situation of water supply worldwide, highlighting water supply problems in Dar Es Salaam the capital city of Tanzania where the study took place. This chapter also set out the problem statement, the objectives, research questions and the methodology of the study.

Chapter two presents the conceptual frame work of the study in which the model indicating three elements of effective water supply management is presented. It is followed by the brief discussion of the interrelationship of these elements, and the contents in them.

Literature review is presented in chapter three. The author reviewed different authors on the same subject to be able to gain more understanding on the subject of community involvement in improving domestic water supply. Along with the literature review, summaries of cases in different parts of the world on where through community involvement water supply situation has been improved have been presented. The lessons learnt from community water participation from other communities and role of community as consumer provide useful information as a basis for comparison and theoretical foundation of this research. The part of the empirical study (section 3.2.4) is also presented in this chapter.

Chapter four on an overview of Dar Es Salaam water supply situation, refers to the management systems where the legal framework, policy and institutional framework are outlined. The Tanzanian National Policy on water is also stated in this chapter. It also looks at the existing situation of water supply in Dar Es Salaam where DAWASA provides the service, and also other institutional forms of water provisioning are highlighted here. This chapter also focuses on the need for improving water quality and quantity, and presents the Tanzanian water quality standards.

The problems facing DAWASA internally and externally are analyzed and discussed in chapter five. The chapter goes on highlighting the initiatives taken by both DAWASA

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and the government to improve the situation. Finally, in this chapter options for the improvement are suggested which includes PSP as one of the option.

The methodology and case studies of the two settlements, Mburahati and Ubungo-Kibangu are presented in chapter six, giving the water supply situations and environmental conditions, also the views and findings from these particular communities are presented.

Finally, chapter seven presents the discussions from what was explored from the study from which the conclusion and recommendations are drawn.

CHAPTER TWO

2.0 THE CONCEPTUAL FRAMEWORK

2.1 Introduction

Involving people in the analysis of problems that affect them and in the design of potential solutions is a good way to achieve sustainable development. Although more time consuming than traditional development approaches that rely on "blue print" plans and development experts, participatory approaches generally lead to development efforts that are sustainable over the long term because the people themselves have a stake in their success. An approach to community water management requires a methodology that is sufficiently flexible and compatible to enable urban or rural communities and support organization to share analyze and enhance their understanding and allow them to plan and implement problem-solving activities.

Different trends have contributed to the evolution of concepts and practices of participatory action development (Lammerink and Wolffers, 1998).

The first school of thought is an ongoing debate about the sociology of knowledge (Habermas, 1971). In this debate the view of society, human order and human history are presented from the point of view of the marginalised the workers, the poor and the deprived, as opposed to the dominant form of knowledge produce and articulated throughout history from the point of view of the rulers.

The second trend came from the work of Paulo Freire and Ivan Ilich. Ilich's critique of schooling in modern societies and Freire's contribution to an alternative pedagogy merged with a number of contributions in the late 1960's and 1970's. This showed the interlinkage of the process of knowing and the process of education and reaffirmed the fundamental linkage between knowing, learning and reflecting (Freire, 1982).

The third trend comes from the practice of adult education in the countries of the South. Adult educators developed a methodology of learning, which helped to establish the control of the learner over his or her own learning process (Tandon, 1988).

Another trend in the history was the contribution of action research. It argued for acting as a basis of learning knowing. This formulation of action research, going back to the work of Kurt Lewin was influenced by the formulation of participatory action research in Latin America (Fals Borda, 1985).

Another trend came from the work of phenomenologists (Solomon, 1987). These contributions legitimizes experience as a basis of knowing, along with action and cognition. This expanded the basis of knowing beyond mere intellectual cognition and helped to develop the practice of experiential learning (Kolb, 1984)

Finally, the debate on development began to place the question of participation as a critical variable in mid and late 1970's; people's participation, women's participation,

community participation etc. The emerging failures of top-down, expert designed development projects and programs supported the promotion of participation as central concept in the development. This has put the use of knowledge and skills of process in the center (Chamber, 1983)

Community water management is a new form of co-operation between support agencies in water sector and communities. It involves a common search to identify problems with the local water supply system, and the possibilities for, and constraints on, management by communities, as well as possible solutions that may be tested. Through this approach, the support agency is no longer the provider of technical goods or solutions, but the facilitator of processes to enhance the capacity of the community to manage its own water system. Community management stimulates thinking and debate about relationships between support agencies and communities, about the capacities of communities to manage their own systems, about the attitudes of field staff working with communities, and sustainable water management.

Both government and donors recognize that water-resource planning must be multisectoral, but water projects are usually designed to meet technical rather than social objectives. Although it is expected that installed water systems will be used by local populations, engineers rarely examine the pattern of needs of different groups of potential users and take this information into account when designing the system. Because of this lack of sensitivity to prevailing cultural patterns within a community, it should not be surprising that water often fail especially after donor support is withdrawn.

Since communities are complex social realities; understanding the social context is a vital ingredient for success. Management capacities can only be built successfully when there is a clear understanding of the social, economic and cultural characteristics of the community. Some communities have developed extensive and comprehensive management institutions and regulations for their water supply systems, as in Colombia, (Gomez and Rojas), while others are still struggling with the concept of management, such as in Nyakerato in Kisii, Kenya (Oenga and Ikumi). These differences are due to many different factors, many of them rooted in the socio-economic structures of a community.

Leadership is also an important factor. Leaders play an important role in facilitating change in communities. If the leadership of a community is committed and receptive to change, the process is likely to proceed smoothly (Tayong and Poubom), but if the local leaders are too dominant and want to pull all the strings of community life, they can also be counterproductive. Therefore, leadership issues have to be approached with care and with understanding. The challenge is to open up charismatic leaders to new functions and attitudes, without destroying the respect they have in the community, or transforming them into bureaucrats. Sometimes a community has various interest groups struggling over resources. Culture, religion, gender or economic interests can divide communities, hampering efforts to encourage them to manage their water supply systems

National water policies can also hinder community development. Sometimes a supply system has been so poorly designed that it has caused inequalities in water distribution. In such cases, community management may not be feasible because the different groups can not find a common denominator upon which to base solutions. All members of the community must then be involved in redesigning the water supply system, and begin with community management at the earliest phase in the project.

2.2 Discussion of the concept

The aim of this study is to illustrate the positive and negative factors, which can contribute to success or failure of the community participation in improving the quantity and quality of domestic water supply. Water is a fundamental need. All human beings including the poor and the marginalized groups, must have access to clean and safe water. To ensure the access for all with full-cost pricing of water will often require financial assistance to help poor communities develop and manage their own water supply. To reach this objective a number of instruments have been developed. These instruments are interdependent and mutually reinforcing and the most optimal way are applied will depend on the prevailing local conditions; and are presented in this chapter.

Figure one below describes the complementary elements of an effective water supply management. These elements must be developed and strengthened concurrently. These complementary elements include:

- 1) Institutional actors:- This includes government and other stakeholders mainly NGOs and private sector.
- 2) Community Involvement

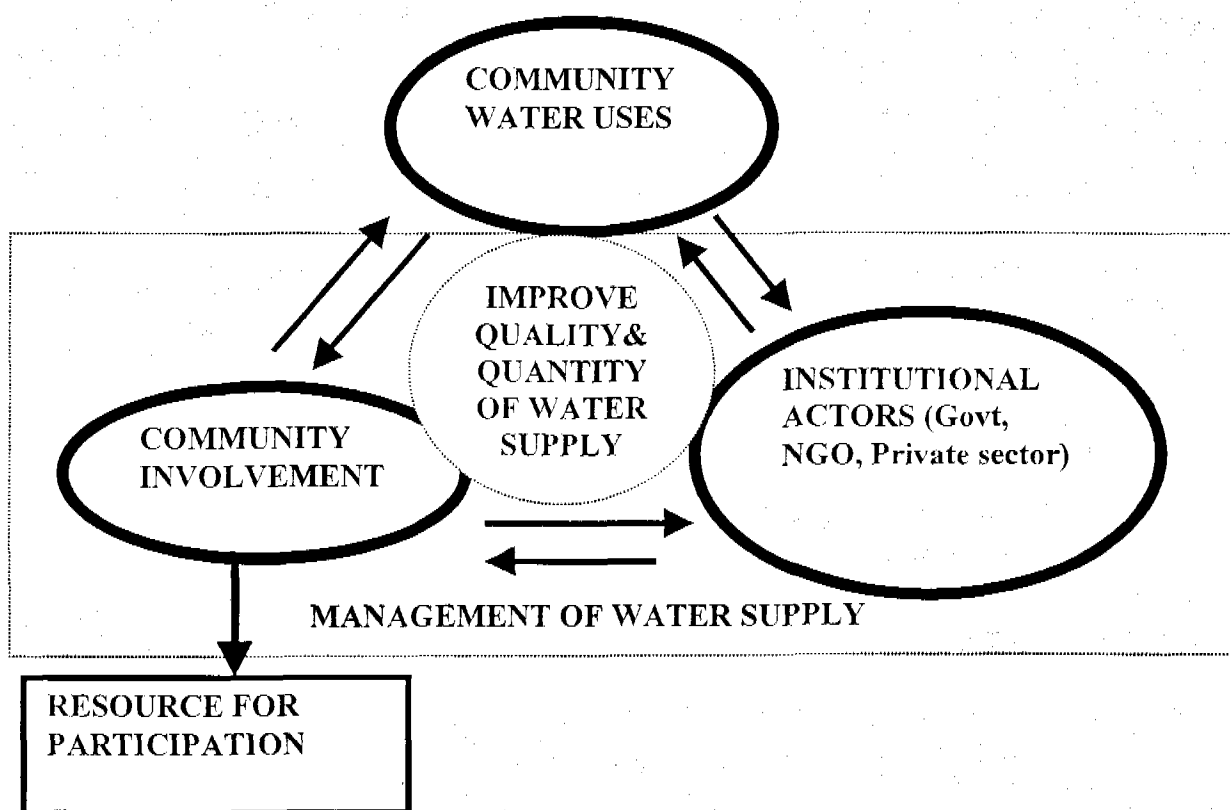


Figure 1: Conceptual model of the study

It is a basic assumption of this study that community participation could help achieve greater equity and efficiency in the provision of water supply service and facilitate new investment in partnership with other stakeholders (Kalyan Ray, UNCHS). Community based management as a strategy for service delivery and financing of domestic water supply has shown to be effective. Communities must be in charge and participate if they are to be custodians of their water supply system.

2.2.1 Institutional actors

2.2.1.1 Government

Real participation only takes place when all the stakeholders are part of the decision making process. This can occur directly when local communities are effectively involved by being empowered to initiate, choose and implement a water supply project that is willing and able to sustain, with necessary support from the government and other stakeholders. In participatory approach government must play its part as a regulator and facilitator. Governments at national, regional and local level have the

responsibility for making participation possible, which involves the creation of mechanisms for stakeholders consultation at community level.

Successful community management builds community confidence and can stimulate wider development efforts. To look after their own water supply system, communities need to operate in a legal and administrative framework, which encourages rather than inhibits their operations. Government commitment needs to be backed by policy and legislation, which favour the community management approach .

Therefore the role of central government is to formulate and approve laws, rules and regulations and to monitor the adherence to those. The government should also guard that all do get a share of the limited resource. The government may delegate the responsibility for certain task to municipal authorities. The principle of developing authority and function to the lowest level is increasingly being regarded as a best practice most likely to lead to sustainability of project (Campfers, 1997). (Dinish Bajracharya NGO water for all, Nepal) stated that water supply provision should be decentralized and power should be shared to different levels from the national level to local level. However, it is very important to have one responsible section in a municipality/town with the overall responsibility for water supply planning. Enabling local government authorities could mean creating an environment where by they can participate in water supply service. Assisting could mean physical intervention of resources materials, personnel and finance. In its absence there is always a danger for prevailing attitude for non-performance and uncoordinated and unplanned activity.

2.2.1.2 CBO/NGOs

The commitment of other stakeholders is extremely important and should have full participation of women and disadvantaged groups (1999, Bangladesh workshop). However, it is often extremely difficult to work with entire communities, therefore when addressing development issues it is more practical to deal with representatives of the community. One type of representative is CBOs. Usually CBOs when implementing a project, have some direction from the government or other agency. In CBOs the decision making process is broad as the beneficiaries are involved. In CBOs the people should be involved in all processes of the project, starting with the identification of the project, starting with the identification of objectives, decision about policies, quantification of targets, allocation of resources and decision about phasing, implementation and supervision, monitor and evaluation. (Rudqvist,1991,IRC,1998). The government or agency should work with and through individual members, groups and leaders of the community. CBOs often receive the assistance of NGOs and work together very closely. CBO/NGO who in themselves may either become services providers or assist the communities and their organizations(CBOs) in development of a sustainable service by providing technical, legal and financial services(Densai, 1995). The primary responsibility of the NGO is to work with a community representatives, and facilitate planning, installation, training, operations and maintenance of community run system (e.g. Tegucigalpa, Honduras case). In many cities NGOs have developed a

function as a mediator between the communities and the municipal authorities. NGOs frequently act as intermediaries or organizers of the poor (Watson et al, 1997).

However, whereas NGOs and CBOs are more easily motivated and frequently already committed to making improvements the government officials are frequently less motivated and committed. Concurrently, although they have the potential to develop a strategic approaches, they are often unwilling and unable to implement the policy or plans. Beauford Weeks (UNICEF, Liberia) described the situation as "Chronic institutional disorder associated with the lack of financial integrity and transparency the lack of effective plans on water supply services and programs and even the lack of trained manpower which in turn leads to the lack of well defined objective, the lack of analysis, the lack of leadership and the lack of coordination.

2.2.1.3 Private sector

The other stakeholder in community participation is the private sector. This is dominated by business. They often have access to large amount of financial capital, provide employment, and technological innovations. Their dominant feature is a profit motive. An enabling environment is necessary as well as a good policy that will encourage the private sector and the people themselves to provide the service. Private sector involvement typically requires more government regulations, not less. Attitudes towards community are changing through a growing awareness of the importance of community relations as part of a business (Luz & Montelibano 1993).

2.2.2 Community itself

2.2.2.1 Resources for participation

Community participation has proposed to offer many benefits relating to increased demand for water supply services, improvements in the cost recovery and responsibility for operations and maintenance (UNICEF). There are a number of case studies (some will be discussed) where community participation has led to improved water and sanitation services. The partnership that evolve from this process are recognized to provide a strong basis for provision of services and to create a heightened sense of ownership and responsibility. When community realize the magnitude of the problems they are more likely to become involved and contribute towards the solution. Communities frequently play many roles in the provision of water and sanitation services. These roles range from beneficiaries to managers, to financiers (Carrie Miller, 1999). Community roles are equally as varied because communities frequently serve to fill in the gaps left by others sectors. The role of an individual community or organization is context dependent (as quoted in Kennedy, 1996). Much of what communities are able to do depend on government policy and the role of the other sectors play.

Community managed projects depend for their success on an environment which enables the community to be effectively involved. Key features in community

participation include: joint planning, training, technology, human resource development, cost recovery and developing accountability mechanisms, and using participatory methods to ensure the full involvement of both men and women in the process.

(a) Technology

The community should disregard from the start water supply systems, which are too expensive to be locally maintained. Instead systems, which can be operated independently of external funding, based on local ability to provide funds for repair and expansion should be located. This lead to self-sufficiency and to systems that can eventually finance their own expansion. Technical specification take into account the local capacity to supply equipment for construction and to provide spare parts in the future. If capacity is lacking in these areas, the time to build it up before is needed. Many problems arise as sometimes government or municipal department accept the technical standards that are advocated by NGOs and sometimes those endorsed by external consultants. One way of reducing cost is to use appropriate technologies, this means to do away with unrealistic standards. It has been suggested that appropriate technology in water supply and sanitation sector is good for poor and rich alike (Resrepo Tarquinn, CINARA). It must be recognized that working in the poorest settlements often carries a stigma, yet this sector can produce solutions that can be used by all (Virginia Roaf, Water aid). This is in comparison with higher cost solutions which may more environmentally acceptable, but which exclude large numbers of the target population. There have in fact been cases of middle income-income areas accepting the simplified systems by low-income areas because the technology is adequate and cheaper than standard approaches. An appropriate technology can be chosen by community and local institutions pooling together their knowledge (Restrepo Tarquino, CINARA). Therefore community involvement is important in the selection of technology so that the design that has been adopted is what the community wants, is prepared to pay for and is able to maintain.

(b) Human resource

The same applies for human resource. Plans can be made well in advance to train local experts so that the skill and knowledge base to maintain the system at its full potential exists from the very beginning. Community should appoint its own caretakers to receive training and tools and be responsible for preventive and simple corrective maintenance. Technical personnel should be made involved in planning, design and construction, so that they are able to understand fully the system they are going to have responsibility for operating and maintaining. This can also avoid inappropriate designs and bad technology choices. Training is necessary at various levels to maintain an adequate and up to date human resource. The technical expertise are needed in the community to carry out the require maintenance tasks, identify the problems and carry out regular repairs. However, large problems need the technical expertise and in put from more experienced technicians and engineers.

(c) Financing and cost recovery

Financing and cost recovery is obviously a key issue for sustainable water supply projects whether it is be local community based or international donor organizations. Both demand and incentives are strongly influenced by affordability and financial arrangements, and subsequently cost evaluation and willingness to pay for services and infrastructure are important. It is acknowledged that without the full support of the community concerned it is difficult to lower the cost or recover the capital investment. As far as cost recovery goes, community members need to understand the advantages for them of the infrastructure and to feel that they are part of the endeavor if they are going to be willing to put an effort into obtaining it and helping finance it. Community representatives also have a much better knowledge of how much of the costs can be recovered and under what circumstances the population will comply (Katherine Coit).

(d) Reliability

Other factors, which can influences the willingness of the community to participate, are the security of tenure, level of service and reliability. A household which is unsure of it tenure will continue to pay to water vendor to meet its daily needs but the willingness to invest in anew and improved service depends directly on the security of tenure of the household. The lack of land tenure in threat of eviction in the slums discourages investment in infrastructure and the existing system of municipal tax/revenue payable by every houshold due to political and other social and technical issues. By providing water or sanitation to people who are occupying land illegally (generally the poorest of the urban poor), government fear that they will be seen to be granting a form of tenure (Virginia Roaf, Water aid 1999). Therefore, if the provision of water and sanitation is independently land of tenure and it is very difficult to envisage any lasting improvement, it is advocated de-linking of the right to clean water and sanitation from the right to the land.

The new facility should provide a level of service better than the available options. Vended water is usually quite a reliable source and a higher level of reliability is needed to wean away customers from the vendors; if they are operational in the area. A piped system that is not reliable enough would not only fail to attract customers but would often result in large unpaid bills due to a distrust which is difficult to remove even when the reliability of service improves.

2.3 Conclusion

In the beginning of the chapter a short introduction on the concept of community management has been discussed. Thereafter a conceptual model consisting of three interdependent elements of effective domestic water supply has been presented and discussed.

The elements as shown in fig 1 are: Institutions including governments, NGOs, CBOs, private sector and community involvement. The model shows how these elements

overlaps in bringing improvement on community domestic water supply. From the model it is obvious that the improvement of both quality and quantity of domestic water use, depends on the interrelationship of various stakeholders working with a community.

The government must play its part. The dominant roles include policy setter, regulator and capital investment. The government can determine the extent communities are able to act through programs that either encourage or prohibit their actions (Campfers, 1997).

Most of poor communities are limited to finance and maintenance. But can provide other useful resources for participation as already been highlighted. Communities must be involved, from the start, in decision making, about water supply system they want, what they can afford, and where the system should be installed. Such involvement can only improve decisions about the introduction of technology that is affordable and accessible, both in economic terms and in term of acquisition of technical maintenance skills.

The following chapter will present the reviewed literature on community involvement in improving water supply and sanitation. and also present summaries of the domestic water supply projects from urban poor communities from developing countries which has proved to be very successful with involvement of the community.

CHAPTER THREE

3.0 LITERATURE REVIEW: COMMUNITY ROLES IN THE PROVISIONING OF DOMESTIC WATER SUPPLY

3.1 Introduction

In order to gain an understanding of the roles that communities can play in the provision of basic services such as water supply and sanitation, literature review has been made. A thorough search through literature explores into different potential roles of community in the provision of water supply and sanitation, when working together with various stakeholders.

This chapter was therefore prepared by studying several documents, books and reports on the subject of community roles in improving domestic water supply and sanitation. The available documents describing community involvement in the provision of water and sanitation stems from a rural context has also been reviewed because many of the same techniques and methods are also applicable in an urban context. The chapter will also present cases and project summaries (section 3.2) which have been published by large donors such as the UNDP – World Bank Water and Sanitation, the UNDP – World Bank Water and Sanitation Program, UNDP's Local Initiative Facility for the Urban Environment (LIFE) and USAID. These projects have successfully improved their water supply situation and sanitation with the involvement of the community. The three cases from Africa will be presented, two cases from Dar Es Salaam (which are part of empirical study) and one from Nairobi Kenya. Other cases to be presented are one from Asia (Bangladesh), and one case from Central America (Tegucigalpa).

In the cases examined, a typical collaboration involved some type of community representative in form of CBO or council, NGO in the role of intermediary or facilitator, and local government, but the private sector is conspicuously missing. The reason for this may simply be the private sector is not yet involved. One of the possibility may be that "business people see themselves as separate from the community. (LIFE 1997).

Most of these documents suggests the following potential role for community involvement in the delivery of basic infrastructure services such as water and sanitation: Express demand, gap fillers, Financing/social capital/construction, Management Researchers and Administrators/operation/maintenance. These roles have two components. First, each one of the listed roles may not occur in every community or during every project. Communities have varying capabilities for each one of these tasks. Community development theory would suggest that through the efforts involved in making the project happen the community will augment its economic, social, and political capital in a journey towards empowerment that will increase the capacity of the community to take a more active role in the future. Turner (1999) submits that sustainable community development that leads to empowerment is comprised of three elements: economical, social and political capital. Economic capital is financing

Chapter 3 Literature review: Community roles in the provisioning of domestic water supply

achieved through government or private sources that can be used towards development projects such as infrastructure. Social capital is “the organized voice of the community and can be measured by civic infrastructure derived through activities such as community organization and community-based decision making”(Turner 1999). Brown (1996 as quoted in Turner 1999) defines social capital as” promoting a rich social fabric and strong community voice”. The third element which is political capital is the culmination of economic and social capital and serves to link “community building, government assistance, and private neighbourhood”(Turner 1999). “Political capital can be conceived as the community’s ability (via its neighbourhood-based organization) to negotiate, set the terms of that negotiation, define what the neighbourhood will look like, and control resources that affect the ability for this place to become a productive economic and social location”(Turner 1999). The result of achieving all three forms of capital is empowerment and through empowerment communities will gain the ability to act independently, in entrepreneurial fashion during negotiations for continued development (Turner 1999).

The role of the community is dynamic and changes over time and with the progression of the project. For instance, in Orangi, a squatter settlement in Karachi Pakistan, community action began by identifying the problem: lack of sanitation. Over the course of project the community managed, financed expanded and maintained their sanitation system, which now covers 600,000 people(Briscoe and Garn 1994, Khan, 1992, in Watson et al). In summary, during the Orangi project the community acted as: issues identifiers, managers, financiers, and beneficiaries and maintained the system. The level of assistance a community will need to implement their project depends upon the technology choice. The more complicated the system is the more external support for design, operation and maintenance will be required. The following paragraphs will briefly discuss the roles communities can play.

3.1.1 Express demand

Currently many development organization are advocating demand driven approaches to development such as the demand-responsive approach(DRA) and Locally Based Demand(LBD) approach. Within this context the role of the community is to express their demand for a service to supply agencies, such as governments, NGOs, service providers, design engineers, external support agencies, and other social intermediaries. The general idea behind these approaches is to delegate decision making to the communities(Sara 1998). Before beginning a project, the community should demonstrate the several key attributes. Those are a willingness to pay, which includes cash, labour, and through social capital(Varley et al.1996). Willingness to pay is directly correlated with the amount of control the community has over the project(Sara 1998). Social capital is the “the networks, shared values associated norms which enable communities to effectively organize themselves and assume the responsibilities of participating in decision making and resource allocation”(World Bank 1999)

Chapter 3 Literature review: Community roles in the provisioning of domestic water supply

3.1.2 Gap fillers

Cooperation will occur when there is a need to provide a service (Watson et al.1997, Silkin 1998). Campfers(1997) found that when states or NGOs did not meet the needs of the community, the gaps were filled by the CBOs. Group members shared common objectives that were associated “with ‘meeting the needs’ of the community in such varied realms as water supply, sanitation, garbage disposal, schools community health care and other infrastructure needs.”

3.1.3 Financing/social capita/construction

Many water projects as TDF (section3.2.4.1), Kitui-Pumwani Kenya (Wegelin-Schuringa and Kodo 1997), Hitosa Ethiopia (Water aid) and Mvula Trust in South Africa(Palmer 1998) required a community financial contribution. The objective of this requirement is to show demand for the project and give the communities a “meaningful stake in the project”(WSP: India 1998). Contribution can be monetary or in the form of ‘sweat equity’ which is either unpaid labour or labour paid reduced rates. Studies have shown that implementation of projects by communities can lead to cost reduction of 30-50%. Cost decrease occur because contract negotiations are faster and transparency improves(Sara 1998). It has been demonstrated that in a few cases “where communities lack resources, contractors in the private investment cost”(Sara 1998). In Tegucigalpa, Honduras case (section3.2.1.1) (WSP Tegucigalpa 1999) communities are involved from the start by providing manual labor and purchasing construction materials which amounted to about 40% of the project costs. The National Autonomous Water and Sewerage Authority (SANAA) and the UNICEF contributed 25 and 35 percent respectively.

3.1.4 Management

Projects in Ethiopia (Salikin 1998), Mali (Faggianelli 1998), Honduras (Trevett 1998), and Malawi(Kleemeier 1998) are among many water systems that have a community management component. Management has occurred through various forms of volunteer water Management Boards, water users associations, or Water and Sanitation association(WASAs). Depending on their set up these organizations perform various tasks such as signing management contracts with municipalities, making all the major decisions, fixing tariffs and administration.

A study of WASAs done in Indonesia indicated that 25% of water systems that had little or no management were in poor physical condition with leaking pipes, absent taps, and poor draining (Hodkin and Kusumahadi 1993 quoted in Watson et al. 1997). Despite the apparent success of WASAs in Indonesia, other documents expressed a concern that the voluntary commitment required by those on the water Management Boards or Water Users Association would be unsustainable in the long run.. The Mali case is particularly interesting because the Water Users Associations involved in the production of clean water across the country formed a federation called the Union of Water Supply System Operators. This union allowed for increased negotiation power

Chapter 3 Literature review: Community roles in the provisioning of domestic water supply

with banks, the government and other supplies. Water User Association can be either community based or run by private entrepreneurs (Faggianelli 1998). However, due to the concern about the sustainability of the voluntary Water Users Association it has been recommended that their administrative function be privatized as soon as possible. This moves the project to the realm of public-private partnership.

Sara(1998) points out that in many projects the communities are not responsible for fund management during the construction phases, but then are expected to manage and operate the system at time of completion. Therefore the importance of technical training as a key component to sustainability of a community-managed project can not be emphasized enough (Silkin 1998, Kleemeier 1998, Faggianelli 1998). The Mvula project does not encourage community management during the project implementation phase (Palmer 1998).

3.1.5 Learners/Researchers

A large part of many projects involves a capacity-building component for the community (Sara 1998). Techniques learned may range from hygiene to book keeping, to operating and maintaining the system. Both the El Alto Pilot project in La Paz, Bolivia and the Tegucigalpa cases incorporated a health education component where communities were taught about health issues related to water and sanitation(WSP 1999). The participatory Hygiene and sanitation transformation (PHAST) is an approach being used by the UNDP-World bank Water and sanitation Program and Water Aid among others to help community members lead healthier lives (WSP 1999). Additionally, community members have served as researchers in their communities by collecting data about cholera risks in the era (Varley et al. 1996) and as researchers with NGOs as researchers to learn about and enhance the effectiveness of community management efforts (Bolt et al. 1999)

3.1.6 Administration/Operation/Maintenance

In Dhaka, Bangladesh (see section 3.2.2.1) case the community's role will change from one of planning and financing to being solely responsible for operations and maintenance of all the water points(WSP 1999). In the Tegucigalpa, Honduras case the Community's Water Board pays into revolving Fund Account that not only recovers the initial costs of investment, but helps to expand the system to other communities and secure coverage of operations and maintenance costs (WSP 1999). A study of the project showed that out of 16 community systems 13 were sustainable with respect to operation and maintenance costs (WSP 1999). In a collaboration with National Water Supply and Drainage Board (NWSDB) community based organizations in Sri Lanka fixed tariffs to recover operations and maintenance costs and discussed staffing and collection issues (Minnatullah 1998) .

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3.2 Gained experiences

3.2.1 Experience from Central America

3.2.1.1 Honduras: Tegucigalpa Model

Honduras is among the poorest country in central America, with an estimated population of 5.6 million inhabitants. In the 1980's Honduras faced a serious economic crisis that led to a massive migration of rural population to the capital city, Tegucigalpa. The uncontrolled immigration movement worsened previously existing problems, because the government institutions were not equipped to provide basic services to the newly established urban population. Now Tegucigalpa has a population of 850,000 people of which more than half live in 225 peri-urban communities. The city is very mountainous and all peri-urban areas developed on the steep hills. The location of the peri-urban areas makes them very vulnerable of natural disasters such as landslides and hurricanes, and availability of water is almost nil. As a result, the construction of basic services in the peri-urban areas, such as access roads, water and sewage systems, takes place under difficult circumstances and at high costs.

Topography of the Tegucigalpa area, the ground water is very deep. Efforts to put into operation water supply boreholes up to 100 meters have not been successful due to limited capacities of the aquifers. In some cases, it was not possible to use the ground water due to its inferior quality. Therefore, of potable water in Tegucigalpa is transported from approximately 5 sources outside the city. It is common to receive water only couple of times a week in the entire city. In addition it has been estimated that approximately 40% of the water pumped in the network never reaches its goal due to leakage in the pipes.

Before the UNICEF program started in 1987, most of the peri-urban communities in Tegucigalpa had a 'water problem'. They had difficult access to or totally lacked water and had to buy it from private vendors at high commercial prices and /or collect rainwater in the wet season. Families used up to 30% of their already very low income just for the purchase of water. For the execution of the UNICEF program SANAA, the National Autonomous Water and Sewage Authority, established the Executive Unit for Marginal Settlement(UEBM). It was to be the body responsible for providing potable water to the peri-urban settlements that did not receive water through Tegucigalpa's regular water distribution network..

In 1995, at the request of representatives of the beneficiary communities, the UEBM was renamed UEBD, the executive Unit for Settlement in Development. Beginning with only 11 staff members, by 1997 UEBD had 30 permanent staff members financed by SANAA and 5 temporary members financed through UNICEF funds. The units professional team is balanced in term of gender and profession; the staff consists of design and field engineers and social promoters of both sexes; headed by civil engineer. In 1995, the UEBD was made part of the formal structure of SANAA, falling under the direct responsibility of the General Manager of SANAA. By the end 1996,

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approximately 150,000 people in 80 communities had benefited from the water supply program and approximately 5,000 in 4 communities from the sanitation program. At this point there were fewer than 20 peri-urban communities, without water supply facilities. By the year 1999, all legalized peri-urban areas in Tegucigalpa would have a water supply system. During the period 1997-2001, the water supply program will focus more on upgrading the existing system by installing house-connections where water is currently only provided at public stand-pipe.

Model of the Program

Technologies: Technological options include house connections, public standpipes, sale-in-block, delivery to public reservoirs filled by water trucks and boreholes equipped with electric pumps connected to elevated tanks with gravity delivery systems to the communities. Some peri-urban communities are connected to the SANAA water network in other communities this is not possible. However, the UEBD designs the community water supply systems so that they can be easily connected to the SANAA water distribution network once its capacity and reliability are improved.

Community Participation: The community mobilized itself and finally apply to UEBD for a water supply system. In general women took initiative. In the application the community had to prove the land of tenure is legalized. Additionally, it had to commit to provide manual labor and some construction materials, financially contribute through water tariffs and recover the full investment costs. The community established a Water Board(Juntas de Agua) to collect the tariffs, administrate the water system and take care of the operation and simple maintenance activities. After receiving the application, UEBD staff visits the community to verify the information in the application and to make a rapid technical feasibility study to assess the capacity of possible water sources. Based on this information UEBD approves or disapproves the request. Normally, the Water Boards employ one administrator and a plumber; elected members of the water Boards work on a voluntary basis. After the project completed, the UEBD offers periodic follow-up and support to Water Boards, usually in accounting and funds management. Practice has shown that this follow up is essential.

Cost sharing, cost revolving, and costing system: Through active participation of the community's manual labor and purchase of part of the construction materials, the community's contribution is approximately 40% of the cost of the water system. SANAA contributes 25% of the cost and UNICEF 35%. The community's Water Boards pays a contribution to the Revolving Fund Account, monitored and managed by the UEBD. The Tegucigalpa-cost-recovery system goes far beyond securing operation and maintenance, it fully recovers the initial investments(without incorporating inflation or interest). This maintains the revolving fund, enabling other communities to develop water and sanitation systems and to expand the program coverage. Every community can't decide the speed in which it pays back the revolving fund with a maximum recovery period of 7 years. In practice, some communities completely pay of their project within 2 to 3 years. A study of 16 community systems showed that 13 of them where sustainable in respect to operation and maintenance

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costs, 5 system also covered inflation and capital costs. The program can be considered as one of the very few examples in Honduras in which costs are being recovered.

Training: All beneficiaries communities and Water Boards receive assistance in training and social mobilization through activities for primary schools, International water day celebrations, street cleaning and garbage collection actions, culvert cleaning and improvements. Training program consists of courses on: administration, accounting and maintenance, problem solving, conflict resolution and negotiation, training on appropriate participatory and informal materials, technical training to plumbers and health education for school teachers.

Empowerment: The program has clearly led to empowerment of population in the communities. The Water Boards were the first type of organization to achieve something in the community. In most communities the struggle for improvement has not ended with the installation of a water system. They continue to fight for proper schools, health clinic, electricity sewage systems and access roads.

Fund raising: In 1993, the program Agua Para Todos (water for all) was founded jointly by the chamber of commerce and SANAA project as a complementary strategy to search for other sources of program financing. Agua Para Todos collects voluntary contributions from Honduran citizens and manages contribution received from donor countries. Agua Para Todos so far participate in infrastructure projects.

Financial sources: Besides Swedish funds, which form the main source of financing for the UNICEF-program, the government of Japan, Canada and Taiwan and the Inter-American Development Bank and the international Red Cross, have supported UEBD. The Japanese contribution is US\$10 million. Because of this additional support the program is expanding much faster than originally foreseen.

The water agency in Tegucigalpa helps the community in low-income urban areas to set up their own water service associations. These associations install independent water supply systems which residents pay for and operate and maintain and which in the long run cost less than continued buying from unregulated water vendors. Communities were involved from the start by providing manual labour and purchasing construction materials which amounted to about 40% of the project costs. UNICEF and water agency contributed 35% and 25% respectively.

3.2.2 Experience from Asia:

3.2.2.1 Bangladesh water supply for urban poor.

In Dhaka capita city of Bangladesh 70% of the estimated 2 million squatter dwellers are deprived of safe drinking water. Consequently they spend much of their time and resources in buying drinking water from local water lord, offices and factories. Legal, financial and institutional obligations do not allow formal agencies such as Dhaka

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Water Supply and Sewerage authority (DWASA) and Dhaka City Corporation (DCC) to consider squatter settlements as legal entities eligible for basic urban services.

Despite such an institutional environment, urban poor cannot be denied access to safe water. Using NGOs as intermediaries, a pilot project has been launched to bring piped water within legal access of urban poor in Dhaka. In collaboration with the Swiss Agency for Development and Cooperation (SDC) and the Participatory Development Fund (PDF) of the World Bank, the project is being spearheaded by Dustha Shashya Kendra (DSK), a national NGO, under the active guidance and supervision of UNDP-World Bank Regional Water Supply and Sanitation Group, South Asia.

The pilot project launched in 1996, uses a process of NGO as intermediation and active user participation to construct, maintain and pay for shared water points in slum communities in Dhaka. The project laid a target of putting up to 20 water points in the targeted slum areas of the city. Led by DSK, the project brought together user communities, DWASA and DCC into a unique alliance to meet the following objectives: develop an approach for community managed water supply for urban poor based on full cost recovery; identify institutional changes necessary to formalize and sustain the approach; and explore possibilities for scaling up the project in Dhaka and beyond.

DSK, which works on health care and income generation among the urban poor, believes in cost sharing for even essential services. It starts off with community building and revolving credit. As credit culture took root, DSK gradually introduces health care, water supply and sanitation services. The project aims at demonstrating how communities can access formal services. Thus, the key principle of the project is to respond to demand for water indicated by willingness to pay. The project works with communities willing to form groups; provides training on management, health/hygiene and behavioral change; designs water points and formulates rules on water access and cost sharing; mediates with formal utilities, and provide technical inputs and initial cost for construction.

The process begins by establishing contacts with leaders of poor settlements to elicit community's willingness to manage and share cost of water supply service. These leaders or promoters assist DSK in social mobilization and organization of the community in-groups representing five households each. Depending on the size of a community, 20-30 groups form a center, which also becomes a unit for water point.

The project works with 20 such communities representing over 5,000 people. The monthly household income of these groups ranges from US\$ 45-70 only. Community building exercise is so strong that despite such poor income they are not only willing to share cost but take part in operation and management of water points too. A motivated community finally forms a gender balanced water society-the Pani Kal Samity. Each samity of 80 members elects its 13-member executive committee to work with DSK in site selection for water point, formulates rules for water access, sets rates for water use and defines modalities of management, accounting, operations and a maintenance

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Upon obtaining necessary approvals, DSK and the samity get their acts together in setting up the water points. The water point comprises of an underground reservoir with pipe connection, two suction pumps and a bathing space. For smooth operations, an agreement is signed between the samity and DSK before commissioning of the water point. The samity manages and operates the water point, repays the capita cost to DSK and pays for the water bills as well. The committee hires two part-time caretakers to collect water rates and to maintain the water point. The rate charged from the community cover DWASA bills, installments on capita cost and caretakers' salary. Differential collection system is followed as some communities prefer monthly rates, some set rates per use, while many others use a combination of both. Per use rate are charged for non-regular users. The rate is normally TK 0.50(1US\$ = 43 Takas) per bucket of water and Tk 1.0 for washing/bathing. Monthly household rate is set at Tk 10 per person or Tk 30 per household, whichever is higher. Despite such low rates the samity is able to recover the costs. Experience indicates that the water points in operation have net positive balance after meeting all regular expenditures. DSK provides management supervision and interacts with water samity through regular monthly meetings. Of the 20 targeted water points and associated utilities, 15 points had been completed by 1997. Remaining five were fairly in advanced stages of completion. The recovery rate is quite satisfactory and it is expected that the samities will be able to repay their loans within the projected time frame.

The project uses a process of NGO intermediation and active user participation to construct, maintain and pay for shared water points in slum communities.

3.2.3 Experiences gained in Africa

3.2.3.1 Kibera informal settlement in Nairobi community organization initiative (CBO)-Kenya

Kibera is an informal settlement, with a population currently estimated at 500,000 living in 9 villages at the centre of Kenyan city of Nairobi. This is predominantly low-income community in the city of Nairobi. The settlement covers an area of 250 hectares which works out a density of 2,000 people per hectare, making it one of the densely populated human settlements in Sub-Saharan Africa.

One of the key problems facing the Kibera community is inadequate infrastructure compounded by lack of clear policy framework and effective programs for meeting the needs of the residents of informal settlements. Inadequate water supply and sanitation tops the list of infrastructure problems facing this rapidly growing settlements, which is a home of 25% of Nairobi's population.

The water supply and sanitation services supposed to be provided by Nairobi City Council(NCC) to the area is very expensive, unsafe, erratic and insufficient. Water is

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available once in a week, and private vendors charge up to 30Kshs per 20 litre jerrican.

The study was commissioned by the UNDP-World bank Water and Sanitation Program- East and Southern Africa(ESA), as a part of technical assistance to the Nairobi City Council water and sewerage department. This assistance supported the preparation and implementation of Kibera Water Distribution Infilling Component(KWDIC).

The KWDIC is a component of the Third Nairobi Water Supply Project(TNWSP) aimed at developing and testing community-based options for improving water supply in Kibera. KWDIC seeks to improve the well being of Kibera's residents and to deliver adequate clean water to all nine villages of the sprawling settlement. Specifically, the Kibera project aim to reduce the price of water, to effect more reliable water supply delivery and management and to enhance the role of the independent private sector in the delivery of water supply and sanitation services in Kibera.

The TNWSP is being implemented by the NCC with funding from the world Bank, ADB and other donors. Among other activities, it includes the development of a dam, treatment of storage works, desludging of sewerage treatment ponds and rehabilitation of sewer lines.

There are over 250 CBOs in Kibera, established as self-help groups and registered with the department of social services. In the environmental sanitation sector, these organizations, mainly the village health groups are involved in weekly clean-up activities. They are involved in clearing solid waste from drains, community managed water kiosks and solid waste recycling. Most CBOs receive funding, training and technical support from NGOs. The CBO initiative in collaboration with NCC and NGO provided a new supply pipeline connected to a water main outside Kibera settlement through a meter as shown in the figure below.

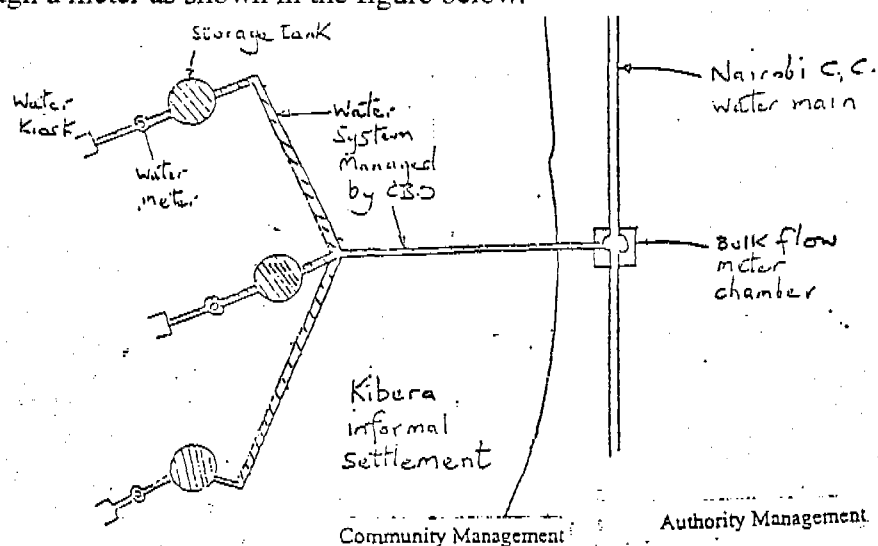


Fig 2: Kibera water utility partnership

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The CBO through their management committee operate about 500 kiosks and pay the NCC on the bulk water meter reading. There is dual responsibility to the system guarded by an agreement but through the bulk supply there is a more reliability and increase of revenue.

The kiosks are mostly run by individual private owner, but some are operated by water committees and women groups. These community kiosks usually sell their water at a lower price than the private owners. The cost of the connection to the city water network can be quite high as the distance to the nearest main for the connection can be up to 2 kilometers, but profit on the sale of water are such that this is easily earned back. The private kiosks usually sell water at 1.50-2Kshs per jerrican of 20 litres and the community kiosks at 1 Ksh per jerrican.

Thus by giving a social tariff, the authority does not control the selling price of water at the kiosks. Where community groups own the kiosks, the profits are usually reinvested in infrastructure services within the same area and are therefore contributing to the improvement of the living environment. The private owners are often absentee landlord who do not invest the profit in the same area.

The new management facilitate cost recovery, through improvement in meter reading, billing and payment.

Profit from water sales is reinvested for other projects to improve other public infrastructures

3.2.4 Empirical part of study

3.2.4.1 Tabata community water project (Dar Es Salaam-Tanzania)

Tabata area with an estimated population of 18,454 is located in Ilala district in Dar Es Salaam, some 5km in western part of the city, and occupies an area of 75 hectares. The area is planned 80% built with permanent structures and occupied by house owners. By standard this is a low-income area but may not be the urban poor. The area is represented by the Tabata Development Fund CBO that has divided the area into five neighborhoods. The main objective is to upgrade deficient infrastructures within Tabata Ward through self-help. In translating the communities objectives into actions the community of Tabata has been able to alleviate some of the problems they were facing in particular inadequate supply of clear water for domestic use. The water committee was formed consisting 15 members, among them seven are women.

Due to inadequate supply of clean water for domestic use DAWASA has introduced a ration timetable whereby Tabata area gets water twice a week and there is no quarantine. Taking into account that supply of water is not adequate people living in

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particular women used to queue in areas where they could find tap water with their buckets in order to get water thus depriving their children the care they deserve. In some cases during critical acute shortage of water people used to buy a bucket of water for not less than TAS 100/=(US\$ 0.125).

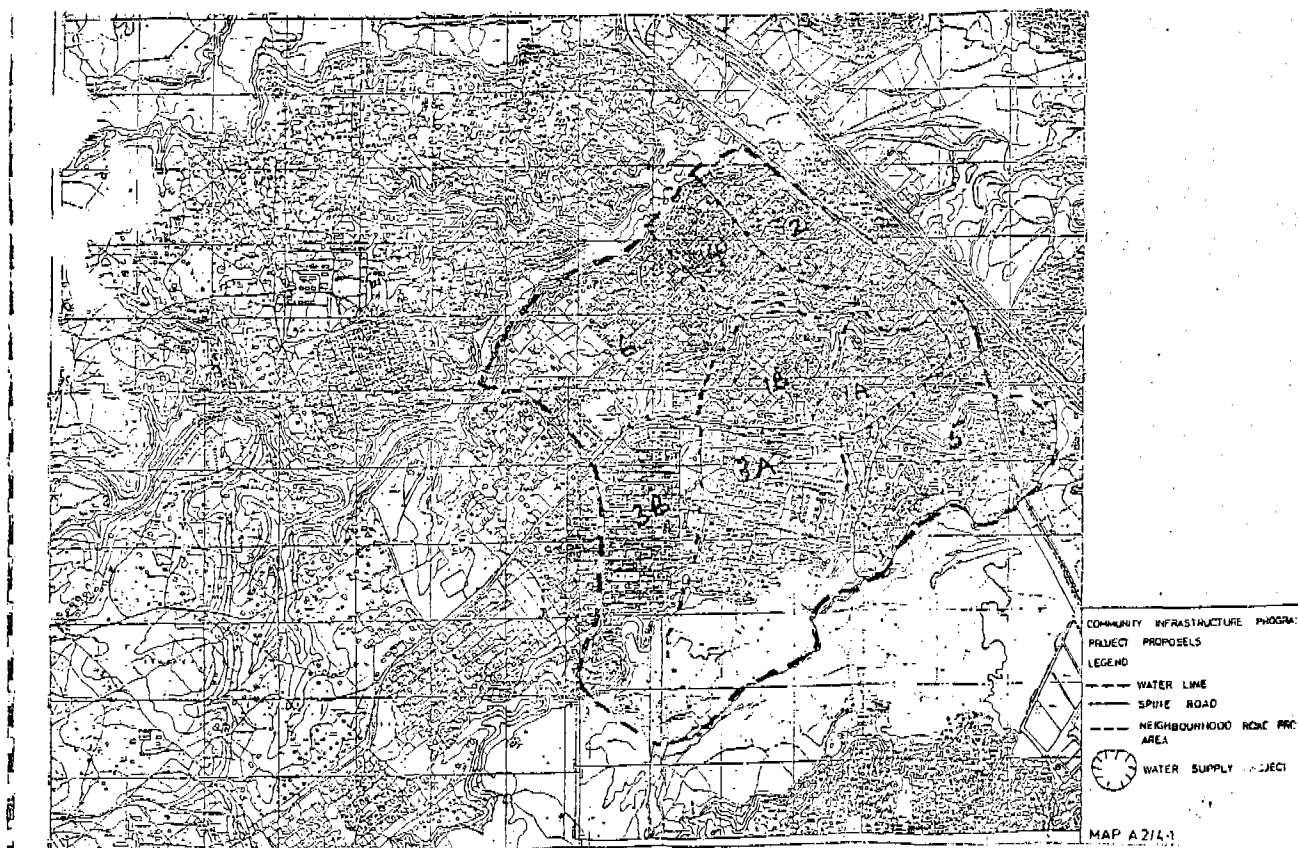


Fig 3: Tabata water project

In order to rescue the community from this problem the community established two water borehole with their own water network system after getting financial assistance from Irish Aid under the coordination of Community Infrastructure Program (CIP). The purpose of establishing their own water network system was to compliment their efforts to provide clean water to Tabata community.

In establishing the network system, it started as a pilot project covering six neighborhoods. They started with one borehole in neighborhood no. 5. This is a squatter area with the most deficient infrastructure and a population of approximately 4000 people. Borehole no. 5 was constructed in 1997 and serves about 4000 people. The borehole has a capacity to produce 4000 litres of water per hour, and five stand pipes run from it. There are two reserve tanks with a capacity to store about 30,000 litres of water and submersible under ground water booster pump.

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Irish aid provided funds for construction materials amounting to TAS 24.76 million(US\$ 30950) while labour and supervision estimated at TAS 6.17 million(US\$ 7712.50) was provided by the community under the umbrella of Tabata Development Fund. Moreover Irish aid committed fund for: one technical advisor with skills and experience in community mobilization for the duration of the program to develop the implementation capacity of local communities and to strengthen the capacity of the CIP coordinator and the selected CBO, pumping system and reserve tanks, water distribution network, logistical support to the project support unit headed by the coordinator to CIP to include transport, office equipment, administration cost, development of training materials and training program that enhance the capacity of the CBO to participate in all stage of the development process and the capacity of the program partner's to promote a more responsive approach to request from CBOs.

Dar Es Salaam City Commission was committed to provide its staff, which are currently working with the CIP, to give all possible assistance to the CIP water program ant to provide technical advice for the duration of the program.

The borehole in neighbour no. 5 started operating in October 1997 and from a period of October to December 1997 the community realized an income of TAS 364,430/=(US\$ 455.50) out of water sales and expenditure of TAS 12,000/=(US\$ 15). One bucket of 18 litres of water is selling at TAS 20(US\$ 0.025) and this rate was fixed and agreed by the community. The income realized from water sales is for paying stand pipe attendants, maintenance of water network system and savings to meet other CBO outgoing and enhance economic sustainability.

In 1998 between January – December income from water sales for borehole no. 5 was TAS 4,429,440/=(US\$ 5537) and expenditure of TAS 3,444,480/=(US\$4306). Expenditure was on the higher side because some of the funds were channeled to the construction of the CBO (TDF) office.

In 1999 with assistance from Irish Aid another borehole no. 3 was constructed. The donor contributed about TAS 48.7 to buy construction materials and partly to pay the private contractor while 25% i.e. TAS 11.42 million (US\$14275) inform of labour and supervision was provided by the community members under the coordination of TDF. Borehole no. 3 is serving four(4) neighbourhoods with about 11000 people and it has a capacity to produce more than 7000 litres of water per hour with 18 standpipes.

In terms of income from water sales borehole no. 5 and 3 realized about TAS20,679,115/= (US\$ 25849) for the year 1999 from January to December while expenditure was about TAS 14,909,606. Total income for a period of three years from October 1997 to December 1999 was TAS 25,472,985(US\$ 31841) while expenditure was TAS18,366,086 (US\$ 229558).

Water from the borehole is pumped to the collecting tanks and are metered. The rate of pumping depend on the advice of the water experts and their description of the potential of the respective water reserves. Water is pumped into the elevated reservoirs where

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water is regularly checked for the quality. Then it is pumped to each neighbourhood where the flow is again metered to determine the supply to each neighbourhood. This kind of system is not only ensuring even distribution but also monitor leaks or illegal connections to the neighbourhood level. Each standpipe is manned to ensure the rationing programme can be brought to plot level. The stand pipe attendant are employed by CBO, and they are familiar with the locality and monitor both the quantity of water being distributed and to which plot it is going. This helps to prevent abuse of the system by water vendors.(author experience).

*Through the CBO, the families contributed to the project through demand responsiveness as a pre-financing and subscribe to their daily water demand. The initiative has proved a success and plans are there to have the system extended to the other neighbourhoods. This has been possible through a project support from the donor, and other stakeholders. The CBO also handle the spin road project into the area from Nelson Mandela Highway.
The project has created an employment for more than 25 people.*

Fig 4: Tabata water project implementation



Digging of trenches



One of the standpipes



Reserves tanks and elevated tank

3.2.4.2 Hanna Nassiff community based organization (Dar Es Salaam –Tanzania)

Hanna Nassiff is one of the oldest unplanned settlement in Dar Es Salaam. It is located in Kinondoni District some 4 kilometers to the North of the city centre. The settlement covers an area of 46 ha. The 1994 studies estimated the population to be 19,000 inhabitants spread over 4,277 households. A study by SDP in 1994(DCC et al, 1995) showed that 42.1% of the households had no access to piped water, 24% had no electricity, 92.2% used pit latrines and 68.4% disposed wastewater on roads and in drains and the river valley. Only 16% of the households were built on surveyed plots and some areas in the settlement had densities of up to 43 houses per ha. Before 1994, the settlement had no roads, and flooding was a problem especially in low-lying areas. Inadequate infrastructural provision lead to both environmental and health problems such as pollution, soil erosion and out break of diseases such as cholera, typhoid and malaria.

The formation of CBO was prompted by the community frustration after being excluded from two successive government supported settlement upgrading and site and service programs in 1976 to 1987. The CBO was granted permission to mobilize people to contribute both in cash and in kind to improve their settlement environment. The residents organized themselves into what they called the Community Development Agency(CDA). The Community Development Committee(CDC) was formed in 1993 after the two community representatives were introduced to the UNCHS/UNDP supported SDP and the ILO. In early 1993, the settlement was divided into six zones with one member represented on the CDC. The elected members however only included men and other two elections had to be done to ensure that women were represented. The requirement by donors to include women representatives in the CDC was particularly commendable as most women tended to be ignored in such projects and thus jeopardizing their participation. The requirement to include women also reiterated the importance of ensuring representation in spite of traditional practice that marginalized participation of certain groups in the community. The role of CDC is to act as a bridge between the residents of Hanna Nassiff and the City Commission and the donors. The first phase of the pilot project on Community Based Settlement Upgrading (1994-1996), which was executed by ILO in collaboration with other United Nations Volunteers.

Since the major problems in Hanna Nassiff were the lack of storm water drainage channels, roads, water supply systems, facilities for the disposal of waste and prevalence of low cost sanitation, the objective of the project were to contribute to the improvement of the living conditions and access to basic urban infrastructural services through the provision of water supply system, storm water drains and gravel roads. The project involves the construction of the 265m of storm water channels, 2km gravel road, 25 road crossings, 4km side drains, 25 ft bridges and a water supply network consisting of 10 water kiosks. The total cost of the project was US\$ 1,423,344 (TAS967.873,920) to which CDA members contributed TAS 20 million. Firstly, each CDA member was encouraged to contribute TAS 1,000(US\$ 1.25) as fee to join the

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CDA community. Secondly, each businessman was required to contribute TAS3,000 with each house owner TAS 2,000 (US\$ 2.5)and each tenant TAS 500(US\$ 0.6).

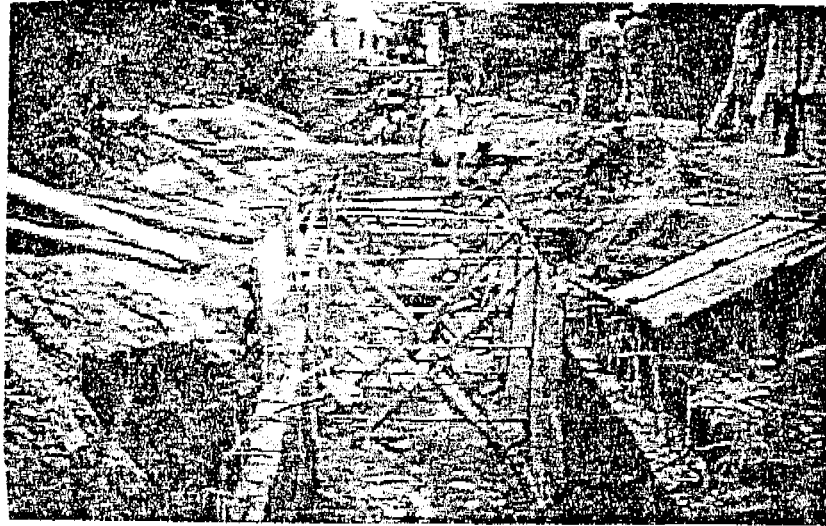


Fig 5: Construction of storm water drains

The project has carried out in two phases. Phase one started in 1994 to 1996, and phase two started in 1994 to 1999. Phase two of the project was aimed at completing the construction of the remaining roads and drains of phase one. These involves empowerment and capacity building at local levels and the devolution of power from donors and the government to the beneficiaries.

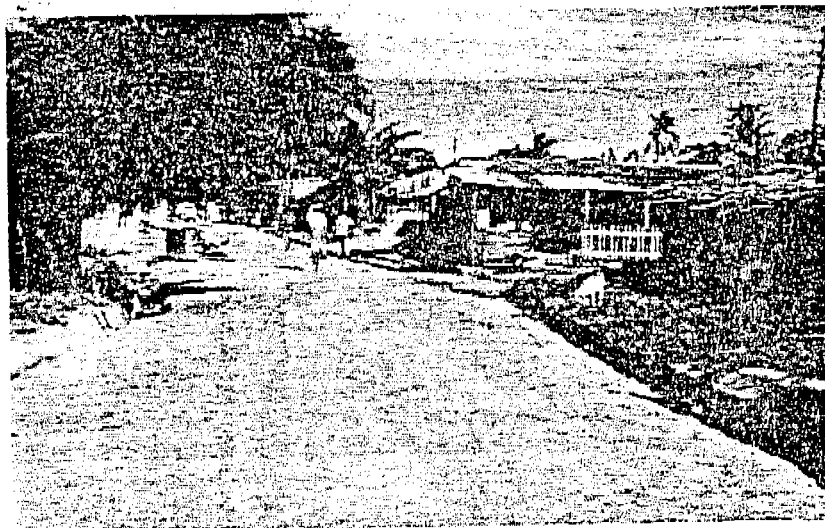


Fig 6: Completed murrum road

By community participation environmental conditions in unplanned settlements can be upgraded. This study shows a willingness of the community to contribute to upgrading of infrastructure in the form of labour, cash and provision of materials.

3.3 Conclusion

The roles of communities have been discussed as reviewed from different authors and also through presentation of different projects summaries, which have already contributed in various ways in improving their domestic water supply. The cases presented show good examples of how community efforts could be organized to solve environmental problems in low –income areas in unplanned settlements by providing the infrastructure services. These projects summaries provides the necessary experience, and can stimulate formation of other CBOs in Dar Es Salaam and elsewhere which are interested in learning from this experience and addressing their infrastructure needs.

Most of the governments in developing countries cannot provide basic social services to the residents, as they lack adequate financial resources. Instead, governments should be available to supplement community efforts.

When communities receive financial and technical support from institution like UNDP, ILO and others their involvement in various stages of decision-making, assessment, planning, implementation, management and monitoring enables them to evolve a good management strategy that can sustain the alternative water system. This approach respects the fact that community members are aware of their own needs and have indigenous knowledge of managing water for their own use. Participation leads to better gender relations and the improved health of household and community members.

Development is ultimately not a matter of money or physical capital, or foreign exchange, but of the capacity of a society to tap the root of popular creativity, to free up and empower people to exercise their intelligence and collective wisdom. (Karl Polanyi Levitt quoted in Kennedy 1996).

Chapter four will give an overview of domestic water supply in the city of Dar Es Salaam, this includes management system and the institutional arrangement.

CHAPTER FOUR

4.0 AN OVERVIEW OF DOMESTIC WATER SUPPLY SITUATION IN DAR ES SALAAM

4.1 Water management system in Dar Es salaam

4.1.1 Background

In Tanzania, urban water supplies have traditionally been managed at national, regional and district levels. In 1994 national Urban Water Authorities NUWA (now DAWASA) a public corporation was responsible for Dar Es Salaam water supply. On the other hand Dar Es Salaam water supply was managed by NUWA since October 1984 until 1997 when NUWA act was amended to allow for merging of water supply and sewerage management in the city and hence the establishment of DAWASA. When NUWA was established in 1984, it was to cover all regional headquarters step by step. Due to multitude of problems of the Dar Es Salaam water supply, NUWA failed to expand to other towns and remained in Dar Es Salaam and Coast region todate.

In 1994, semi autonomous Water Supply and Sewerage Departments(UWSDs) were established in regional headquarters. UWSDs were semi autonomous based on Treasury authorization to establish special accounts as provided for in the exchequer and Audit Ordinance of 1961. The authorization gave the UWSDs some financial autonomy under supervision of advisory boards.

In 1998, all the UWSDs were declared by the Ministry to be Urban Water and Sewerage Authorities(UWSAs) in three categories. Category (a) are those authorities which can meet all operation and maintenance costs, category (b) are those authorities are those authorities which can meet all operation and maintenance for personnel emoluments. And category (c) are those authorities which can meet all operation and maintenance costs except for personnel emoluments and electricity.

Before 1997, review of the Waterworks Ordinance, urban water supply were managed under the Regional Water Engineers while sanitation including sewerage was managed by Municipal/Local Councils. The legislation review however merged the activities of water supply and sewerage under the management of the Urban Water and Sewerage Authorities(UWSAs).

The current legal and institutional framework is therefore one in which Dar Es Salaam city water supply and sewerage services are managed by DAWASA through Act. No 8 of 1997. DAWASA is wholly owned by the government of Tanzania. It is responsible for the provision of water supply and sewerage services in Dar Es Salaam area and Coast region(Bagamoyo).

4.1.2 The Urban Water Supply and Sewerage Authorities(UWSAs)

4.1.2.1 Policy Framework

It is the policy of the government that urban water supplies management should be decentralized. This decentralization is currently to UWSA's which are solely owned by the government. The policy is also clear that sewerage cannot be separated from water supply and hence both should come under the management of one institutions.

However the government of Tanzania now wants PSP in the management and financing of urban water supplies and sewerage services. Essentially the government has agreed PSP in Dar Es Salaam and supporting legislation is now in place. A private sector is foreseen to start managing the operations of Dar Es Salaam water and sewerage services within the financial year 1999/2000. Other urban centres will gradually follow after PSP is in place in Dar Es Salaam.

4.1.2.2 Legal Framework

The UWSA's operate under (WVO) as amended in 1997. The subsidiary legislation under WVO include waterworks rules and regulations. The WVO and its regulations provide for the establishment of Board of Directors to oversee the activities of the UWSA's. The Board of Directors of each UWSA contain ten members who represents key stakeholders in urban water supply and sewerage services:

- 1) Chairperson who is a resident of the municipality or town in question.
- 2) Representative from MoW
- 3) Representative of the regional or district administration
- 4) Municipal Director or District Executive Director
- 5) Local Councilor
- 6) Managing director of the UWSA who is the secretary to the board
- 7) Representative of local commercial sector
- 8) Representative of the locally based large consumer of water
- 9) Representative of the domestic consumer of water, and
- 10) Representative of women

4.1.2.3 Institutional Framework

The overall functions of UWSA's are:

- (a) To secure the continued supply of water in the municipal/town for all lawful purposes.
- (b) To develop and maintain waterworks in the municipality/town or waterworks connected with the supply of water to the municipality /town.
- (c) To promote the government in the formulation of policies relating to the development and conservation of water and potable standards in relation to the municipalities/towns.

- (d) To advise the government in the formulation of policies relating to the development and conservation of water and potable water standards in relation to the municipalities/towns.
- (e) To plan and execute new projects for the supply of water to the municipality/town
- (f) To educate and provide information to person residing in the municipality/town on public health aspect of water supply, water conservation and similar issues.
- (g) To liaise with the municipality/town authorities on matter regulating to water disposal and the preparation and execution of plans relating to the expansion of water supply.
- (h) To construct and maintain sewerage disposal works on any public and or land acquired or lawfully appropriated for that purposes.
- (i) To construct and maintain public sewerage in, on, under or over any street.
- (j) To provide amenities or facilities which the authority considers necessary or desirable for persons making are of the services or the facilities provided by the authority
- (k) To collect fees from customers for water supplied and wastewater collected by the authority

4.1.2.4 Role and Authority of Central Government

The role of the Government, as represented by MoW, with regard to urban water supplies is to:

- (a) Regulate and formulate policies pertaining to water supply and sewerage services.
- (b) Initiate major capital works with a view to expand and consolidate water and sewerage services in urban areas and to compensate properties which may be affected or damaged as a result of gaining access to the right of way.
- (c) Provide funds by way of subvention to the authority, which may be necessary for the performance of its functions.
- (d) Assist and facilitate repayment by the central Government and Government Institutions of outstanding debts due to the authority.
- (e) Assist the authority to repay debts owed and which are due to the Government and its Institutions.
- (f) Assist and facilitate peaceful and harmonious relationship between the authority and regional and municipal/town authorities.
- (g) Regulate and monitor the performance of the authority. The performance shall be measured using agreed performance indicators.

4.1.2.5 Role of Private Sector including NGOs

Traditionally the private sector in Tanzania has only been involved in the water sector as consultants and contractors but not as operators or investors. Considering the current poor state of water supply and sewerage infrastructure in all towns, PSP should primarily aim at attracting financial resources from the private sector. Improved sector performance through private sector management should also be given due consideration. It is likely that after the completion of the PSP process for DAWASA,

other municipalities and towns will follow. Considering economies of scale, water supplies for small towns and informal settlements which are scattered all over the country may not be so profitable to attract PSP. Appropriate policy and strategies have to be developed to address this issue.

4.2 National Water Policy

The Government's policy has been to provide potable water to consumers at the least cost. In 1970 the government of Tanzania adopted a policy of providing free basic social services to its citizens, including domestic water supply. The government owns the water systems and paying for operation and maintenance(O&M) costs in both urban and rural communities. This led to the deterioration of the water supply systems. This condition took some years until when it was realized that the policy was not sustainable.

Though in 1980 the government adopted the UN goals for the water decade, little attention was given at that time to the ownership of the systems and their sustainability. Systems were built and maintained by the government which owned them. This resulted into enormous burden to the central government, and result into a less coverage despite the large investments that had been made since the early 1970's. The communities were hardly involved, except for unskilled jobs, such as trench digging, clearing of construction site and ferrying construction materials.

In 1986 the Government reviewed the UN Water Decade, it became evident that the targets set for 1991(access to safe and potable water supply to all) could not be met. From this the government revised the target and now the Tanzanian water policy is geared to provide clean water to all inhabitants by the year 2002.

In 1991 the government launched the National water policy for overall development and management of water resources. The overall national objective is to provide adequate clean and safe water within easy reach, to satisfy other water needs and to protect water sources. Specific objectives of the water policy include:

- protection of water catchment areas
- promotion of efficient use of water
- promotion of efficient water treatment and waste water treatment
- promotion of water recycling
- institution of water charges that reflect full value of water resources
- prevention of water pollution and management and conservation of water bodies and wetland

National Water Policy 1991 states that: Water is vulnerable resource, has economic value among competing users and necessary to sustain life, development and the environment.

In the effort to attain these goals the Ministry of Water;

- (a) Is promoting sectarian approaches into water resources management and forming the river basin water offices to abate the pollution and to promote conservation
- (b) Is striving to strengthen the UWSA's so as to be able to attract financing and be sustainable to include private sector participation
- (c) Is soliciting financing so as to rehabilitate expand and construct Urban Water and Sewerage Projects to meet the public, private and Industrial demands to satisfy the ever increasing demands for domestic and environmental needs
- (d) However, the National water policy does not have or encourage the politics of low-income bracket (poor) to offer preferential tariff as of now.

4.3 Existing situation

4.3.1 Water supply services by DAWASA

About 80% of inhabitants in the city of Dar Es Salaam are categorized as low-income group and living in both unplanned and in urban poor communities. The water supply in Dar Es Salaam is in a state of crisis and worsening day after a day. The DAWASA water supply services level is below 50%, and in some highly dense populated area, this is low as 0% especially during times of draught. The people who are not covered by the public network are dependent on private wells, or boreholes, vendors or neighbors.

4.3.1.1 Water sources

DAWASA has two different sources on which the inhabitants and other economic activities in Dar Es Salaam depend

- (a) **Surface source:** The main source is Ruvu river located in East-West of Dar Es Salaam some 60 kilometers from the city. This source has been used as main source since 1950's. There are two pumping stations the upper Ruvu and the lower Ruvu. The existing upper Ruvu water works with a treatment plant at Mlandizi and a transmission line to Dar Es Salaam was constructed in stages between 1950-1975. The upper Ruvu water works has a full spectrum of treatment units and a production capacity of 82Mld.

The lower Ruvu scheme was constructed in 1976 on Ruvu river near Bagamoyo town North East of Dar Es Salaam, downstream of the upper Ruvu plant and has a capacity of about 182Mld (millions of liters per day), but this has never been achieved fully. Surface source via lower upper and lower Ruvu waterworks produces 97% of daily production, and it supplemented by Kizinga river at Mtoni to the South of the city with a capacity of about 9Mld

Table 1: Surface source showing production capacity

S/N	Water Source	Production per day(millions of gallons)	Transmission sizes (mm)	Age (Years)	Pipe material
1	Upper Ruvu	18.00	900	25(+)	Cast Iron
2	Lower Ruvu	40.00	1300	23(+)	Concrete
3	Mtoni	2.00	600	30(+)	Cast Iron
	TOTAL PRODUCTION	60.00			

Source: DAWASA TANZANIA July 2000

(b) Ground Source: The second source is ground water which produces 3% of daily production. Ground water sources were established during water crisis in Dar Es Salaam in 1996. Ministry of Water formed the emergency team-Technical task force was formulated to find device means of solving water problem, the team came up with an idea of using ground water as temporary measure. Ground water is obtained from boreholes. These boreholes are hand-or machine-drilled wells. Hand-drilled wells have a small diameter and are sunk using special tools, such as bits or augers. Machine drilled wells are typically 100-200mm diameter and are sunk relatively sophisticated equipment powered by diesel or electric motors. Machine drilling is suitable for depths up to 50m, but the depth depends on the geological conditions.

The DAWASA area of supply covers not only the city but the villages and townships on the route of the two transmission mains. Treated water is pumped to reservoirs in the city at University of Dar Es Salaam and Kimara respectively. From this reservoirs water flows by gravity to the city through primary distribution mains to which secondary distribution mains are connected. The approximate length of existing mains in the city is about 824km, with 237km of primary distribution and 587km of secondary distribution mains.

DAWASA provides water from the distribution mains at standpipes located around the city. There is no charge for this water which is used by individuals as well as water vendors who charge their customers for the water they transport.

4.4 Causes of water shortage in the city of Dar Es salaam

The distribution of water supply by DAWASA is a big problem currently in Dar Es salaam as far as the availability of water is concerned. It is providing unacceptable levels of services and is unable to meet the increasing demand for services. The distribution is mainly affected by water rationing, water supply interruption and water source fluctuation.

4.4.1 Water Rationing

DAWASA has to distribute its water by rationing in different parts of the city. The rationing of water has been going for quite a long time now. Most of the places other than sensitive places get water at pre-arranged days. A particular area can get water once or twice a week and only for few hours 4-6 hours. In highland areas people mostly get water supply during the night. This lead to intermittent water supply which forces people to woke up night hours to fetch some water. The common affected areas are Tabata, Tandale, Ubungo-Kibangu etc.

4.4.2 Water supply interruption

Water supply interruption is another situation which create shortage within the city. It is caused by frequent bursting of pipes along the distribution system, which may take long time before repair or replacement or may not at all attended. Most burst pipes are of low quality PVC, laid above the ground surface. Also most of these pipes are of small diameter, this limits the volume of water available through the outlets.

4.4.3 Water source Fluctuation

The city of Dar Es Salaam has been experiencing lack of tap water completely for some months each year. For the months of January, February and March from 1997-1999, the city of Dar Es Salaam experienced an acute water shortage, a situation which left people confused and find alternative ways of getting water, mainly from unimproved sources. This shortage was due to decreased level of water in river source which is main source for Dar Es Salaam, due to delaying short rains leading to unusual drought. The above situation result into a big percent of city population not to access water from public utility and hence to rely on other sources like private hand dug- wells, boreholes, springs, vendors or neighbors and polluted streams.(see figure 7)

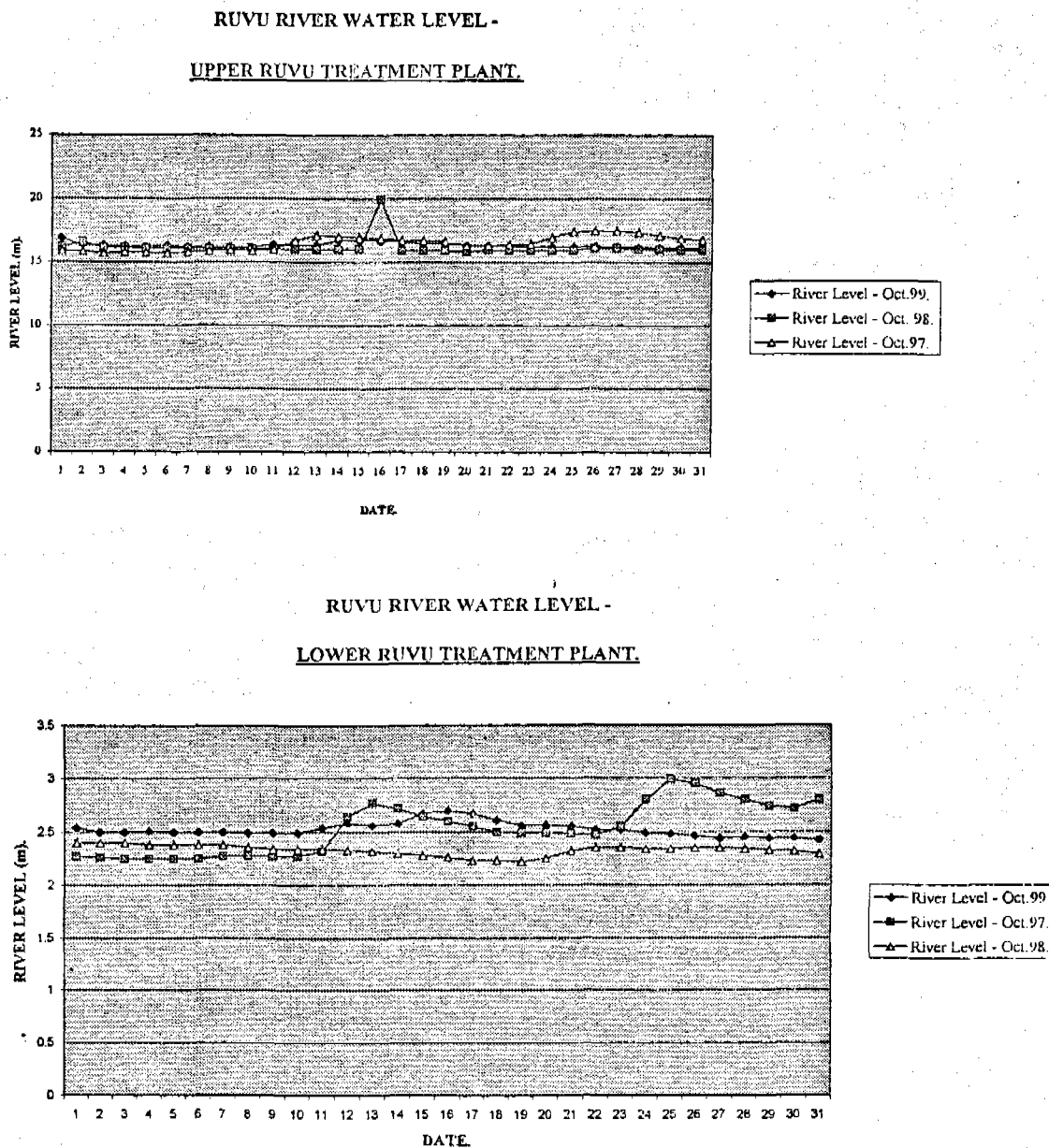


Fig 7: Ruvu River water level
Source: DAWASA

4.5 Other institutional forms of water provisioning in Dar Es Salaam

The frequent shortage of water resulting from water rationing, interruptions and limited access and availability of water in most parts of the city contribute to an increase in prices, distance walked and time spent looking for alternatives. Residents particularly women and children spend valuable time queuing for water. During acute

shortages queuing may go up to 2-4 hours. This situation has given opportunity to street vendors and water tankers to make a good business of selling water.

There are numerous private businesses operating a water tanker service within the city, and it is estimated that about 14 tankers are used to ferry water to premises on a daily basis. These people get water either from DAWASA standpipes and resale to consumers in those areas with water problems or they get water through their own means. The water tankers sell water at Tshs 18,000/= per 9000litres which is equivalent to 27 US\$.

Private vehicles carrying water containers are common sight in the city, as people transport water to their homes. Another feature of life in the city is the number of water vendors providing a valuable service to the people by transporting water to their premises in custom built carts(pushcarts) in Swahili language "*Mikokoteni*". Most pushcarts carry 6-7 containers "*Madumu*". Thus the load they transport usually weighs between 150-160kilograms plus the weight of pushcart itself. Water is mostly obtained at TAS 20/= per container and resold for TAS 70/= to TAS 100/=. When water is difficult to obtain, the price tend to go up to TAS 150/=:, and in times of severe water scarcity, as much as TAS 700/= per container. The above prices are far more expensive than official DAWASA price of TAS 1/= per litre. Also a lot of people use bottled water for drinking which comes from other regions..

4.6 Need for water supply improvement

4.6.1 Rationale

Unsafe drinking water and inadequate sanitation are among the most serious problems facing poor people in unplanned areas in Dar Es Salaam city as is the case in other cities of developing countries. Majority of people in these areas lack adequate supplies of water and also have no basic sanitation facilities. Water supply and sanitation are infrastructure services which are linked and always form a vicious circle. By improving one also lead to the improvement of the other or at least lessen the burden on the other. Poor sanitation imparts great effect on water supply system by contaminating water, and hence leading to the need of additional treatment apart from protection against pollution caused by it when it is not functioning properly. This holds mainly where on-site sanitation systems are used. Leakage of water distribution systems cause sanitation systems to malfunction and these in turn contaminate the piped water supply systems leading to public health problems.

The WASH(Water and Sanitation for Health) study (Esrey et al,1990) showed that each year there are 875 million cases of diarrhea, of which 4.6 million end in death, most of them children. There are also 900 million cases of ascariasis of which 20,000 end in death as well. Furthermore there are 800 million cases per year of hookworm, 200million cases of schistosomiasis and 500 million cases of trachoma of which 80 million end in total blindness.

It was noted by Wright(1997) that human and domestic waste from any area can contaminate the local environment, groundwater, lakes, and rivers used for supplies of fresh water. In Dar Es Salaam the waste re-contaminate piped water supplies. Poor sanitation in the city and the resulting deterioration of water quality for both piped and groundwater is rampant and evidences of this situation abound. Most parts of the city ground conditions are poor with high water table, permeable soils and an increase in housing density and mismanagement of solid wastes are responsible for serious health and aesthetic problems in squatter areas, especially due to overflowing sewage from septic tanks and pit latrines(Mbuligwe,1997). There is a need for to frequently empty the pit latrines and septic tanks and malfunctioning soakaways leading to flooding and resulting aesthetic degradation as well as physical damage to the environment. Other problems which have been observed include pollution of groundwater and contamination of piped water by infiltration of polluted water into clean water pipes during low-pressure periods.

The above situation is known to be caused by extensive leakage in the distribution system of the city reflected in water losses of up to 40%(Dahi and Weder-Heinen, 1992). The water losses worse enough forces people to rely on other sources which are even more contaminated, like simple hand dug wells and polluted streams and rivers. The deterioration of the pipes resulting from old age as well as illegal connections add to water loss due to leakage.

4.6.2 Water quality standards

4.6.2.1 Guidelines for drinking water quality

The primary aim for the guidelines for drinking-water quality as recommended by WHO is the protection of public health. Drinking water quality has been a constant subject of concern to WHO which resulted in the publication of standards and guidelines entitled International Standards for Drinking Water. The guidelines are intended to be used as a basis for the development of national standards that, if properly implemented, will ensure the safety of drinking-water supplies through the elimination, or reduction to a minimum concentration, of constituents of water that are known to be hazardous to health. Each member country adopts its guidelines of drinking water quality. Appendix III presents the guideline for water quality in Tanzania:

Water quality standards in their simplest terms can be divide into three groups. The first group are those relating to substances and organisms which, if present in water consumed by man or animal, can cause physiological damage, illness, and even death. A second group are standards which includes those which concern substances and characteristic damaging to piping systems and materials or are unfavorable for certain commercial or industrial processes; and the third group relates to the substances which render water unattractive to use for cooking, drinking, washing and recreation. Among the latter there are those which cause tastes, odors; cause discoloration on clothing and articles coming in contact with the water or which make the water cloudy and

unattractive in appearance. All these groups are categorized as: physical, chemical and biological qualities.

Water is essential to sustain life, and a satisfactory supply must be made available to consumers. Every effort should be made to achieve a drinking-water quality as high as practicable. Protection of water supplies from contamination is the first line of defence. Source protection is almost invariably the best method of ensuring safe drinking water and is to be preferred to treating a contaminated water supply to render it suitable for consumption. Once a potentially hazardous situation has been recognized, however, the risk to health, the availability of alternative sources, and the availability of suitable remedial measures must be considered so that a decision can be made about the acceptability of the supply. As far as possible, water sources must be protected from contamination by human and animal wastes, which can contain a variety of bacterial, viral, and protozoan pathogens and helminthes parasites. Failure to provide adequate protection and effective treatment will expose the community to the risk of outbreaks of intestinal and other infectious diseases. Those at greatest risk of waterborne disease are infants and young children, people who are debilitated or living under unsanitary conditions, the sick, and elderly.

The potential consequences of microbial contamination are such that its control must always be of paramount importance and must never be compromised. The greatest microbial risks are associated with ingestion of water that is contaminated with human and animal excreta. Microbial risk can never be entirely eliminated, because the diseases that are waterborne may also be transmitted by person-to-person contact, aerosols, and food intake; thus, a reservoir of cases and carriers is maintained. However, provision of a safe water supply in these circumstances will reduce the chances of spread by these other routes. Waterborne outbreaks are particularly to be avoided because of their capacity to result in the simultaneous infection of a high proportion of the community.

The health risk due to toxic chemicals in drinking water differs from that caused by microbiological contaminants. There are few chemical constituent of water that can lead to acute health problems except through massive accidental contamination of a supply. Moreover, experience shows that, in such incidents, the water usually becomes undrinkable owing to unacceptable taste, odour, and appearance.

The fact that chemical contaminants are not associated with acute effects places them in a lower priority category than microbial contaminants, the effects of which are usually acute and widespread. Indeed, it can be argued that chemical standards for drinking water are of secondary consideration in a supply subject to sever bacterial contamination.

The problems associated with chemical constituents of drinking water arise primarily from their ability to cause adverse health effect after prolonged periods of exposure, of particular concern are contaminants that have cumulative toxic properties, such as heavy metals. Also it should be noted that the use of chemical disinfectants in water

treatment usually results into the formation of chemical by-products, some of which are potentially hazardous. However the risks to health from this by products are extremely small in comparison with the risks associated with inadequate disinfection.

In assessing the quality of drinking-water, the consumer relies principally upon his or her senses. Water constituents may affect the appearance, odour, or taste of the water, and the consumer will evaluate the quality and acceptability of the water on the basis of these criteria. Physical standards which concern taste, odor, color, and appearance usually have little or no adverse effect physiologically on people and animals drinking the water. Water that is highly turbid, is highly coloured, or has an objectionable taste or odour may be regarded by consumers as unsafe and may be rejected for drinking purposes. It is therefore vital to maintain a quality of water that is acceptable to the consumer, although the absence of any adverse sensory effects does not guarantee the safety of water.

For substances which are non-toxic the limits set by certain standards such as the WHO Recommends International Standards are presented only as suggested limits; and nothing prevents going below the stated standards except the willingness of man to accept the tastes, the odors, color, and appearance and their ability to adjust and tolerate. Although it may be costly to meet high physical standards in areas where highly colored raw water or serious taste and odor problems exists it is usual in most developing countries to find that no additional treatment is necessary over that normally provided to make the water safe, since the latter processing also accomplishes at the same time to the needed improvement in physical quality.

4.6.3 Water quantity criteria

Potable water supply to cities and urban centres is the mainstay of all development programs and must be made not only available but must be available in sufficient quantities, otherwise, it may not serve the purpose for which it is required. For urban health and sanitation purposes there is need for a continuous supply of a certain minimum amount of water to individual houses to run the water closet system for example which is the most efficient system for sanitary waste disposal.

If the supply is intermittent, the use of water closet system may pose sanitation problems. People would be forced to use less efficient systems including defecating in unauthorized places . The situation pertains in many parts of developing countries. In Tanzania it is estimated that per capita consumption is

Water systems show wide differences in the quantities of water provided to the people they serve. It is normal for engineers to examine the quantities of water being consumed in any one location and to use these figures as a guide for design. Such data, however, are not to be construed as standards; and there appears to be no point, therefore, in discussing the question of reducing standards of water quantity. What can be discussed, however, is water conservation and the reduction of excessive use of water. A combination of good design, good maintenance, good management, metering,

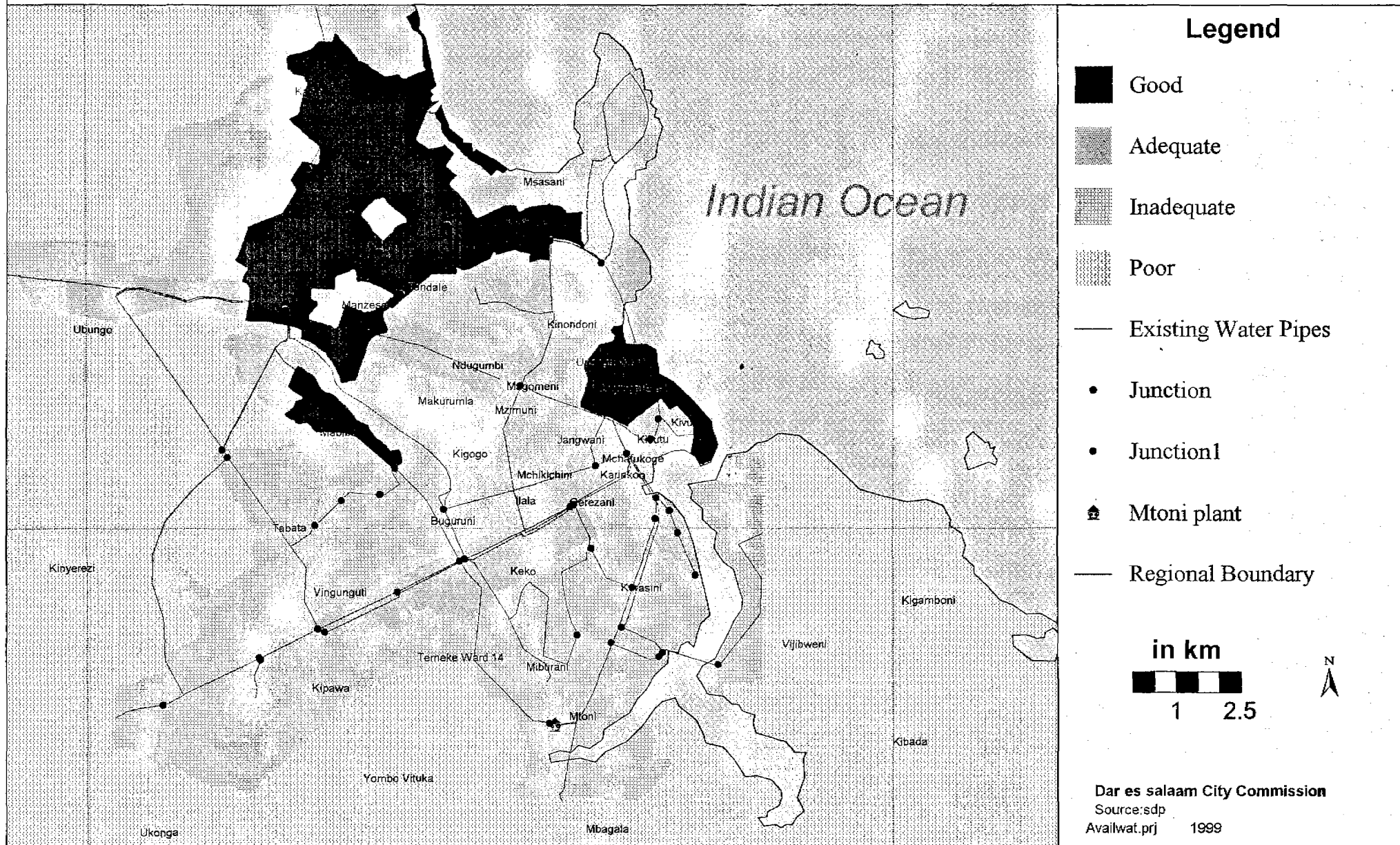
proper pricing policies and possibly new technological developments is required to cope most effectively with the problem of excessive use and waste of water. However, after all steps have been taken it will no doubt be found that different people, different cultures, different climates, and different conditions lead to wide variations in water consumption which not only defy establishment of standards of quantity but make precise comparison of per capital consumption between cities a meaningless exercise.

4.7 Conclusion

This chapter has given an overview of the general water supply situation in the city of Dar Es Salaam. It first presented the management system of water supply in the city, highlighting the policy framework, institutional arrangements and the national water policy. Though the management system mentions the role for private sector, it is not yet in position. However, currently DAWASA is the only authority which is responsible to provide water supply services and sanitation to the residents of Dar Es Salaam. The existing services by DAWASA are not adequate leading to acute shortage of water supply in the city. Informal institutions mainly in the form of street vendors, have emerged as a business to provide the service to the people (section 4.5).

The following chapter analyzes the factors which contribute to inefficiency of DAWASA. Internal and external problems facing DAWASA will be outlined, the chapter will also include the initiatives by DAWASA to improve the existing situation and the constraints. Also strategies to improve the situation are recommended.

Water Supply Availability in Dar es Salaam



CHAPTER FIVE

5.0 ANALYSIS OF FACTORS CONTRIBUTING TO INADEQUATE WATER SUPPLY BY DAWASA AND STRATEGIES TO IMPROVE SITUATION

5.1 Problems facing DAWASA

DAWASA is facing a number of problems in providing water supply services to the city residents. Some of its problems include technical, operational, financial, institutional and public awareness. The section below elaborates the problems.

5.1.1 Dilapidated networks and water works

The existing network is so weak because of old age also lacks maintenance and repair. The water works plant have always been plagued by serious problems . For example: The lower Ruvu treatment plant filters have been out of operation for a long period due to lack of suitable filter sand. In addition, the transmission mains from lower Ruvu to distribution reservoirs in Dar Es Salaam have been prone to disruptive damage by floods, leading to water supply interruptions that sometime last for as long as a week. The upper Ruvu which was constructed in 1958 is prone to fecal recontamination through leaks along its route, and it has never been expanded to accommodate the population increase. The leakage which is not uniformly distributed and goes up to 40% is because of pie deterioration because of old age, encrustation and saltation, illegal connections and severing of pipelines because of poor road infrastructure.

5.1.2 Illegal connections and vandalism

Illegal connections is a serious problem in the city, and this go unreported because majority of the residents do not feel responsibility for the system or a sense of being disadvantaged by these connections. For DAWASA it is extremely difficult to get an overview of the incidence and number of illegal connections in a densely populated low-income areas, where houses are not numbered and small footpaths form the roads. Also with regard to sources of resale water as it is highly likely that many of these are also illegally established or operating from non-metered households connection forming a large part of unaccounted for water. High rate of unemployment and ignorance result into vandalism. Unknown people uproot the pipes, damaging by cutting them.

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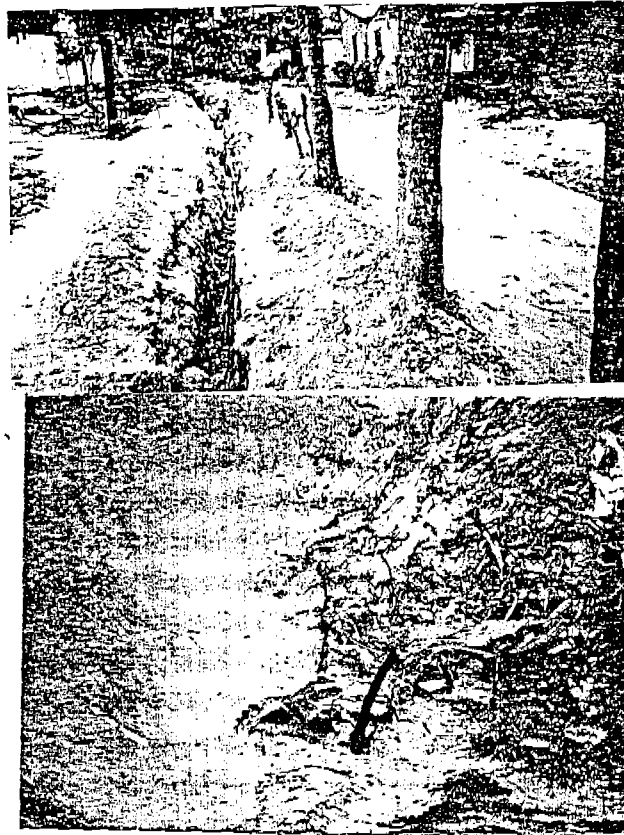


Fig 8 : Illegal connections and vandalism

5.1.3 Lack of water conservation measures

High rate of unaccounted for water are very common in the city of Dar Es Salaam, reaching extreme levels of more than 40% of the water produced, representing critical water which is a scarce resource and also the loss of an income opportunity. Leakage problems are the result of pipe deterioration because of old age, lack of maintenance and failure to replace aging system, encrustation and saltation, illegal connections and severing of pipelines because of poor road infrastructure. The 1992 Cowi/USE finding reported on up to 35-40% of water loss due to leakage. However, reporting of above ground leakage by the public, would assist in leak detection and thus reduction of losses. Yet for people to inform DAWASA on leaks, requires not only awareness of the need to report, but also information on where to report and motivation to do this reporting. The contrary is usual: a leak and is welcomed as a source of free water and is likely to go unreported as long as possible. DAWASA has insufficient leaks detecting instruments as well as pipe connectors required for efficient and effective leakage control. The table below show the situation on physical leakage for the year 1998 on the transmission and service pipe

Table II: Leakage reported and repaired for 1998

s / n	Description	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
	(I) Transmission pipes													
1	Leaks reported	31	7	25	38	17	34	18	23	8	12	16	21	250
2	Leaks repaired	31	7	25	38	17	34	17	24	8	16	16	21	250
	(II) Service pipes													
1	Leaks reported	564	417	406	590	367	457	494	633	599	561	456	483	5987
2	Leaks repaired	568	434	431	615	368	535	500	627	638	561	458	486	6221

Source: DAWASA – TANZANIA, July 2000

5.1.4 Supply and demand imbalance

The demand of water for the all city of Dar Es Salaam is 400,000cc/day, DAWASA can supply at best 273,000cc/day (source: DAWASA, July 2000). This indicates that there is mismatch between supply and demand. Demand is so high mainly because of rapid increase of city population and change of life style like some people building high rising houses with facilities as swimming pools and fountains within the houses. Increase of industrial and commercial activities is also another cause of high water demand. Moreover, DAWASA was forced by the government to provide water for Coast region (nearby region) which was not in the planning and design, so Dar Es Salaam get shortfall.

5.1.5 Capital

Initial investment was not given attention by the government, when DAWASA took a responsibility of water supply to the city from NUWA (1997), there were already a lot of problems and DAWASA inherited them. So DAWASA started dealing with problems from the beginning, and is still dealing with problems instead of giving proper service to the citizens.

5.1.6 Lack of reservoir across the river source

There is no catchment or water reservoirs along Ruvu river (the main source), which could be constructed across the river to take care for the situation during water shortage or during dry season. High amount of water which could reserved is left flowing to Indian ocean.

Despite the above facts, no future predictions that has been taken into account for provision of substantial reservoir or the catchment to solve the problem. DAWASA has two reservoirs along the transmission mains one at Ubungo-Morogoro road and the second one at Lugalo Barracks with storage capacity of about 1,500,000 and 1,000,000cc respectively. These reservoirs have never been used for more than ten years. They were meant to boost or to cater for water shortage.

Chapter 5 Analysis of factors contributing to inadequate water supply by DAWASA and strategies to improve situation

5.1.7 Cost recovery

DAWASA doesn't receive government budgetary allocations for recurrent expenditures and hence must raise funds from consumers and customers to meet its overheads and maintenance cost. To ensure more self-financing DAWASA has three kiosks where it sell water from them using tanks and tries to revise water tariff for the customers.

Lack of meters is also a problem which DAWASA is facing. Only few customers are provided with meters, and others are not. DAWASA tries to install meters to those customers who uses a lot of water like industries, commercial areas and institutions like University of Dar Es Salaam, medical centers, State House, Army and colleges. Most of the households are not provided with water meters. In this case water used is assessed by estimation. This estimation was done after a research which was conducted in 1990/91-billing for those who have no meters. But even where consumption meters are provided, billing is still done on a flat rate basis(property value or location), regardless of the actual amount of water consumed. This make the users to use water carelessly and excessively because they don't feel the cost of whatever the amount of water they use, and make a big financial loss to the utility. It is recorded that 40% of all connections have no water running; though DAWASA continuous to send these customers monthly bills majority of them don't pay. This represent the loss of income which if collected, could be used to pay for running costs and to build new facilities to meet the needs of more people. Users are unwilling to pay for poor service. This in turn causes further deterioration in service because finance is not available for repairs and maintenance.

Table III: Customers with connections by June 2000:

Consumer	Connections
Domestic	88,668
Commercial	5,031
Institutions	1,400
Industrial	1,125
Diplomats	255
Total	96,479

Source: DAWASA, July 2000

Chapter 5 Analysis of factors contributing to inadequate water supply by DAWASA and strategies to improve situation

Table IV: The existing and planned water meters to be installed to each category of consumer

S/N	Consumer	Number of customers	Meters(existing &planned to be provided)	Total percentage(%)
1	Domestic	70,000	1,700	2.4%
2	Commercial	5,500	450	8.2%
3	Institution	7,000	500	7.1%
4	Industrial	150	50	33.3%
Total		82,650	2,700	

Source: DAWASA

This condition shows loss to DAWASA , where 95% of domestic customers don't pay their bills, and 67% for industries and 64% for commercial.

Table V shows the increased water tariff for all customers with effect from 1st February, 1999. The tariff which has considered only production costs are shown together with the old ones. The tariff is per 1000 gallons.

Table V

Category of customer	Old Tariff (TAS)	New Tariff (TAS)
Domestic	1,065.00	1,225.00
Institution	1,620.00	1,863.00
Commercial	1,971.00	2,267.00
Industrial	2,324.00	2,673.00
Expatriates	US\$ 8.6	US\$ 9.9
Minimum tariff per month whether metered or non-metered		
Domestic	1,636.00	1,881.00
Expatriates	US\$35	US\$40
Commercial	20,231.00	23,265.00
Agricultural	46,288.00	53,231.00
Industrial	46,288.00	53,231.00
Institution	20,231.00	23,231.00
Water by tank 9000litres	39,675.00	45,626.00

Source: DAWASA, July 2000

5.2 Wider problems facing DAWASA

5.2.1 Informal Settlement

It is estimated that more than 70% of urban population in Dar Es Salaam live in unplanned and informal settlements, which are densely populated. The layout of the unplanned settlements make the provision of the water supply services and other social services very difficult. Distribution network in these areas is not good, and most of it has been obstructed by the buildings. Connections become difficult also because of interruptions of other services like sewage lines, or sometimes connections has to be made from far which make it very expensive.

5.2.2 Government Intervention

Government policy on water sector affects DAWASA. DAWASA has a mandate to set the water tariff. DAWASA has been facing problems and challenges on setting water tariff being caused by political intervention. Sometimes DAWASA is forced to review its new tariff. When running an operation of revenue collection and disconnection of water services for those who don't pay, the Government intervenes and stops the operation, by claiming water is a basic need for any human being. This encourages people to dodge paying their bills to DAWASA, and that water should be free.

5.2.3 People's Habit or attitude

It is a common practice for the citizens in the city of Dar Es Salaam to use piped and treated water for multipurpose uses such as car washing, irrigation on gardens and small farms of vegetables, construction works such as brick making. Majority of people are not aware on conservation of water like closing of taps, leakage reporting. No measures are taken to deal with this situation. People have to be educated and sensitized to refrain from misusing and wasteful of treated water.

Treated water should be for health purposes and not for other uses. Other activities should depend on other water sources(Kay,D and McDonald A.T (1998).

5.2.4 Monopolistic Nature

DAWASA is the only institution given authority by the Government of Tanzania to provide water supply services to the city. In this case, DAWASA remains in dominant position, resulting into inefficiency of providing the service to the city. More agents could put DAWASA on competition challenges.

5.2.5 Lack of Coordination

The coordination and integration within different institutions which provides public services in the city of Dar Es Salaam are lacking. *Participatory and coordination of all levels of users and stakeholders lead to corrective action and problem solving through the generation and use of knowledge(Narayan D.D).* It seems DAWASA works in

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difficult situation, as there is insufficient coordinated effort from any other institution like local authority or city council. In this case during implementation of water schemes conflicts arise how should DAWASA lay the distribution pipes. This happens in squatter areas or upgraded areas, and people complains about their boundaries and properties. For example during upgrading of squatter areas by the local government in 1998, and water scheme implementation which was under strategic plan-sustainable Dar Es Salaam project in 1998 there was no linkage made between local government, the city council and DAWASA to ensure smooth network layout in these areas.

5.3 Initiatives by DAWASA to improve existing situation

The above section made the analysis of the problems facing DAWASA, and hence causing poor water supply in the city. The main consequences resulting from this situation are impacts on: Human health, social and economic development, as well as environmental pollution.

Despite the fact that DAWASA is entrusted by the government of Tanzania to provide water services to the residents of Dar Es Salaam city, the situation reveals the ineffective and inefficient performance to manage the water supply service in the city.

To rescue the alarming situation both the government and DAWASA are making initiatives to combat the problems. Some of the initiatives that are undertaking by DAWASA include:

- Keep up the resource by doing regular maintenance on the distribution network.
- Install more public standpipes
- DAWASA has employed private people to operate standpipes on their behalf
- Increase the distribution pipe diameters to keep the system working
- Divide the city into zones and identify customers for the purpose of improving billing and revenue collection
- Metering for customers with connections, this serve as water conservation measure and demand management strategy . Also to come out with fair bills to the customers.
- The government has allocated funds for 23 boreholes to supplement water supply by 9,600 cubic meters per day
- Preparation of the tenders for drilling new 250 boreholes
- Review and analyze the cost estimates for the rehabilitation of entire Dar Es Salaam water supply system. In 1995, the feasibility study of this project was carried out by and financed by Japanese government, and by that time it was estimated to be US\$ 28I million.
- Review and analyze the cost estimates for construction of a dam at Mzinga stream to augment the Ruvu source. It was also financed and prepared by the government of Japan in 1997 and it was estimated to be US\$62million.

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DAWASA depends on the revenue from its customers and connection charges for new customers to generate funds to run the utility. Section 5.1.7 describes the cost recovery problems.

Hence to be able to implement the rehabilitation projects, maintenance and repair of its infrastructure, DAWASA in collaboration with the government find alternatives for getting loans and funds from donors. DAWASA is not in position to tell when the projects can be effected (Information on the existing initiatives of DAWASA are based on technical report for improvement of water supply in Dar Es Salaam under the Ministry of water-Tanzania).

Another alternative solution is the privatization of DAWASA. The process started through Parastatals sector reform committee(PSRC) since July 1997. The government targeted to have privatized DAWASA by the year 1999/2000. However, the whole process is delayed.

The efforts which are being made by the government and DAWASA seek mainly to solve the technical part of problems facing the utility. But, in the analysis of the problems facing DAWASA there are also social and institutional problems identified, which need to be solved along with technical problems. Hence there is a need to device and find effective ways of bringing permanent solution to this worse situation of water supply, to serve the people particularly the urban poor.

5.4 Constraints

Following are the main constrains identified as contributing to or causing the problems.

- Institution (DAWASA) responsible for water services delivery operate in an uncoordinated and inefficiency way. Poor institutional management results into low cost recovery, leading to infrastructure falling into disrepair and further reducing the quality and level of service in the city. Networking with other actors has not been given attention.
- DAWASA has not responded adequately to the problem of urbanization, resulting in grossly inadequate service to residents of peri-urban and informal settlements.
- A failure to encourage and support community or households/neighbourhood initiatives, which can contribute much to reducing problems at relatively low cost, without making heavy demands on limited government capacity.

5.5 Recommended strategies

To address the acute water supply problems facing the residents of Dar Es Salaam and achieve long term sustainable water supply service commitment are needed from every one responsible.

Appropriate water sector policies, legislative support and institutional framework should be put in place to guide the stakeholders. Government need to create an enabling

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environment to facilitate service delivery with due involvement of all partners including the private sector and community participation. Where sustainable solutions have been achieved, these should be regarded as models. (chapter 3)

5.5.1 Private sector participation options

PSP is a general term covering a broad variety of options for involving the private sector in service provision. This may range from service contracts by which the private sector provides specific technical services such as pipe repairs or meter reading to management contracts and leases under which the private sector takes on responsibility for the overall operation and maintenance of a water or sanitation system to concession through which in addition to operation and maintenance, the private sector takes on overall investment responsibilities for the improvement and expansion of water or sanitation services. These options differ in their allocation of risks and responsibilities between the public and private sectors, their complexity and their duration, but all involve a partnership between the government and the private sector. (Penelope J. Brook Caven – is a senior PS development specialist with the World Bank)

Like in many other cases in developing countries, DAWASA being a government institution has failed to provide the long term need for effective, equitable and efficient water supply services in the city of Dar Es salaam. Involving PSP can be an important element in achieving public health benefits for all as well as convenience benefits for those who can afford them. PSP is seen to increase efficiency and introduce new sources of finance, it is presumed that private contractors have better access to sources of capital, but above all to require a new emphasis on proactive, performance oriented, commercial management that aim to match the demand of its customers with their willingness to pay realistic charges and tariffs.(WB, 1992)

The general perception of privatization in domestic water supply sector has tended to focus on the French and U.K models as applied to the urban s water sectors. It is now assumed that the complete sale or divestiture of water supply operations that occurred in England and Wales in 1989 along with the development of a sophisticated regulator is inappropriate in developing countries, because of the weakness of stock-markets, public unacceptability and political interference in regulation. U.K model is not followed anywhere else in the world. However, the preferred solution is often seen to be the French model of leasing and concession('privatizing' management whilst retaining public ownership of the assets) which has served in France for over a hundred years and has been transferred by French contractors, to Francophone countries with some success. For the French model decisions are taken at local level, within the community, between users and providers. The French model is well suited to urban water supply and sewerage but is not only one approach by which the private sector can contribute.

The private sector involvement is not the only means for providing higher efficiency levels of service. The tools used by the private sector to maximize profits, either in a competitive environment or constrained by regulation, end up improving effectiveness and should be used by any organization, private or public, responsible for running the

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service. These tools are related to a managerial approach with clear objectives. This means that in whatever organization public or private, the management style should compromise functions, objectives and responsibilities clearly defined and easily attained to avoid confusion and overlapping of action, and that targets are set to achieve the objectives. These characteristics could be achieved in a public organization through an institutional strengthening programmes which includes setting tariffs, managers being accountable for results etc. Thus the ownership of the assets or who runs the service is not the core issue in the provision of the services. (World Bank, 1996)

Private sector involvement options : Options which may not need the transfer of ownership to the private sector may include: Performance, services, management, lease, concession and Build Operate and Transfer(BOT) contracts. Those that will involve complete transfer of ownership may include divestiture and joint venture. Case studies of private involvement in water supply in developing countries(e.g. Guinea, Ivory Coast, Malaysia, Indonesia, Mexico and Botswana) seem to be in favour of privatization without the transfer of ownership. One of the arguments for involving the private concessionaires in low-income countries is the shortage of funding for capital investment when future supplies may cost two to three times more per unit than existing supplies (World Bank, 1992) Among the options concession and BOT may require huge capital investment, whereas the other in the group may only require working capital. The government need to focus upon the lower income groups who generally require a multitude of small scale PSP interventions. The resulting focus on small businesses is also likely to generate higher economic benefits in an area.

Management contracts

The management contractor, for a fixed fee (which might include a performance related element as it is important to specify performance targets), takes responsibility for managing operations and maintenance of existing usually through existing staff. Assets to be managed range from complete treatment and distribution system to elements of these systems.

Lease/(Affermage)

The lessor takes over the responsibility for operating and maintaining an existing system and for collecting the tariffs from which the company makes its profits as well as pays its costs. The government remains the owner of the fixed assets used by the lessor and is responsible for investment in new works.

Concessions

The concessionaires takes over the responsibility for operating and maintaining an existing system and for new investments as and when they are required, paid for by also collecting the tariffs from which the company makes its profits as well as paying its operating costs and repaying its loans. Ownership of the assets remains with the

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government who could take over operation or pass on to a new lessor at the end of the concession.

BOT/BOOT

Similar to a concession a "Build (Own) Operate Transfer' contract is normally used for a complete new segment of the system such as a water source development and treatment works or a waste water treatment works. The private company is paid for bulk water at a rate which should give them a reasonable profit having taken on the financing and construction risks.

Divestiture

The water supply and/or sanitation assets and the right to operate and maintain them in exchange for tariffs are sold to a private company (or consortium) or through a sale of shares or to existing management through a buy-out. There may be a license regulating the authority and responsibilities of the private company which can be time-limited. There may be a regulator with various duties to ensure compliance.

Multi-mode PSPs

In addition to the main approaches described above there is potential for combinations of these approaches to be used. 'Multi-mode PSP' is possible whereby a core company or regulator/overseer sets the objectives with a clear customer focus but enables, for example, one private company to be responsible for managing the source, treatment and transmission (either as BOT or lease), whilst other companies are responsible for selling the water through a leased distribution system in different parts of the urban area. Alternatively the treated water from the BOT could be sold to a single distribution company which contracts out meters-reading and billing to one company and operation and maintenance to a series of small contractors in various areas. Many combinations are possible and need to be considered to gain maximum benefits.

5.5.2 PSP selection

To choose between the options listed above it is necessary to differentiate between the different components of the sector in terms of population size and location as well as by technical solutions. Small-scale PSP is therefore seen as most appropriate for the lowest income groups whereas the more sophisticated leasing and concession are particularly relevant to the metropolitan areas. (UN, 1994)

5.5.2.1 Service providers

Table below suggested by the author proposes the kind of partnership which may bring sustainable water supply solutions for Dar Es Salaam

Table VI

S/N	Activity	Key Actor
1	Regulation/Planning	Government/DAWASA
2	Ownership of water structures	Government/DAWASA
3	Operation and Maintenance responsibility	- DAWASA - Community and/or both - Private sector
4	Representation of users(community)	CBO NGO

In low income areas where they lack the proper service from the municipal authorities, PSP can be the answer for the problems. These may be formal private sector provider or informal. PSP can significantly bring improvement in service efficiency and responsiveness as well as more rapid expansion of service to households formerly forced to rely on poorer quality or more expensive informal services. PSP can be granted responsibility for operation, maintenance and investment in water supply. Also PSP can work with local communities and NGO to find innovative ways to expand services more rapidly and affordably into informal settlements. However, the success of private contracts in delivering benefits to consumer depends first and foremost on a high level of political commitment, the design and quality of PS contract itself, and the institutional arrangements a government puts in place to support that contract. It also takes rigorous management, a high degree of technical skill, careful attention to the concerns of stakeholders from employees and unions to community organizations and transparency and fairness. Finally, it means listening to prospective PS investors to find out their concerns about the local environment and their ideas about what is possible. Planning is needed to ensure the greatest possible benefits. The government should do planning beginning with developing strategies in water supply that takes full advantage of the potential for PS involvement, building consensus in favour of appropriate policy, regulatory and institutional reforms, designing and implementing specific reforms and transactions and finally developing government capacity in the design and execution of private infrastructure arrangements and in the regulation of PS providers.

The informal private sector includes such as individuals, families and small enterprises. Actually they are engaged in similar activities as formal enterprises, but on a small scale and usually confined to service provision in low income areas. The main interest of these enterprises is income generation, and much employment is generated through these services. Because they are small, they are flexible and able to respond to demand to consumers, they can generate profit which can be reinvested in the same area, and therefore contributing to improvement of conditions.

Many of the poorest are already having to purchase water from private vendors at a high price due to the failure of public organization. In a privatized system that achieved

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the necessary service coverage prices paid by the poor would come down and the service they receive should improve. If the official suppliers could attract even 15-20% of the outlay that now goes to water vendors they could provide a lower cost service that would pay for itself within a few years (UNICEF, 1991).

A second form of informal service provision is generated through CBO and or/NGOs, who in themselves may be either service provider or assist the communities and their organizations (CBO) in the development of a sustainable service. In many cities, NGOs have developed a function of mediator between the communities and the municipal authorities (see chapter three). There is a whole range of different types of community managed service provision, ranging from group taps and community managed kiosks to completely autonomous community-based systems (see section 5.6).

Since majority of residents in low income areas in Dar Es Salaam are not served by household in connection, the proposed options which may suit the low income areas depending on type of system in the area include:

Legally occupied areas: May be connected to the city network., house connection or yard tap connection, autonomous system (boreholes tankers, wells). With household connections metering should be applicable. Public taps can also be metered.

Illegally occupied areas: These are squatter areas, where the security of tenure is very low. This may be served by public taps or vendors. Vending systems are itself an extremely effective form of water provisioning in low income areas whether legally or illegally operated. However vending can be done legally and controlled depending on the rules and regulations.

5.6 Water systems used by communities to provide services.

Community based systems vary in degree of community ownership, degree of responsibility for operation and maintenance and in degree of community organization needed as a basis for the service. Examples of systems progressing in levels are given below:

Group taps: These are closet to private connections. Under this system households jointly take one private connection and share the bill. The essential social conditions for the success of this system are that the users form their own group and decide in whose name the connection is registered where the tap is located and how costs are shared.

A communal water point services: These consists of several taps with a bucket stand, a drain, a soakpit and a valve box which contains also the water meter and can be locked. The user group chooses a small (usually 3 persons) tap committee, which unlocks and locks the valve box, oversees proper water use, receives and divided the water bill between the user household, collects the money and pays the public authority.

Community-managed vending kiosks: Water is sold per bucket at public vending points or kiosks. The committee manages the overall fund and takes care of

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maintenance and repairs of the water supply system up to replacement of pumping equipment.

An autonomous local distribution net: This is operated by a community organization that buys water in bulk from the urban utility. The utility either installs a metered master connection to the city net, or fills a community reservoirs. From there the local community distributes the water on the members of the local user association through private connections or shared taps. The community pays the water charge to the utility and operates, maintains and manages the local system.

Autonomous water supply system: These are found to be operated by a community. User households are members of a local water users association with an elected water management committee. The water utility gives technical advice and helps arrange for the investment loans, which are partly paid by the community through the water tariff. Sometimes water utilities establish a special unit for experiments with alternative water supply systems(adapted from Van Wijk, 1997).

These systems demonstrate a great deal of creativity and can be an improvement over the previous system.

5.7 Community-based and private water vending

It is not justified to assume that all communities are interested or capable to manage their own systems, many prefer not to be bothered and to pay for a regular service based on a service level they want. But, similar systems or services provision could also be provided effectively by utilities or private water vending enterprises as long as the community has been involved in the process of decision making on the service. In this process effective information transparency with the utility and the private enterprises is a key issue.

The activity of informal water vending has both advantages and disadvantages to poor communities in developing countries. On the negative side, the distribution of water by vendors is expensive irrespective of whether vehicles are powered by people, animals, or engines. In addition, it is generally the case that households served by vendors pay higher charges for water than those directly connected to a piped water system. Beyond cost considerations, vending sometimes is linked to health problems as hawkers may sell water from polluted sources or from fouled containers.

Positive features of water vending are that it furnishes a valuable service for communities in urban areas with no access to piped water. It provides a significant saving of time compared to fetching water from other sources. Other positive features of water vending as an informal activity concern its labour- intensiveness and thus job creation impact and the fact that the simple technologies of water vending systems can be readily maintained on a local basis. In low-income urban settlement, a private and community-managed vending kiosks often compete with each other.

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5.8 Conclusion

The problems facing DAWASA internally and externally have been analyzed in this chapter. An analysis has shown how these problems contribute to poor water supply situation in the city. The major problem being the old age of the distribution leading to a big amount of unaccounted for water. The coverage by DAWASA is very small hence large part of the city population is without connection, which make them to rely on other sources. The lack of coordination, non-existence of competing agencies or other companies, and government policy on water have been described as the wider problems facing DAWASA. Despite the fact that both DAWASA and the government are making initiatives to rescue the situation a number of constrains (section5.4) have been identified which hinders the improvement. Section 5.5 proposes further action needed to achieve better solution.

Chapter six will presents the case studies of two settlements in Dar Es Salaam where the in depth study took place. It also indicates the method of study and suggestions from the community members on improvement of water supply situation.

CHAPTER SIX

6.0 PRESENTATION OF CASE STUDIES OF TWO SETTLEMENTS

6.1 Introduction

This chapter examines the study which was carried in two settlements in Dar Es Salaam where members of communities were involved in diagnosing the water supply situation in respective communities. Findings with the views including suggestion from the community members are also included. A summary of their social characteristics and infrastructure is also presented. Generally, the two settlements chosen for this study are comparable in many respects with the exception of the housing conditions and with regard to income levels of their residents. In Ubungo-Kibangu, majority of houses are occupied by owners and have permanent structures. Large population in Ubungo-Kibangu is working class and business people. While in Mburahati, majority are tenants mainly unemployed people and houses are built with very low quality material. The water supply situation for the two settlements are almost similar, except that in Ubungo-Kibangu the magnitude of the problem is felt differently by the residents. The different classes of people living in Ubungo-Kibangu is described in section 6.4.1.

The two settlements where the study was carried Mburahati and Ubungo-Kibangu, all are located in Dar Es Salaam. The two settlements in which the interview took place have different characteristics in terms of the buildings(permanent versus temporary) and with regard to incomes. Mburahati area is an unplanned settlement. The major concern regarding unplanned settlement is that, although these areas accommodate many people, the conditions in them are poor. Services are lacking or inadequate, because either resources are not available to provide them or the layout of the settlements make the provision of the services difficult. This has led to environmental deterioration. Lack of drainage, and garbage disposal facilities have resulted to environmental pollution as wastewater is discharged and garbage disposed randomly. This beside damaging the environment, is also an eyesore and a danger to the health of the people living in this area. The problem of environment damage is exacerbated rapid increase in the population of these areas. This put a strain on existing infrastructures because the areas cannot be easily reached by garbage collection vehicles or wastewater removers and because of poor roads. The second settlement, Ubungo-Kibangu is planned but not serviced, and therefore presents the same characteristics as the first settlement in terms of basic public infrastructures.

6.2 Method of study

6.2.1 Data collection techniques

The approach taken in this study was to collect all available data on water supply situation in each community. Two categories of data were collected, primary data and secondary data. The primary data was collected from the informal discussions and conversations, interviews and observations made during field period. The secondary

data was mainly collected from desktop studies, government offices, written papers and published reports.

The fieldwork was conducted over a three week period in July/August 2000. The research assistants were two educated men living in Mburahati, and one official from Ministry of water and one secondary school teacher both residents of Ubungo-Kibangu. Similar approach for data collection was used for both communities.

Key problems faced during fieldwork bureaucracy in government offices. Interruptions by visitors or guests during discussion with officials. Some of information could not be obtained as some data was missing and reluctance to give some information due to socio-political reasons.

6.2.2 Interview guide

An interview guide consisting of three parts with a total of 24 questionnaires was used for interviews with community members(Appendix II). A focus group chosen randomly from each community was used to get the information regarding water supply situation in the study areas. Included in the group were two primary teachers, one secondary school teacher, and two government officials from MoW and ordinary members of community. Sixteen are from Mburahati where comprises a total of 4 men and 12 women, the majority being between 30-50 years of age, 4 women and two men being over than 50 years. From Ubungo-Kibangu 14 respondents constituted the focus group, 10 women and 4 men. Total of 34 were interviewed from both communities. According to Maas (1998:21), for an exploratory and in-depth work, a sample of size in the range of 30 and 50 is usually large enough. Although some questions are close(e.g. question 6,11,13,17,18) during interviews, the question were formulated in a more open way. In addition to the information that obtained through questionnaires a lot more information was obtained from community members through normal conversations. Part one of the structured questionnaires collected information on the particulars of each respondents from the communities. Part two sought information on the water sources, locations, how is water fetched, families sharing the sources distances, alternative sources. Part three investigated the views from the community and water situation problems. This part also has questions on alternatives which community thought could be used to solve their water problems including the possibility of community participation. The last part deal with health conditions including diseases which are common in the study areas. All the respondents participated very positively in an interview.

6.3 Mburahati informal settlement

6.3.1 Background

Mburahati area which covers an area of 56 hectares and a population of 54,141, is located in Kinondoni district north west of Dar Es Salaam city. It is approximately 3.5 kilometers away from the city centre. Majority of people accommodated in this settlement are poor who are marginalized and are desperate. Being an unplanned settlement, Mburahati is characterized by poor housing conditions and inadequate infrastructural services. Majority of the households have no access to piped water

supply, no access roads, and use pit latrines and dispose wastewater on roads and in drains, yards and valleys or depressions. Flooding is a problem especially on low lying areas.

Most of the houses are built of low quality materials. The area is densely populated with a high degree of overcrowding in and between the houses. Houses have been built with little space between them; small corridors or paths separate one residential unit from the other. Most of the inhabitants lack security of tenure(lease holds) and those who rent do not have a contract or a written agreement with their landlords. Studies carried in June 2000 indicated a population of 63,730. It is one of the highly densely populated area in Dar Es Salaam. Only few houses owned by National house corporation were built on surveyed plots and some areas in the settlement has very high densities per hectare.

6.3.2 Existing water supply situation

In Mburahati residents are suffering from water supply interruptions because of water rationing on behalf of DAWASA. In Mburahati, rationing is done through allowing water only to flow on certain days of the week. Mburahati area gets its water allocation from DAWASA on Sundays, Wednesday, and Thursday. There is no guarantee and water flows for a very short time, so one is therefore forced to have a lot of buckets or containers in order to conserve the water for the rest of the days when it is not supplied by DAWASA, otherwise if one doesn't have such containers will have to fetch water from very far places. Water supply service on this area depends on the access being an unplanned area, the distribution become very difficult.



Fig 9: Water containers at one of the residents in Mburahati

Most of the residents of Mburahati settlement do not have piped water supply in their houses. For residents having connections, it is not practicable to get water in normal tapes, unless one uses a pump. Most of the residents who are able to buy a pump of 1/2Hp, 1Hp or 2Hp are the ones who get the ration of water and normally they have yard tap connection. Some of residents with pumps, they also have reserve tanks where after filling them they are able to sell to other people at TAS 20/= per bucket.



Fig 10: Resale of water at Mburahati after filling the tanks

Water is also purchased from vendors but its quality is not guaranteed and its price per litre is usually many times that paid by richer households for publicly provided piped supplies. Many people rely on safer but still inconvenient supplies for instance public stand pipe, yard taps, or for dozens or even hundreds of households (through survey 40-150 households share one standpipe). Most of the DAWASA public standpipes are dry and not at all maintained.

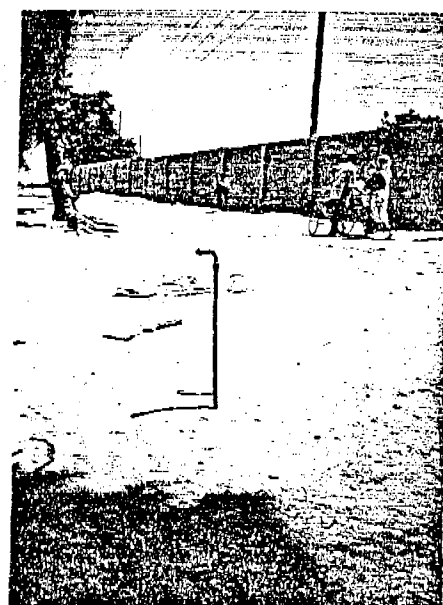
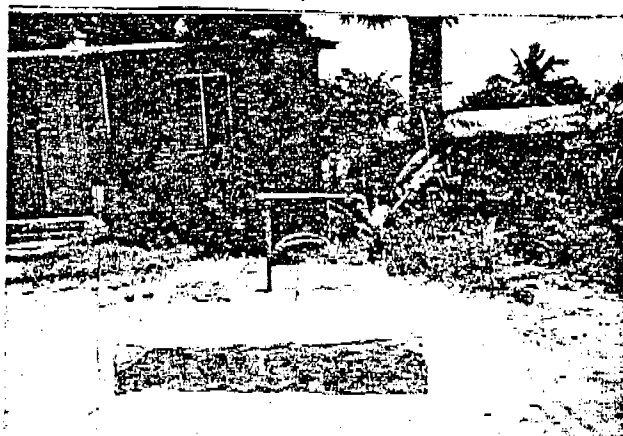
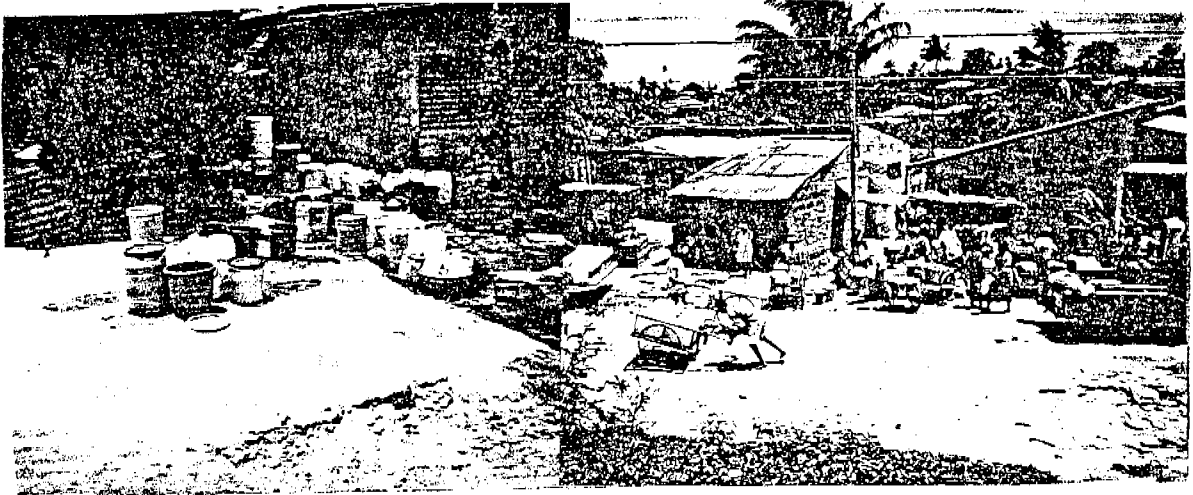


Fig 11: Public dry pipes

Long queues at a public tap (especially if water is only available for a few hours a day) and time spent making repeated trips to and from the house with water containers use up time that could be used in earning an income. It also makes it impossible to obtain sufficient water for washing and laundry.



**Fig 12: (a) Long queue under the tap waiting unpredictable flow
(b) Numerous families sharing one public stand pipe**

Large population in this area who cannot afford buying water always, they have no alternative but to use contaminated water or water of bad quality. Their water generally comes from depression or polluted streams or other surface sources that are often little more than open sewers.

6.4 Ubungo-Kibangu settlement

6.4.1 Background

Ubungo-Kibangu which occupies an area of 64 hectares is located approximately 5kilometers North-West of the city of Dar Es Salaam. It is relatively a young settlement with an estimated population of 47,281. The area is planned but not serviced, more than 80% built with permanent houses and occupied by the house owners. This area is occupied by three different categories of income groups. The high income people, the middle income being the majority, and most of them employed people and people of low income.

Inadequate public infrastructures is the key problem facing residents in Ubungo-Kibangu, including adequate domestic water supply. The whole of Ubungo-Kibangu area has suffered from inconsistent water supply and low pressure for a long time. In 1996 El-nino rains swept away the water pipes.

6.4.2 Existing water situation

This is one of the most disadvantaged area in terms of water supplies. The allocation by DAWASA in this area is on Wednesday and Thursday and there is no guarantee. Mainly water flow during the night or in the afternoon for only certain hours . One standpipe serves several households, this resulting into spending a lot of time on fetching water. People in the high ground area do not get DAWASA water at all,

though there are public standpipes installed by DAWASA which were meant to serve 40 families per standpipe. These standpipes have never worked, and one of the reason could be because they are on higher ground and cannot be reached by the gravity pipelines and the existing low pressure.

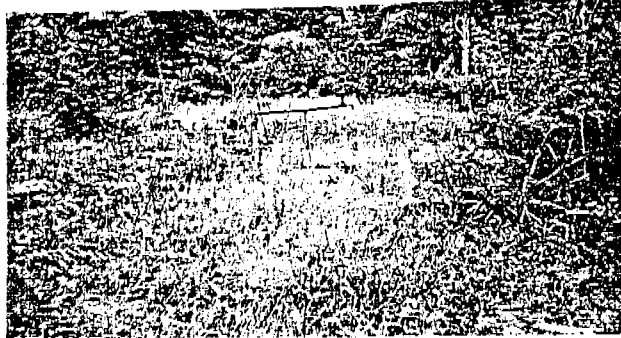


Fig 13: Public dry pipe in Ubungo-Kibangu

High income people in this area are able to meet their water requirements at individual households level by being connected to the DAWASA water supply system or by installing their own facilities as wells, boreholes or rain water harvesting systems, and usually they have built storage reservoirs attached to their connection. For this people the service is usually in-house multiple taps. Poor households cannot afford this.

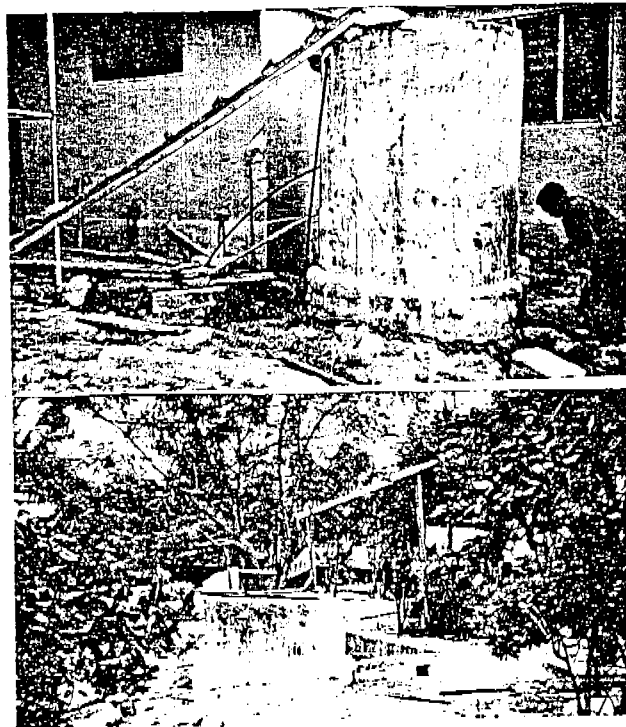


Fig 14: Rain water harvesting in Ubungo-Kibangu

Middle income groups who are the majority in this area, generally they are connected to DAWASA water supply system with individual house connection or yard

connections. Also they rely on separate sources(wells, borehole and rain water collection). This category is very diverse with the conditions at the upper end of the category being very near to those of the high income category and the lower end near to conditions in low income areas. In this category those who cannot afford individual connections or yard tap, they form groups of 6-10 people , these groups are normally formed on the basis of income, relationship whereby they contribute money to buy the pipeline. This is connected to DAWASA pipeline (a big one) which takes water to the southern part of Dar Es Salaam and make connections in their houses or install yard taps. To recover the cost they resale water to those having no access.

Residents from low-income families do not have their own connections, so they usually rely from other sources like simple dug well or water from depressions and streams which are highly contaminated with industrial wastes or solid wastes. River Gide which is near to this area is said to be highly contaminated with human wastes is one of the source which residents fetch water for home consumption. Another alternative they have to buy water from neighbours per bucket.



Fig 15: Hand made dug well

Water by rationing from DAWASA is very regular, during wet season(rain season). When carrying out the interview the respondents mentioned that it is a blessing period as far as water supply is concern because some of people having gutters in their houses they manage to harvest rain water as an alternative source for drinking and other domestic uses in addition to that obtained from the authority. Even when DAWASA rationing is very regular, still it doesn't meet their requirements. A number of population has reserve tanks built on the ground for rain water harvesting. In dry season which is very long normally lasts from September to the end of March, no water is available at all from the DAWASA source, and also the level of water from other sources go down very drastically and eventually fall dry. In this period, women and children must walk several kilometers to fetch water and carry on their heads. Usually the shortest distance they can find water is about 5kilometers which is at the University of Dar Es Salaam.



Fig 16: Women carrying water from far distance

Users do not pay for water, but neither do they get a reliable supply of adequate drinking water. Services hours are irregular and unpredictable and the users do not know whether they will get water from tap and how long they will have to queue. Breakdowns are common and long lasting, forcing them to go back to contaminated sources and thus reviving health hazards.

6.5 Findings from the communities

Focus group discussions from each community helped to identify problems and suggested possible solutions for the water supply situation. However, findings and suggested solutions are very similar from both communities.

Insufficient water was the main problem quoted by the residents from all the communities. The main causes of shortage described by community respondents are: burst pipes, rationing, low pressure, lack of maintenance, vandalism, drought, high demand, small pipes disconnection done by DAWASA, careless and inefficiency by DAWASA. Some of the respondents knew nothing.

Access and availability of water is limited: Majority of respondents from both communities explained a serious shortage of water supply, that there is no continuous availability of sufficient quantities of water of sufficient quality. Most of the public standpipes owned by DAWASA lack maintenance and have been dry for a very long

time. In Mburahati few standpipes which are working are being shared by numerous families. Those with yard taps, water flows only on rationing day, which is also very unreliable. People wait for water to come through taps – women in the group complained that it make them very hard to manage their time and work. Much of their time is spent on water. They normally leave the containers lining up under the tap(see figure 8) waiting for water to flow out. Sometimes a child is sent to the tap to look for falling out of water or otherwise regularly someone has to check for water flow and give warning to others. When there is flow few install booster pumps directly to distribution system in order to increase the pressure for drawing water into taps, and fill into storage tanks or containers and sell to others. The frequent shortages contribute to an increase in prices, distance walked and time spent. Residents, particularly women and children spend valuable time everyday queuing for water, the water is of poor quality. During acute shortage queuing may go up to 2-4hours and this sometime lead to quarrels and fights at standpipes leading to misunderstanding and tensions between families. One respondent stated that: Very occasionally water can flow at unpredictable hours and lasts for unpredictable period, sometimes not longer than half an hour. Frequent water cuts sometimes leaves the area dry for more than a week.

Quality of water: Most of the respondents described the water quality from the taps to be turbid, especially during rainy season.. Majority of them they are aware that water is not safe, they have to boil before drinking. About the colour and smell there was no complaint for the tap water. Water from other sources is of poor quality, muddy, whitish in colour, bad smell. They make sure at least one to get a bucket of clean water from the tap wherever available. Those using water from borchole or wells described water to be clear(no turbidity), but is very salty, and have to use a lot of soap to produce a foam when washing clothes.

The average nearest distance indicated by the majority of the respondents to the water source ranges between 500-1000m. During acute shortage the nearest distance they can fetch water source may be up to 5kilometers. Other households get their water from vendors.

A woman form Mburahati complained that some of the days she can spend 1/2 a day fetching for water and end up with one bucket of water. She adds on that lack of clean water makes people sick and adding to the workload of women who spend many hours a day collecting contaminated water.

Few community members who are well informed, explained the existing water problems as a result of the population growth of people residing at Mburahati which has incapacitated the existing water supply service. They argued that 4inch pipe supplying water to the area is inadequate to cater for the current population which is rising on the daily basis. Since most of pipes supplying water are of small diameter. This limits the volume of the water through the outlets.

The leakage in DAWASA water supply pipes and those small diameter pipes usually $\frac{3}{4}$ and 1 inches for individuals also add to the loss of water which reduce the quantity of water reaching the residents.

Furthermore there are unmonitored people who make illegal connections to DAWASA water supply pipes during nights. They do not pay anything to the organization and for this reason, a lot of quantity of water is consumed illegally by some of the residents. They thus, enjoy free services, those who pay for the service are not served well. Thus, the water pressure is constantly low, without using a pump it is not possible to get water in the normal way.

When asked the question about the kind of diseases from which the residents of this settlement suffer, the majority of the respondents named diseases which are water-borne (directly or indirectly associated with the quality of water and environmental sanitation), infectious and communicable. These include: dysentery, diarrhea, stomachaches, scabies, skin diseases, eye problems, typhoid and intestinal parasites, various disorders particularly for children such as vomiting, headaches, dehydration, and malaria. However, cholera remains a threat to the residents in this area. Information derived from the respondents shows that the incidence of diarrhea, vomiting and malaria among children is very high as is the rate of infant mortality and death in children. (Appendix III presents cholera report form from 1990 to May 2000)

The 1998 National Population census shows that this rate was 104 per thousands in children below five years of age and a study by the World Bank itself argues that the IMF has not improved over the last decade (World Bank 1995:XVII)

To give some examples of the current situation for these communities:-

- a) Majority of residents from these communities are either walking several kilometers to purchase water at the market price (i.e. TAS 20/=) or purchasing water locally at the inflated rate of TAS 500/= per 25 liter container.
- b) Traditionally it is women who are responsible for providing water for the household. This water crisis has greatly worsened the already over burdened workload of the local women.
- c) People are no longer in a position to differentiate between drinking water and water for washing or other purposes, but as the situation is it appears that poor quality water is being used more and more for household consumption. There is huge burden of diseases that is the result of deficiency of water supply and proper sanitation facilities. However among all the mentioned diseases cholera pose the threat. There are several outbreaks of cholera disease and other water related diseases.

Dar Es Salaam, where cholera is endemic has been suffering from a major cholera outbreak since 1997. A peak number of cholera cases which was reported from Kinondoni district where Mburahati and Ubungo-Kibangu are located in 1998 was due to the breakdown of the main water pipe in this area, which created severe shortage of water supply (see appendix III)

6.5.1 Community suggestions on actions to improve water supply

The interviewed members of community suggested some solutions in order to help residents of Mburahati and Ubungo-Kibangu

Different answers were given when asked about the suggestion for improvements. Some of respondents quickly suggested that DAWASA should immediately carry out the maintenance. And people believe that if DAWASA can make effort to make rehabilitation, and be realistic on their rationing timetable the problem wont as big as it is now. Mentioned suggestion include:

- Installation of large inch diameter pipe by DAWASA would increase the volume of water available to the residents. Some of the respondents suggested that installation of say 12 inches diameter pipe would increase the volume of water to the residents. Another suggested solution is to install large water tanks which can be used to supply water to the residents at all times. Construction of water wells at places which are not populated can equally alleviate this problem facing the residents.
- It is important to maintain leaking pipes in the whole locality to minimize losses occurring at both communities. Controlling those losses can result into better use of existing supplies and improvement of the system in general. Majority know that water is simply stolen by people who make illegal connections to the system. However this is so because there is no incentives from DAWASA to identify or control the losses . Some mentioned that but even if all leaks were sealed still water will not be enough and the use of pumps to supply water will persist as long as fundamental problems are not attended. Frequent burst of pipes was explained as a result of low quality material PVC and sometimes laid barely above the ground.
- Other solution is harvesting of rain water. Rain water harvesting is means of taking water out of hydrological cycle(water cycle) for either human or agricultural use. The rainfall is intercepted and collected on prepared watersheds. Rain water catchment schemes intended for agricultural use require large catchment areas. In this case use of the ground surface is the obvious choice. However, water for human use should be more convenient and cleaner than for agricultural use. Roofs are an obvious choice for a catchment surface as their elevation protects them from contamination and damage which are common to ground surface catchments. Tanks located close to homes highlights the convenience of this system(see figure 14). The limitations for this an alternative can be: the initial cost is high, the water available is limited by rainfall and roof area. Supplementary water sources must be available. For long dry season, the required storage volume may be too high.

Few respondents answered:

- Necessity of the government to find new source and construct the water supply system to take care for the population increase. He emphasized that this can be possible if people are united and participate in the construction of the new water source, it will be possible to supply piped water to the entire population.
- One primary school teacher replied that the research is first needed, to know exactly the population, and possibility of new distribution layout. He added that people

should be taught to reduce vandalism and illegal connection and also DAWASA has to be more aware and keen and heavy punishment has to be given to those doing illegal connection.

- Establish water user groups from the community to manage distribution of water within the community. This suggestion was discussed and the majority of the respondents explained that, they lack the ability to undertake water supply project without the assistance from the government or donors. They explained that if given opportunity, and receive aid they hope that they can get safe drinking water and have regular and sustainable water supply. Respondents from both communities were asked about their willingness and ability to pay for sustainable water supply system, however, the majority of respondents expressed a willingness to contribute in form of labour, cash and the provision of materials and any other kind of contribution. One respondent from Ubungo-Kibangu when asked about his choices replied he is interesting in obtain a yard tap connection so that he can sell water to others.
- Some participants believed that there was nothing they could do to solve their water problems since they depend that the government has to do and claim that they pay tax for development levy

The analysis which was made from the communities showed that the worse situation of water supply lead to frustrations, tensions, and often leads to environmental living conditions that endanger the health of the residents with consequent losses in quality of life. Majority of the residents have realized that the government cannot solve their problems and DAWASA is not able to extend water supply service to them. However, they believe government can help them together with donors to improve the situation. From the study conducted, reveals that residents are willing to participate in solving the water supply problems.

CHAPTER SEVEN

7.0 DISCUSSIONS AND CONCLUSION

This chapter discusses the authors findings from the study in relation to the conceptual framework and literature review, and also presents the conclusions and recommendations. The research questions are also answered. The conclusions and recommendations are based on literature and findings from the empirical study. From the literature on community involvement it can be concluded that preconditions for community in the study areas have not yet been met. This makes it difficult to involve the community in water supply services and management in the study areas. The preconditions for community participation in any development programme includes:

- community demands for an improved system
- community must understand its options and be willing to take responsibility for the system
- community must be willing to invest in capital and recurrent costs
- community must have the institutional capacity to manage the development and operation of the system
- community should have the human resources to run these institutions
- there should be a policy framework to permit and support community management
- effective external support services must be available from governments, donors and the private sector and the effective information must be available to the community members.

Both communities have realized that DAWASA who is currently provider of water supply service on behalf of the government cannot solve their problems. They have realized the need to look for solution themselves, the initiation is becoming difficult because these communities are not organized and make it difficult for them to choose leaders who can forward their demands to the government or NGOs who can support them.. From the theory it is indicated clearly that successful community-based project must be demand-driven and fully supported by at least a significant number of community members.

Another important aspect to realize is that, successful community involvement requires a Community-based Organization(CBO), that would be the entry point to the community to facilitate community mobilization. This requirement as found in literature also is lacking in the study areas. The study areas lack any CBOs of any kind. Through mobilization and organization the heterogeneous community can be unified and this can lead to the assessment of the problem and search for solutions. Mobilization is very important to enable the donor to know the character of the problem and the project the community wants. CBO can initiate the project, the implementation process is facilitated by CBO who represents community. However, it is extremely difficult to work with entire communities, therefore when addressing development issues it is more practical to deal with representatives of the community, this is an important precondition which is also lacking in both communities. Different types of CBOs such as the residents associations and amenity groups or women's organizations can be formed, and act as a bridge between community residents, and local authority

and donor agencies to address the community needs. Beside bridging from CBO, different committees for action plan for a particular project can be formed. CBO would represent an attempt to organize the community and can be registered as a legal entity. The existence of CBO can make it easier for interested donors to be involved in water supply project because they could directly be approached or approach the community through CBO. When CBO would be empowered they can be involved in decision making process, strengthen the commitment and create a sense of responsibility. Therefore, residents of Mburahati and Ubungo-Kibangu can only be involved in improving their water supply situation, if they have the ability to form community based-organization(CBO) of local residents. Only as CBO can they negotiate with local authorities or donor agencies. However, the beginning may be difficult because for these cases community members have not been involved in similar activities.

To answer research question one on the involvement of the community in water supply services and management, there are so many factors to be considered. These include: social, environmental, financial, institutional and technological factors. These factors affect the viability and sustainability of activities aimed at improving water supply services through community involvement in the study areas. The most important ones are discussed below.

Provision of basic infrastructure in low-income urban areas by involving community members, has a high chance of being successful, if the community is motivated to participate from the start or initial phase of the project. To organize the community better, the foremost important thing is to overcome the internal differences within the community. Given the heterogeneous nature of people in terms of ethnicity, religion, occupation and economic condition in urban areas, it is difficult to organize the people. This creates a lot of distrust between different groups, also taking into account that the traditional leadership which may overcome it, is lacking. However, the difference in culture is not a big problem on these areas, because Tanzania depicts a dynamic model of a multi-ethnic and multi-cultural societies. It has more than 120 African tribes each with its own cultural ethics. In these areas though there are mixtures of people with various attitudes, but they have been unified by factors such as inter-tribal marriages and the Swahili language which is a national language.

The majority of people living in Mburahati are tenants, they don't own the houses. The landlords are absentee and probably live in places where the environmental conditions are much better. Due to this fact, it may be difficult to organize the community because tenants do not feel responsible for improvement, while the absentee landlords do not suffer from poor environmental conditions. This seems to be a temporary place for the most tenants. The gender issue is another aspect, if not considered can affect the degree of participation by all water users including women and in fact a number of the households are headed by women who are very poor.

Residents and especially owners of the houses (the case in Ubungo-Kibangu) are more inclined to spend their effort and money towards improving their neighbourhoods and to make adaptations to suit high density, resulting from high rates of urbanization.

To answer the research question two on the willingness and capacity of the community to use available resources to improve the domestic water supply the study showed a

proven willingness to pay by the majority for the real water supply service, but poverty and widespread unemployment lead to a bad financial position of the majority both in Mburahati and Ubungo-Kibangu. A study carried out in 1994(DCC et al, 1995) showed that the majority of the households earn about 45,000/= Tshs(US \$56.25) per month which is very little given the high standard of living in Dar Es Salaam. This can be one of the reasons why the people in the low income area, will not be able to pay sufficient for their water to operate and maintain a water system, let alone to get return on the capital investment. To the contrary, most of people in these areas depend on vendors for their water or buy water per container and the prices paid for this are considerably higher per unit than through a connection to the water distribution system. The poor pay through vendors many times more per unit of water than the rich (median value of 12 times more ranging from 4 to 100 times more, Bhatia and Falkenmark, 1992). People's traditional perception on what should be done by the government may be another factor. It may be hard for many residents to agree to pay voluntarily contributions, while they still pay the development levy.

On research question three which looks at the consequences and risks for public health and well being brought about by poor water situation in these communities, it was found out that the study areas have high population densities and located on land characterized by valleys, depressions and swamps, thus rendering them unsuitable for residential purposes. Improvement of water supply always necessitate the improvement of sanitation facilities such as drainage. The improvement of drainage for example requires improvement of solid water collection and off site sanitation which requires also sufficient water supply. (Water supply and sanitation form a viscous circle, *see - section 4.7.1*). Though water and sanitation go together the provision of water supply has more priority with the communities than the hygienic disposal of wastes. This is because the communities find it easier to provide water for themselves than to dispose their wastes hygienically. Hygienic disposal of wastes has to be facilitated by the municipal authorities but they are unable to do this. The lack of attention for disposal results in environmental conditions that pose a threat to the health of residents, especially because systems installed by householders themselves often have a low technical quality and contribute to deterioration of environmental conditions. The community, effort to provide water for themselves result in public health risks that affect their well being. Several hours per day and energy are spent on water collection and hauling by mostly women and children. Women have become unproductive owing to huge man-hours spent looking for water to meet household needs. Children in particular, suffer poor health, as a result of:

- (i) direct injury through hauling heavy loads commonly between 20-25kg over long distances. Also are denied their right of going to school.
- (ii) Through use of insufficient amount of water to maintain adequate standards of hygiene(where the source is far away from home, the consumption is very low) resulting into water washed diseases.
- (iii) Through consumption of contaminated water causing outbreak of water borne diseases.

Referring to the last question on the possibility of community members in the study areas to meaningfully participate in improving the domestic water supply, the monopolistic nature of DAWASA makes this difficult. If community participation is promoted in the study areas, the communities will rarely have the sustainable capacity to manage their own water supply services independent of the government or DAWASA. DAWASA has not yet introduced a section in its departments with staff trained in working with and for communities, and this may affect the participatory approaches. Though, DAWASA is trying hard to ensure smooth functioning of the water supply service, low operating cost, adequate revenues and the possibility of expanding their services, very little consideration is given to low income areas which include the study areas. Sections 5.1 & 5.2, describes the poor performance of DAWASA, internally and externally. One of the reason identified as the cause of failure is the monopolistic nature of this institution. By promoting community participation on these areas should be remembered that, communities rarely will have the sustainable capacity to manage their own in complete independence of government or DAWASA. If DAWASA has not yet introduced a section on its departments which its staff are trained in working with and for communities, this may affect the participatory approaches.

Another aspect which needs to be realized is the technologies and level of service. These must commensurate with the community's needs and capacity to finance, manage and maintain them. Municipal engineers who can provide technical supervision mainly focus on the conventional system when providing services to low income areas. These technical standards and regulations usually hinder the application of appropriate technologies and the systems are not adapted to actual need and demand in low-income areas. Appropriate technologies for low-income areas are those in which the technical and organizational characteristics of the infrastructure system are adapted to the socio-economic and environmental conditions in the community. Municipal engineers tend regard these low-cost technologies as substandard.

The type of land and the densities of these areas require specific technologies, and operation and maintenance requirements for these systems by the community may be more difficult to organize as a result of the nature of these communities. Finally, appropriate technology options at community level will have to link up with the hierarchical network of the whole city and cannot be developed in isolation.

The above discussions show that the community participation in Mburahati and Ubungo-Kibangu, has not been promoted because of disorganization of these communities. It has been learnt that both of the communities lack the representatives who can forward their needs to the government or donor agency who can support them. Other factors which have been explained to be a threat to the community participation includes attitudinal, social, institutional, environmental and economic factors, because community participation alone is no guarantee of success.

7.1 Recommendations

Based on the literature reviewed, analysis and discussions of the empirical study through the thesis, the following recommendations are proposed:

- ◆ The foremost important aspect which needs adequate preparation is the formation of CBOs in these communities, which can learn by doing from other communities like Hanna Nassif in Dar Es Salaam who already has experience on working with CBO (section 3.2.4.2). It will be necessary to give adequate time for these organizations to be formed and leaders need adequate training. There must be commitment to the leadership to the committees and acceptance of responsibilities. They should be democratically elected with gender sensitivity.
- ◆ Registration of the community should be a prerequisite as per law of the country.
- ◆ Sharing of information with communities as a starting point for community involvement and participation; information helps communities to understand issues and bring their commitment to the process of participation. Also consultation with these communities with a view to assess their effective demand (affordability and willingness to pay) for the services; such consultation help to understand community preferences.
- ◆ A clear and measurable demand responsiveness by the community members themselves have to be established and formal request for their participation forwarded as evidence.
- ◆ Since government on its own (through DAWASA), has failed to extend proper water supply service to these areas, there seem to be a community participation. DAWASA can help these communities to set up their own water service associations. These associations can install independent water supply system which residents will need to pay for and operate and maintain, and which in the long run may cost less than continuing buying water from unregulated water vendors. Different water sources options can be promoted such as: construction of community wells provided with hand pumps, leading the water to a communal tank for further distribution. Water tankers from DAWASA can fill up these communal tanks from which the community distributes further and pays for the bulk delivery.
- ◆ DAWASA and local authority's technical and financial support still remain a key input in building grassroots community participation. Without support, however, the community based water supply project will not achieve anything approaching to permanence.
- ◆ These communities can act as client to the private sector in situation where work is contracted out. Water vending system can be one of the informal private sector since is now serving hundreds of residents, can be well organized, and controlled by community itself.

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Appendix I: Location- Map of Tanzania



Appendix 11

Questionnaires that guided the research

Part one

1. Name of the Community.....
2. Name of a Respondent.....
 - (i) Occupation.....
 - (ii) Marital Status.....
 - (i) Gender.....
 - (ii) Age.....

Part two

3. Is this your home area? Yes/No
4. What source of water do you have?
5. Who fetches water in your family?
6. Do you get water regularly from this source? Yes/No
7. If there is scarcity what alternative do you use?
8. Who takes care of this source?
9. How many families use this source?
10. How far from the source to your home area?
11. Are you satisfied with the water situation from this source? Yes/No
12. If no why?
13. Do you real think water is a big problem? Yes/No
14. What are the problems?
.....
.....
15. How do you think this problem can be solved?

16. Have you got any chance to give your complaints on water to any government or DAWASA officials? Yes/No

17. Do you think the government can solve the problem of water supply? Yes/No

18. Do you think is important to improve the water situation in your area? Yes/No

19. What suggestion do you have to improve the water situation?

20. Are you willing to contribute one of the following to improve your water situation?

- Material
- Labour
- Financial

Part three

21. What diseases are common in this area?

22. Do you have a problem involving the gut e.g. diarrhea?

23. Does this occur seasonally?

24. What surrounding factors could be causing these diseases?

Appendix III

Guide line value for water quality

Parameters and unit of measurement	WHO standards	Tanzanian standards
<u>Water for general domestic use</u>		
Organoseptic Factors		
Colour TCU	15	Ns
Turbidity NTU	5	25
Taste	n.o	n.o
Odour	n.o	n.o
<u>Physico-chemical factors</u>		
PH	6.5-8.5	Ns
Conductivity	400	Ns
Total Hardness, as CaCO ₃ Mg/l	500	600
Calcium, as Ca Mg/l	200	200
Magnesium, as Mg Mg/l	50-150	150
Sodium, as Na Mg/l	200	Ns
Sulphate, as So ² Mg/l	400	600
Ammonium, as NH ₃ Mg/l	1.5	0.5
Alkalinity Mg/l	600	Ns
Chlorides, as Cl Mg/l	250	600
Aluminum, as Al Mg/l	0.2	Ns
Nitrites, as NO ₂ Mg/l	3	Ns
Phosphorous, as P ₂ O ₅ Mg/l	Ns	Ns

Appendices

Potassium, as K	Mg/l	Ns	Ns
Total dissolved solids, (TDS)	Mg/l	1000	1500
<u>Water causing toxic effects</u>			
Arsenic, as As	Mg/l	0.001	0.05
Cadmium, as Cd	Mg/l	0.003	0.05
Lead, as Pb	Mg/l	0.01	0.01
Mercury, as Hg	Mg/l	0.001	Ns
Chromium, as Cr	Mg/l	0.05	0.05
Cyanides	Mg/l	0.01	0.01
Silver	Mg/l	Ns	Ns
Barium	Mg/l	1.0	1.0
Phenolic compounds	Mg/l	0.002	0.002
Selenium, as Se	Mg/l	0.01	0.05
Fluoride, as F	Mg/l	1.5	1.5
Nitrate, as No ₃	Mg/l	50	50
Iron, as Fe	Mg/l	0.3	1.0
Manganese, as Mn	Mg/l	0.1	0.5
Copper, as Cu	Mg/l	1.0	3.0
Zinc	Mg/l	3	

Source: DAWASA

Bacteriological Drinking Water Quality Criteria

Coliform count per 100ml at 37 °C(TC&Fs)	Faecal Coliform count per 100ml at 44 °C (E. Coli)	Class of water
0	0	Excellent
1-3	0	Satisfactory
4-10	0	Suspicious
More than 10	one or more	Unsatisfactory

- In 95% of samples examined throughout a year Coliform bacteria should be absent in 100ml.
- Coliform organisms should no be detectable in 100ml of any two consecutive.

Residual chlorine: should not be less than 0.3mg/l for the next 30 minutes (WHO 0.2Mg/l – 0.5Mg/l).

Notes:

Ns – Not stated

n.o – Not objectionable

Water quality report for free chlorine and turbidity for the study area, given from 1998 to 2000

Free Residual Chlorine concentration

Location	1998	1999	2000
Ubungo-Kibangu	0.35Mg/l	0.51Mg/l	0.44Mg/l
Mburahati	0.39Mg/l	0.44Mg/l	0.21Mg/l
Turbidity			
Ubungo-Kibangu	3.0NTU	3.5NTU	2.14NTU
Mburahati	5.0NTU	4.5NTU	3.8NTU

Note that: The figure are average of the analysis throughout the particular year.

Appendix IV: Cholera report form

This appendix presents cholera reports from 1990 to May 2000. The report form gives the figure of the whole of Dar Es salaam, but the most affected areas are unplanned settlements like Mburahati. These reports only related to cases which were admitted to hospitals. The outbreak which was reported this year stated on 15th of January and 19 cases were reported from Mburahati. The outbreak extended to Ubungo 54 cases were reported. Investigation from city health department found that, the pipe taken water to Ubungo had breakdown which forced the residents from this area to fetch water from heavily contaminated river Gide which surrounds the area. Also investigation found that water drawing from shallow wells and boreholes are very much contaminated with human wastes. Presence of E.coli indicated this.

Appendices

Cholera report from 1990 to 27th May 2000.

		TEMEKE	ILALA	KINONDONI	TOTAL
1990	Cases				518
	Death				52
1991	Cases				2,093
	Death				181
1992	Cases				730
	Death				60
1993	Cases				674
	Death				60
1994	Cases	0	0	0	0
	Death	0	0	0	0
1995	Cases	6	0	0	6
	Death	1	0	0	1
1996	Cases	0	0	0	0
	Death	0	0	0	0
1997	Cases	2,503	2,850	1,213	6,566
	Death	75	87	65	227
1998	Cases	954	2,148	1,566	4,668
	Death	8	29	65	102
1999	Cases	313	641	490	1,262
	Death	8	9	5	22
2000	Cases	52	49	138	239
	Death	4	3	1	8

Source: DCC, August 2000

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