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The Development Planning Unit
University College London

Service Provision Governance in the Peri-urban Interface of Metropolitan Areas Research Project

AN OVERVIEW OF THE WATER SUPPLY AND SANITATION SYSTEM AT METROPOLITAN AND PERI-URBAN LEVEL: THE CASE OF DAR ES SALAAM

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University College of Lands and Architectural Studies (UCLAS)
Dar es Salaam, Tanzania

For more information, please contact:

Peri-urban Research Project Team
Development Planning Unit
University College London
9 Endsleigh Gardens
London WC1H 0ED
United Kingdom
Tel. +44 (0)20 76791111
Fax: +44 (0)20 76791112
E-mail project: j.davila@ucl.ac.uk
Email paper authors: kombe@uclas.ac.tz
PUI website: <http://www.ucl.ac.uk/dpu/pui>

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About the project

This report is one of several outputs from the project *Service provision governance in the peri-urban interface of metropolitan areas*. This is a three-year project run by the Development Planning Unit, University College London in collaboration with a number of institutions from developing countries and with support from the UK Government's Department for International Development (DFID).

The purpose of the project is to improve guidance on governance and management of water and sanitation in the peri-urban interface (PUI) of metropolitan areas, in order to increase access by the poor and promote environmental sustainability. Presently there is a gap in the operating knowledge of implementing agencies on the specific problems that arise in the PUI. A premise of the project is that greater knowledge of the social, environmental and governance issues arising from changes in the management of water supply and sanitation in the PUI, and more specifically of the impact on these of different and changing regulatory frameworks, would be beneficial not only for the poor but also for these agencies and other local agents.

The project examines the cases of five metropolitan areas, each with different and changing service management regimes influencing the governance of basic service provision: Chennai (India), Dar es Salaam (Tanzania), Cairo-Giza (Egypt), Caracas (Venezuela) and Mexico City.

A. Allen, J. Dávila and P. Hofmann
Development Planning Unit
University College London

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ACRONYMS

ADB	African Development Bank
BOD	Biological Oxygen demand
CBO	Community Based Organisation
CCM	Chama Cha Mapinduzi
CIP	Community Infrastructure Project
COD	Chemical Oxygen Demand
CWSS	Community Water Supply and Sanitation
DAWASA	Dar es Salaam Water supply and Sanitation Authority
DCC	Dar es Salaam City Council
DO	Dissolved Oxygen
DSSD	Dar es Salaam Sewerage and Sanitation Department
DWSSP	Dar es Salaam Water Supply and Sanitation Project
EWURA	Energy and Water Utilities Regulatory Agency
FC	Faecal Coliforms
FC	Faecal Coli form
GDP	Gross Domestic Product
GoT	Government of Tanzania
IDA	International Development Agency
MAPET	Manual Pit Latrine Emptying Technology
NEMC	National Environmental Council
NGO	Non Governmental Organisations
NO ₃	Nitrate
NUWA	National Urban Water Authorities
PRSP	Poverty Reduction Strategy Paper
PU	Peri-urban
PUI	Peri-urban Interface
RWH	Rain Water Harvesting
SDP	Sustainable Dar es Salaam Project
TANESCO	Tanzania Electricity Supply Company
TTCL	Tanzania Telecommunication Company Limited
TTS	Tanzania Temporary Standards
UNDP	United Nations Development Programme
URT	United Republic of Tanzania
WDC	Ward Development Committee
WEO	Ward Executive Officer
WHO	World Health Organisation
WHO	World Health Organisation
WSP	Waste Stabilisation Ponds
WSP	Waste Stabilisation Ponds
WSS	Water Supply and Sanitation

AN OVERVIEW OF THE WATER SUPPLY AND SANITATION SYSTEM AT METROPOLITAN AND PERI-URBAN LEVEL: THE CASE OF DAR ES SALAAM

INTRODUCTION

Tanzania covers an area of approximately one million km² with a population of 34.5 million (Census 2002)¹, 30% of this constitute urban population. Agriculture dominates the economy, and accounts for 50% of the Gross Domestic Product (GDP), followed by services and industry. With a GDP per capita of approximately U\$ 230 (URT 2001), Tanzania is ranked among the poorest countries in the world. Half of the population is classified as being very poor.

The topography is generally flat and low along the coast but a plateau at an average of 1,220 metres constitute the greater part of the country. The climate is warm and tropical on the coastal strip, where the case study area (Dar es Salaam) is situated.

Dar es Salaam city experiences a hot humid climate with a mean annual temperature of 26°C, average humidity of 96% and heavy rainfall (1,000 mm-1, 900 mm); mean rainfall ranges between 1000 and 1400mm. Being situated in a coastal zone it is generally an area with a high water table. There are two distinct seasons, the dry season, which lasts from June to October, with temperatures ranging between 25 - 30°C and long rainy season from March to May. There are also short rains in November and December.

Overall the provision of basic infrastructure services including water supply, sanitation, solid waste collection and disposal and drainage in most urban neighbourhoods in the country is not only poor but overall in disarray. Water shortage and unsanitary conditions are a common feature particularly in most unplanned (informal) settlements. The level of service for water supply especially in the peri-urban interface (PUI) of big cities and towns is particularly inadequate, making the life of the poor living in these areas vulnerable to water borne diseases as well as restraining their livelihoods opportunities. In many cases potable water supply is non-existent, often supply from wells is unsafe, particularly as housing densities increase. Governments, both central and local are increasingly under pressure to provide and improve basic services especially water and sanitation, however financial resource constraints constitute the major handicap. As a result the performance of the urban public institutions responsible for providing WSS including Dar es Salaam Water and Sanitation Authority (DAWASA) has been dismal.

This report presents background information about the Dar es Salaam metropolitan area highlighting the existing Water and Sanitation Service System (WSS) as well as trends in the two peri-urban study areas. The main actors involved in WSS, their potentials, constraints and opportunities to improve WSS are also presented.

In addition, recent measures taken by the Government of Tanzania (GoT) to privatise DAWASA including strategies, financial arrangements and institutional settings which are intended to improve WSS among low income city inhabitants are also outlined.

The report therefore provides a general account on the WSS situation in the metropolitan area and sets the scene on the basis of which WSS conditions in the case study can be understood.

In a country characterised by extensive informal housing settlements in almost all urban areas, a wide range of low income (informal) settlements is anticipated in the PUI, see map 1.

1 Tanzania in this context refers to the mainland only.

Map 1: Planned and Unplanned Land Use (mid 1990s)

In Dar es Salaam, variations in peri-urban (PU) settlements are associated with factors such as differences in housing densities, location vis a vis the WSS trunk lines, proportion of the urban poor various PU settlements as well as differences in terms of sources of livelihoods. Each of these factors has an implication on the opportunities for improving WSS.

As will be discussed in section 2.1, for choosing the two study areas, several factors were taken into account. For instance one of the factors was the need to capture a typical WSS system in the PUI of Dar es Salaam where the poor live. That is an area where the WSS system is non-conventional, and where the state has not been able to improve WSS problems or has done very little. Tungi and Stakishari meet these considerations fairly well. On the other hand, the choice also shows diversity in WSS in the PU low income settlements; that is a settlement which in the past the government provided piped water services but gradually the system was left to collapse primarily because water was provided as a social service (free), as a result the state failed to maintain and sustain the system. In these settlements the inhabitants have resorted to non-conventional systems, however, the level of services remain unsatisfactory. Tungi is one of those settlements which had a piped water supply system when the government embarked on massive social service provision including water supply projects in the villages established under a villagisation programme.

The present groundwater sources which constitute the dominant source of water in most PU areas are unsafe because often groundwater, particularly from shallow wells, is polluted or contaminated. At the same time, most settlers in these areas cannot afford water supplied by vendors. Water supplied by vendors costs up to fifteen times the supply from wells. As will be noted later, the persisting WSS problems and the WSS service option adopted by the poor, albeit being unsatisfactory seem to have influenced or shaped recent government policy interventions.

1. OVERVIEW OF THE METROPOLITAN REGION

Dar es Salaam city covers an area of about 1,350 km². According to the 2002 preliminary National Population Census data in 2002, the city population is 2.5 million. Dar es Salaam is the largest and most important commercial and industrial centre in Tanzania. It contributes about 18% to the National Gross Domestic Product. The growth pattern of the city has been primarily concentrated along the coastline and four arterial roads of Bagamoyo, Morogoro, Nyerere (Pugu) and Kilwa. Most settlements along the arterial roads are fairly well serviced in terms of basic infrastructure including water supply and electricity. Between the arterial roads, large housing areas, most of which are unplanned, are without basic infrastructure such as water supply and appropriate sanitation system. It is estimated that between 70 – 80% of the city population live in informal housing areas. Up to June 1996, the administrative structure of the city comprises a council headed by an elected mayor and an appointed city director. Owing to poor performance especially failure in the provision of basic services, in 1999 the government dissolved the City Council and established a Commission to run the affairs in the city. In the same year the city administrative system was restructured. This gave rise to the establishment of three Municipalities, namely Kinondoni, Ilala and Temeke. Apart from empowering the municipalities to improve basic services delivery and maintenance, the restructuring of the city was intended to eliminate excessive central government control on the city council. By the end of 1999 the three municipalities had started operating and functioning as entities within metropolitan Dar es Salaam, each with a Municipal Director and powers to run and manage its routine functions. In 2001 elections were conducted in the three municipalities. This led to the restoration of democratically elected councillors for each municipality; some councillors were elected from each municipal council to constitute Greater Dar es Salaam Council. Whilst the three Municipalities are semi-autonomous authorities, the Greater Dar es Salaam City Council serves as the coordinating organ and overseer of the cross-cutting infrastructure services such as solid waste management, public transport and water supply. Metropolitan region as used in this report refers to the Greater Dar es Salaam region.

Of the 1350 sq. km city area, 430 sq. km (31.8%) have been declared urban area, a 20 sq. km area for forest reserve, while 900 km² are designated and considered suitable for agriculture. Within the area reserved for urban development there are, however, many PU settlements as well as other entities operating as rural villages in social and economic terms, see map 2. The dominant land uses are agriculture, forest and grassland. In the PUI there are mixed land uses, however housing is increasingly becoming a dominant future as more and more people immigrate into the area. Housing occupies about 60% of the consolidated or built-up area.

The administrative structure of urban authorities in Tanzania comprise three levels namely City/Municipal/Town Council, Ward and Subward (Mtaa in Kiswahili). As shown in figure 1, a Ten Cell unit exists as the smallest political-administrative unit put in place during the mono-party era in Tanzania. A Ten Cell unit is theoretically composed of 10 houses, in reality however, the size varies between 8 and 15 houses. Ten Cell leaders are like Subward (Mtaa) leaders elected by the household members constituting the cell. The status and role of Ten Cell leaders have been withering due to multi-party politics, primarily because they are associated with or seen as structures of the ruling party Chama Cha Mapinduzi (CCM).

Map 2: Location of Peri-Urban Settlements and case studies (I and II)

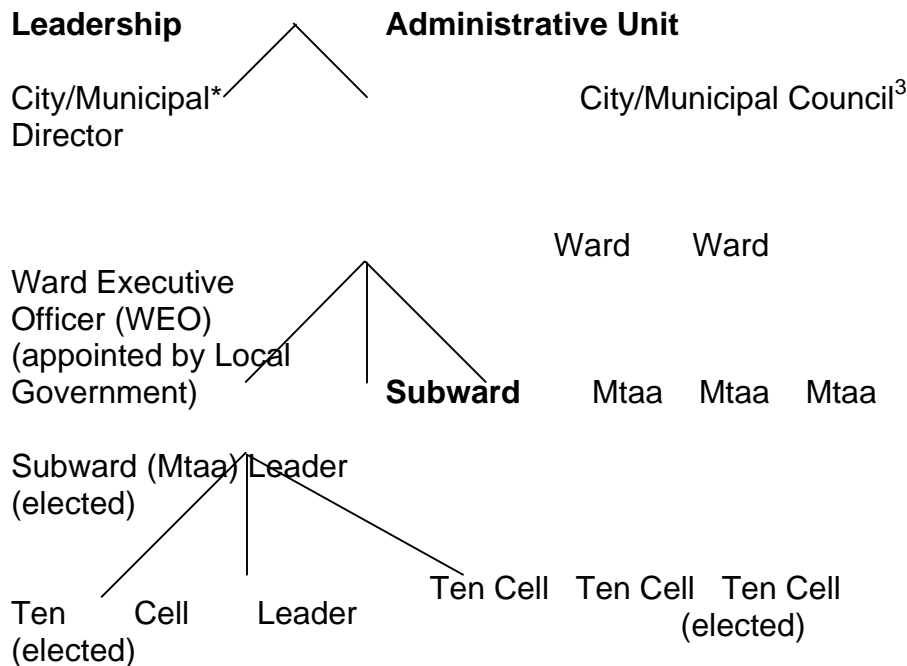
The Wards are constituted by a number of Subward areas, which are called 'Mtaa' (meaning 'street', plural 'Mitaa' in Kiswahili). The Ward Executive Officer and the Subward or Mtaa Leader are the government leaders in their local areas. The Ward Executive Officers are appointed by Government, while the Subward Leaders are elected by the residents living in their area. The size of a Subward area varies according to the geographical size of the Ward and its population distribution. It should also be noted that even though a Ward Executive Officer is an appointee of their local governments he or she represents both the local government as well as the district leadership at the Ward level.² The Ward Development Committee (WDC) is responsible for scrutinising and endorsing development projects before submission to the Council. Local governments discharge their functions through a committee system. Therefore each urban council has a number of Standing Committees to include:

² Ward Executive Officers are answerable to their respective local governments as well as to the District Commissioner who is the central government representative at the District level.

Finance and Administration
 Economic Affairs, Health and Education
 Urban Planning and Environment
 HIV/AIDS

The committees are responsible for making policy proposals and budgets for specific projects or areas as well as monitoring operations of various departments of the council.

Figure 1: The Administrative structure of Local Government in Tanzania



It should be emphasized that even though structurally the local government administrative system in Tanzania comprises three levels, (City/Municipal/Town Council-Ward-Subward), strictly speaking the Ward and Subward levels are mere administrative organs, without a corporate form of governance. Ward and Subward units do not have decision making powers and they don't receive fund disbursement from the Councils. Projects which are financed by Councils are often directly implemented by the respective council departments or contractors appointed by the Council. Therefore WEOs are essentially implementers of decisions and directives made by their Councils. They also take matters from Subward units to the Council. Wards and Subwards are therefore weak local government organs, which are mainly assisting local governments to function at lower levels particularly in terms of promoting citizen participation.

The ongoing Local Government Reforms, are geared towards devolution of roles and authority from central government to the local governments. They aim at empowering and building the capacity of the latter to deliver services efficiently. However because so far the reforms have mainly focused at the City, Municipal or Town level, it is doubtful whether they will have immediate impact on basic service delivery unless Ward and Subward levels are empowered to play meaningful roles in the local governance.

³ A Municipal Council' is an urban centre with more than 80,000 inhabitants and a financial capacity to generate at least two thirds of its recurrent expenditure from local resources, i.e. from local revenue .A city' is an urban centre with more than 612,000 inhabitants and a capacity to meet all of its recurrent expenditure from local revenues.

The Greater Dar es Salaam area comprises one of the 22 administrative regions of the country. Regional Commissioners are the principal representatives of the central government. Whereas each of the three municipal entities is also an administrative District headed by a District Commissioner; neither the Regional nor District Commissioners have specific roles in the Municipal or City council administration.

Other key players in the discharge of routine City and Municipal roles and functions, include the sectoral central government ministries such as Ministries of Regional Administration and Local Government, Lands and Human Settlement Development; Industries and Commerce, Education and Culture; Works; Labour and Social Welfare; Water and Livestock Development and Communicational and Transport. There are also utility institutions which provide various urban services such as Dar es Salaam Water and Sanitation Authority (DAWASA); the Tanzania Electricity Supply Corporation (TANESCO) and the Tanzania Telecommunication company (TTCL).

Generally potable water supply service in the city is erratic and unreliable. During dry season the situation worsens because water supply decreases in most parts of the city. During this period women and children from different parts of the city especially from low-income settlements trek on foot for long distances to fetch water for domestic uses. On the other hand, water vendors primarily men riding bicycles, tricycles and push carts are engaged in selling water. Due to severe shortage of water supplied by the public system, most housing areas in the city including areas where the affluent live, buy water from water vendors. This is costly particularly to the poorer households who have to pay dearly for domestic water needs. A recent study conducted in some selected informal settlements in Dar es Salaam has revealed that some households spend up to 10% of their total monthly expenditure on water⁴. During rainy season many households harvest rain water at the same time, ground sources are replenished increasing water supply among households which depend on groundwater sources such as deep and shallow wells. However, raised water table due to recharge of groundwater adversely affects sanitation in low lying low income settlements, where on-site sanitation especially traditional pit latrines (without lining) are the most dominant sanitation system. In fact over 90% of the urban population depends on pit latrines. During rainy season, pit latrines and even septic tanks in low lying areas overflow. Studies conducted in some informal settlements (e.g. Ukonga and Majumba Sita) revealed polluted groundwater sources, especially shallow wells.

The present city population is almost 35% of the country's urban population. The population has been more or less doubling every ten years, adding an average of 60,000 additional inhabitants to the city every year. Between 1992 and 2002 the annual growth rate was about 7.2%. Development of informal or unplanned housing is rampant. Unplanned settlements accommodate between 70 and 80% of the city population. Informal settlements increased from 16 in 1970s to 43 in the 1980s to 55 in the late 1990s. By the end of 2003, the number reached 105 (see map 1). Most of the settlements lack or have very poor basic infrastructure services and facilities including poor water supply and sanitation services. This has created a range of environmental problems, most of which affect the poor most.

A high population growth rate amidst low public resource capacities has created a huge backlog of housing services and facilities, particularly among low-income households, most of which accommodated in the informal housing sector (URT, 1996:56). Unlike many third world, informal settlements in Tanzania accommodate a wide range of social and economic groups. Most informal settlements accommodate a mixture of low income and middle inhabitants, even high income people. Therefore, physical and social alienation of informal

4 Average salary for a salaried low income civil servant is TShs 50,000/= (≅ 50 U\$) per month. Artisans and casual labourers earn between 2,000 – 3000/= TShs per day.

settlers from the rest of the city residents, which is often notable in Asia and Latin American countries, is by and large non-existent in Tanzania. Almost all, i.e. over 95%, of urban houses are owned and have been built by private individuals, mainly through own savings. About 60% of the existing housing stock is in informal settlements.

Generally, public health conditions particularly in densely built informal low income settlements are poor because of considerable crude dumping of domestic waste, unsanitary conditions and poor accessibility. Occasionally, waste is washed down into shallow wells, boreholes and streams which supply domestic water requirements to some low income households. Even though problems arising from both ground water pollution and poor sanitation are not severe in raised landforms, because Dar es Salaam city has many low income housing in low lying land, these areas constitute a public health threat as they are often the source of outbreak of water borne diseases such as cholera, dysentery, diarrhoea and typhoid.

Recent trends in service delivery in urban areas show that despite substantial investments and improvements in service coverage since independence, the supply falls far below demand⁵. Past investments and programmes in urban areas have not satisfied consumers' demands. If anything, increased socio-economic differentiation over the last two decades and cuts in government expenditure on social services has increased demand for better services particularly among the better off (Semboja and Therkildsen 1995:4), at the same time, this has further widen service deficit gap and restrained service access among the poor. This particularly is the case among poor households who cannot afford alternative options including those offered by the private sector. The varying quality and quantity of basic services including potable watersupply and sanitation provided in the formal and informal areas is increasingly making the gap between the poor and the rich apparent, as well as accentuating spatial inequality in our urban centres. The provision of water and sanitation services has been for decades, provided by the public institution (DAWASA). Originally these services were provided more or less for free, i.e. the charges were so low that they could not meet supply costs -operation and maintenance. Water services therefore provided (by a state parastatal) as social services. Under socialism, provision of free services in the country was therefore seen as a mechanism for fair distribution of wealth (Water Aid 2001). The Government of Tanzania has over the last decade implemented reforms that seek to change the role of the state and its institutions from direct providers of water and sanitation services, to enablers and regulators. This is in line with the now widely accepted changing paradigm (global thinking) about the role of governments and their institutions.

5 Population with access to water supplies increased from 39% in 1960 to 49% in 1990. (Semboja and Therkilsen 1995:5)

2 PROFILE OF THE PERI URBAN LOCALITY

2.1 Brief Introduction and Justification of the Case Study

Provision of the basic services to include water supply and waste management in Dar es Salaam city, like most other rapidly growing urban centres in the country, is generally poor. The capacities of the resource starved local authorities and utility service institutions have been over-stretched; the level of service provided is poor and inefficient. Looking at the population growth rate of Dar es Salaam and the sprawling character of the land development pattern, it is apparent that city and municipal authorities are unable to cope. Extensive horizontal growth (urban sprawl) implies high and uneconomic costs for providing basic infrastructure such as water or sewerage system.

In line with the research issue and the objective, considerations which were taken into account in selecting the two case study settlements are:

A rapidly growing low income settlement in the PUI which exhibits problems in terms of access to potable water and or sanitation, and where increasingly, the livelihoods of the inhabitants are grossly affected due to poor WSS services. Both Tungi and Stakishari fits these contexts.

A settlement which is predominantly occupied by the poor and where there is evidence that initiatives have been taken to fill deficits in the provision of water supply and sanitation services, where there are indications that the current WSS options constitute public health threats, are inadequate, unaffordable or unsustainable – both cases fit this situation.

Settlement which displays typical (current) WSS conditions in the PUI area which is predominantly occupied by the poor. At the same time, it should reveal past WSS service provisioning characteristics in the PUI areas. This is an important consideration because the WSS services in the case study areas will also be seen in their historical and political context. That is at the time when water supply was seen as a social service that had to be provided “free for all”. This is particularly useful so as to appreciate recent policy changes in WSS.

Finally, the choice of the case study areas also took into account the need to pick an area where trends in WSS compare well with the on-going reforms related to WSS improvement strategies, been instituted at city level. In this regard, the Water Aid supported project in Tungi which is based on boreholes and has been developed in close collaboration with the Community Water Committee makes Tungi an appropriate case study area. This is particularly so because commensurate with the CWSSP approach, after completion, the water improvement project will be handled over to the community to operate and manage it. Community will be entrusted to sell water and maintain the system.

Other factors which were considered include the existence of a CBO or local groups, which are involved in WSS services. Settlements which are located on hazard land were not considered. This refers to, for instance, settlements earmarked for demolition by the Municipal authorities, such as those built in river valleys or flood plains.

Preliminary visits made to various low income settlements in the PUI and physical observations and personal experience and knowledge about Dar es Salaam, information collected from secondary sources, casual discussions held with various individuals including colleagues who have been working in the peri urban areas, and on the basis of the four considerations outlined above, two settlements are proposed for indepth studies. These are Tungi in Temeke Municipality and Stakishari in Ilala Municipality. The basic facts and futures about the two areas are presented in Tables 1 whereas maps 3 and 4 show the development characteristics.

Table 1: Summary of the profile of the cases

Case study	Location and area	Major issues	Actors
Tungi (Temeke Municipality)	<ul style="list-style-type: none"> - PUI, 5 kms from the city centre, but in Kigamboni Peninsula. - Fast growing since 1980s. - Area 84Ha; 1,680 houses; 17,500 people; ~ 20 houses/ha and most houses are owner occupied - Majority of people are self employed, mainly engaged in agricultural activities and petty trading. 	<p><i>1. Water supply</i></p> <ul style="list-style-type: none"> - Severe problems - Ground water sources through private and limited public initiatives (electrical and hand pumps) - Kiosks-selling water. - Problems include salinity, contamination, pollution, insufficient supply network - No public (tap) water (DAWASA) supply system - Ground water based on. A reservoir and a local distribution system under-construction. <p><i>2. Sanitation</i></p> <ul style="list-style-type: none"> - Pit latrine - Few WC 	<ul style="list-style-type: none"> - Mtaa or Subward leaders - Water Committee - DCC (provide chemicals) - Private water vendors - NGOs (Lion Club and owners of the wells) - Pump operators - DAWASA (owns three wells and train well operators) - Water Aid - Households
Stakishari (Ilala Municipality)	<p>About 14 km from the city centre</p> <p>Largely gently and also some areas are low lying</p> <p>Rapidly densifying</p> <p>About 15,000 inhabitants</p> <p>Predominantly owners (70%); tenant (30%)</p> <p>-Self-employed, gardening, informal petty trading activities</p>	<p>1 Water Supply</p> <p>Boreholes and shallow wells (95%)</p> <p>Tap water (5%)</p> <p>2. Sanitation</p> <p>Pit latrines (80%)</p> <p>Cesspit emptier for high and medium income inhabitants.</p>	<p>Households</p> <p>DAWASA</p> <p>Mtaa/Subward leaders</p> <p>Subward leaders</p> <p>Households</p> <p>DAWASA</p> <p>CBO- MODECO</p>

In short the two cases were chosen because they first of all fit the general framework guiding the entire research protocol i.e. they represent settlements located in the PUI which are predominantly occupied by the urban. poor. At the same time, they were chosen because they exhibit differences in terms of particularly actions so far taken to improve WSS commensurate with the changed WSS improvement policy environment the City. In this regard Tungi was specifically preferred because unlike many other PUI settlements steps taken by the Water Aid in collaboration with the community to improve water using non-conventional approach i.e. boreholes with a reserve tank and a distributor network comprising 13 kiosks, have reached an advanced stage. According to the Water Aid project manager the project is expected to be completed and operational in December 2003. In this regard Tungi case could provide preliminary responses from beneficiaries on potential problems and challenges the new WSS improvement strategy based on the CWSSP approach is likely to give rise to, refer section 3.

Map 3: Tungi Settlement –Existing Housing Development for the year 2002 (Case I)

Map 4: Stakishari Settlement – Existing Housing Development for the year 2002 (Case II)

2.2 Demo-Geographic and Socio-Economic Characteristics

The PUI of Dar es Salaam comprises a diverse environment depicting a variety of socio-economic activities. It is also an area, which is undergoing rapid transformation from rural to urban land use. Agriculture is the main land use, however, this is gradually being displaced by housing, especially by those who cannot afford to rent a room or a house or buy land in the inner or intermediate city areas. There are also increasing number of middle and high income households which have acquired large tracks of land in the peri urban areas, for gardening and animal husbandry purposes.

New economic opportunities which are emerging in PUI as a result of land use changes include wage employment particularly in retailing business and service areas, artisanship, livestock keeping, quarrying (of stones, aggregates, sand, lime and coral), renting rooms, land selling and gardening activities. The main crops grown include maize, cashew nuts, cassava, bananas, tomatoes, cucumber, amaranths and fruits⁶. Other income generating activities are poultry and selling fodder. Poultry keeping is one of the main economic activities in the PUI. Many new immigrants who are unskilled and cannot easily access employment in other sectors in the city are employed in poultry keep activities such as Nyatira Lupala (2002). In Dar es Salaam peri-urban agriculture constitutes an important source of food for most (65% of the city population) households (Mwamfupe 1994; Mwamfupe and Briggs 2000), substantial part of the agro-produce (90%) is sold in the city market outlets Lupala (2002:31). However it is also one of the main sources of unauthorised water connection in the city.

The increasing immigration of people from the inner and intermediate city areas into the peri urban areas is a recent phenomenon, which has been largely triggered by massive retrenchment in the public sector, rural-urban migration and increasing economic hardships and poverty among many urban households. Most immigrants are low income households who find it cheaper to settle in the peri urban areas because room rents are lower and living costs affordable, e.g. food such as vegetables and fruits are cheaper. Many households which grow vegetables and or keep poultry and cattle in the PUI have connected water supply to their sites. Households setting in the PUI are therefore able to supplement their food needs with what they cultivate within or outside their residential areas. The immigrants settling in the PUI areas comprise the major force underpinning the sprawling informal housing land development in the city. Overall densities decrease from the inner city to the PUI areas. However, housing densities are generally higher along the major arterial roads which link PUI areas with the consolidated city area. Within the PUI settlements, housing densities vary remarkably depending on the location and history of the settlements. Generally settlements on the northern and western parts of the city are more densely built than those on the Southern area, primarily because of better access to basic infrastructure services especially water supply. The two major trunk lines from Lower and Upper Ruvu Water reservoir run along Bagamoyo and Morogoro road which link the inner city with the Northern and Western PUI areas respectively. On the other hand, settlements such as Tungi which were originally established under the Villagisation Program of 1970s generally are less densely populated than traditional settlements which have grown spontaneously. Lower in densities in post-villagisation settlements was mostly attributed to restrictions which were exercised in the past, to prohibit subdivision and selling of land allocated or granted for residential purposes by village governments. The trend has been gradually changing, in recent years many households in these areas have been parcelling and selling. In fact in many post-villagisation settlements in the country, even farm land which were cultivated communally have been subdivided and reallocated or sold. As a result, livelihoods in many PUI areas are increasingly changing from agriculture related activities to non-agriculture activities such as furniture

6 The urban farming regulation (1992) provide for urban agriculture as one of urban land use activities.

and blocks/bricks making repair workshops, food vending and other petty trading activities. Many people including youth are increasingly unemployed as farming land outside and within the residential areas is increasingly being built. In many cases, it is the women who suffer most because among most households along the Coastal area, they are the main actors in food production especially cultivation of vegetables. It is also noteworthy that because bush and forests are being cleared to open up new farms away from the residential areas; the environmental problems are increasing. For instance, clearing of vegetation on sloping sites and valleys has accentuated soil erosion and sedimentation.

Selling of land in the PUI is an important source of income among the indigenous Zaramo. They are subdividing land and selling piece after another, primarily because of increasing economic hardships (Kombe and Kreibich 2002). As a result, gradually they are bought of by immigrants from the inner and intermediate city areas. Buying and selling of land is mainly done through the informal system and networks without Local Governments' support or control. Informal land delivery sector has and continued to attract many people into the peri urban area, including land speculators (Kombe 2002, 1995; Shivji 1998). There are therefore many better off persons who have or are grabbing large tracts of land in the peri urban areas, in anticipation of windfall profits when they later sell for building use. This is the trend in PUI areas of Dar es Salaam city such as Bunju and Mabwepande along Bagamoyo road to the North; Charambe and Mji Mwema along Kilwa road to the South and Mbezi Luis and Kibamba along Morogoro road to the West (map 2). These areas accommodate heterogeneous social groups and stakeholders, however, many a time, when indigenous land sellers have sold all the land they migrate further into the periphery where they put up new house after clearing forest and bush. Informal land subdivision and selling are activities which are largely handled by individual households. In Tanzania, there are presently no public institutions or organisations involved in land grabbing.

Apart from housing neighbourhoods along the major trunk and arterial roads, most of the settlements which are situated inland have poor accessibility. Accessibility problem is worse during rainy season and is complicated by rough topography and clay soils, which characterise some of the peri-urban areas. Most settlers in the PUI use bicycles or walk long distances to the trafficable roads or to market and shopping service centres. The latter have largely emerged sporadically. The socio-economic pattern of most settlers in the PUI areas of Dar es Salaam city is that generally, the poorer the household, the further it is situated vis a vis the major roads and basic infrastructure services. Implicitly, the poorer spend more time to access services and facilities; in turn this has detrimental effect on the households' initiatives to improve their livelihoods.

2.3 Environmental Characteristics and Processes of Change

The city is characterised by four distinct land forms namely:

The shoreland immediately abutting the sea and comprising sand dunes and tidal swamps. Environmental threats along this landform include sea erosion of and encroachment on the coastline. Dynamite fishing is one of the main sources of erosion because it destroys coral reefs.

A limestone coastal plain to the west of shoreland which extends to Pugu hills to the west. This has a fairly uniform relief lying between 15 and 35 metres above sea level and slopes of less than 3%. Due to tree cutting for fuel and construction coupled with bush clearance, environmental degradation problems are increasing.

Rivers originating from Pugu hills dissect the Coastal Plain in series of steep sided U-shaped valleys culminating in creeks and mangrove ocean. The valley soils are generally poorly drained silt clays.

The deeply dissected Pugu Hills which bound the city to the west, with an average of 100 to 200 metres above sea level, rising to some 300 metres at some points.

Apart from the mangrove swamps, limited forests reserve areas and the sea front, there are no other protected land uses. Failure of the land development control has accentuated environmental problems because of unregulated building on steep slopes, farming, and bush and forest clearing. Almost 70% of the 1350 sq. km land available in the city is designated for non-urban uses including rural related activities such as farming and animal husbandry.

Apart from settlements which are along the arterial roads where main trunk water supply line run, most of the PUI settlements away from the trunk lines including the two study areas of Tungi and Stakishari depend on wells – either deep or shallow wells. Only few deep wells in areas where there is electricity supply network are operated with a motor pumps, the majority have manual pumps. Water from most wells is salty. There are also water vendors, they use bicycles and push carts. The price for water supplied by water vendors varies depending on the season, at times vendors charge up to TShs.150 (0.015US\$) per bucket. During dry season, generally prices rise.

Even though there is increasing immigration and settling by particularly low income households in the PUI, agriculture remains a dominant livelihood activity. However, most of the agriculture activities take place outside the residential areas, often only a few kilometres from the PUI area. Apart from a few uncleared bush and forest areas and flood plains most of the natural ecosystems in the PUI have been encroached upon by human activities especially farming and housing construction. Valleys are particularly vulnerable because they are used for vegetables and rice cultivation. The proportion of rural vs. urban activities in the PUI varies depending on the location of the settlements. Households away from the main roads have still large tracts of land for farming, whereas those close or along the main roads are mainly engaged in non-agriculture sectors such as petty trading and gardening activities at fairly small scale.

The formal approach to change of agricultural land to residential use in urban areas has been by way of declaring an area to be a planning area under the Town and Country Planning Ordinance of 1956. Normally the government has to pay compensation to land occupiers in areas declared as planning areas before the land is planned and surveyed. Before the enactment of the Land Act (1999), bare land was officially considered valueless, but informally bare land has for decades been commodified. Commercialisation of land is one of the factors, which has stimulated and sustain informal land use changes including changes from agriculture to housing. Normally, prospective land buyers get in contact with potential land sellers through middlemen. The latter could be a relative or friend. In the past, especially in the case of village owned land in the peri-urban areas, the village leaders used to allocate land to immigrants for a token payment. One could also access land through inheritance. Purchase is at present the modus operandi for land acquisition for housing or other uses in most peri-urban areas including Dar es Salaam city.

Land tenure is governed by the Land Act (1999). Under this legislation, all land in the country is a public property, and is vested in the President, therefore occupiers have usufruct rights only. Access to and occupation of land is by a way of Right of Occupancy granted by the government. Statutorily, the state through local authorities is responsible for allocating land for housing. Applicants are required to lodge their applications with their respective local governments. Until very recently, allocation was done administratively, i.e. through “first come first served” principle. This allocation approach failed miserably due to corruption, nepotism and malfunctioning of the government institutions responsible for urban land management. Poor performance by the formal land delivery institutions has given rise to informal land access system. Informal land markets operate and constitute the main mode for accessing land. Informal land delivery is presently the most vibrant housing land access system in the rapid growing urban areas in the country Dar es Salaam city included. The land supplied by the formal system is planned and surveyed, but often it is not serviced. Native communities (mainly in rural areas) who occupy land under customary tenure have deemed granted right of occupancy. The legal position regarding customary land tenure, especially in

the PUI urban areas is a controversial issue, primarily because most landowners occupy land under customary rights, however in Tanzania, customary tenure is often considered inferior to statutory land ownership (Kironde and Rugaiganisa 2002:5-9). Implying that customary rights ought to give way to granted rights when boundaries of a town or city are for instance extended to engulf rural or PUI land.

Due to increasing demand for land by immigrants and poverty among most households in the PUI areas, many customary land owners are selling their land in order to meet social and cultural commitments. Even though traditional norms and practices among most tribes in the country prohibit selling of customary land. The size of land bought or sold depends on several factors including amount the buyer wants willingness of the owner to sell as well as the nature and magnitude of the problem a household which intends to sell land is facing. Normally customary land is granted freely, a token fee may be made to the grantor as a symbol of appreciation for the grant. This tradition is fading out among many tribes particularly customary landowners in the PUI areas of the rapidly growing cities in the country including Dar es Salaam, Arusha, Mbeya, Mwanza and Morogoro. In these areas land parcelling and selling activities are rampant. This has given rise to a new form of tenure which may be referred to as quasi-customary⁷. This seems to be increasingly replacing customary rights. Local leaders, namely Sub-ward (mtaa) and at times Ward leaders are involved, they authenticate land transactions and sign selling agreement forms. In so doing they officiate land transfers so long as willing buyers and willing sellers have agreed upon the price and boundaries of the land being transacted have been ascertained. Handing over ceremony including payment is witnessed by the neighbouring landowners, relatives or friends of the transacting parties. On their part, the local leaders normally sign selling agreement papers, to confirm and in a way to formalise transactions. Land which is transacted is not planned or surveyed. It should also be noted that there are also many immigrants who have acquired large tracks of land, some owning tens or hundred of acres (Kombe 2000). Most of these have not developed their land or are not effectively using it for agriculture purposes. Many a time, they clear the bush and erect a small structure where a guard who occasionally clears the land stays. A few landowners keep goats or cattle, some grow vegetables and fruits, mainly for selling in the city.

Due to rapid urbanisation under the poverty conditions, land in the peri urban areas has become an important commodity. Informal land access is the dominant mode of settling on land in the urban periphery. It is being facilitated by customary and quasi-customary land owners. Informal housing land access is one of the main causes for overcrowding, land use conflicts, environmental problems and excessive costs of servicing land including provision of water and sanitation See map 2. Even though wells constitute the main source of water supply there are some PUI settlements with access to piped water. These are mainly the areas which have been invaded by the middle and high income inhabitants.

As noted earlier, clearance of bush by new immigrants in the PUI together with gardening and animal keeping activities albeit sporadic and limited are giving rise to environmental degradation and misuse of water which is already treated and desperately required for urban use. Nonetheless gardening activities are providing employment to many young people who would otherwise be idling, at the same time they are important sources of food for city inhabitants.

⁷ Quasi-customary refers to land rights held by non-native persons often immigrants or landowners who have acquired land mainly through non-customary system, i.e. they have purchased land from customary occupiers.

2.4 Legal and Institutional Framework

Responsibilities for supply potable water and sanitation in Tanzania fall under the Ministry of Water and Livestock Development. The Ministry has over the years established Water and Sanitation Authorities in all cities and Municipalities to promote access to safe water supply to urban residents and improve sanitation services. In smaller towns, Districts and Regions, Water Department under District and Regional engineers are responsible for managing water supply and sources. Until July 2003, in Dar es Salaam the Water and Sanitation Authority (DAWASA) was the sole responsible for water and sanitation services. As it will be noted later, some of the services have been privatised

Water Supply

Before 1997, two separate public corporations, the National Urban Water Authority (NUWA) and the Dar es Salaam Sewerage and Sanitation Department (DSSD), then a semi-autonomous department of the then Dar es Salaam City Council, were responsible for the provision and management of water and sanitation services in the city. In 1997, NUWA merged with DSSD to form Dar es Salaam Water and Sanitation Authority (DAWASA)⁸. DAWASA, an autonomous public institution, was until very recently (May 2003) responsible for sourcing, treating, transporting and distributing water in the city. It is also responsible for maintaining and repairing the system as well as billing and collecting revenues. Following the privatisation of DAWASA operations its roles will change.

Overall, the performance of DAWASA particularly in ensuring adequate supply of water has been poor. Subsequently there are many private individuals who get water from DAWASA and other sources and then distribute to customers in various neighbourhoods in the city. Most of these are small informal water vendors operating with push and pull carts with a number of jerry cans (between 6-8) or plastic buckets each measuring between 20-25 litres⁹. Most of the vendors are young people aged between 25-30 years who have resorted to water vending activities because they have no other employment opportunity (Kjellen 2000).

Subward leaders are mandated to mobilise resources from inhabitants to carry out WSS improvement or other development projects in their areas. They are also allowed to solicit finance from sources such as NGOs, external financial support institutions or from private individuals.

Overall, in Tanzania, apart from NGOs supported project, community organised or initiated self-help activities or individual household initiatives, financing sources for activities in PUI at Subward level, are scanty. NGO funded projects refer to activities such as the water project funded by Water Aid in Tungi.

Owing to water shortage among even the high and middle income neighbourhoods, in recent years there has been an increasing number of large scale water vendors operating water trucks mounted with tanks. Some of the large scale vendors have agreements with customers whom they routinely supply water. Some CBOs have with donor support, established own community water supply system which operates outside public/DAWASA system. These are pumping ground water to elevated tanks and distribute (sell) to customers.

Fetching water is an activity which is normally under taken by women, however, because of the severe water shortage in many parts of the city, men with light vehicles make trips to fetch water for their households. Many households especially in middle and high income areas have constructed reserve tanks and installed booster pumps. Few of the household harvests rainwater to supplement supply from vendors or DAWASA, others have own water

⁸ DAWASA is under the Ministry of Water and Livestock Development. The Ministry is responsible for water resources management through central Regional Water Advisory Board established under the Water Utilisation Act (1974), as amended in 1981.

⁹ Some of the improved push carts which have big tyres carry between 20-30 water buckets.

wells on the plot. DAWASA has been cooperating with NGOs and donors in providing deep-water wells in some of the housing areas experiencing severe shortage of water (Kjellen 2000).

Sanitation

DAWASA is also responsible for providing and managing sanitation services in the city, this includes constructing, operating and managing sewerage systems, cess pit emptiers/collector services and WSPs. Besides DAWASA, a number of public organisations including the DCC as well as private individuals own and run cess pit emptiers for customers who want to dislodge their septic tanks. In 1998, 19 different organisations were operating cess pit emptiers discharging waste water from septic tanks and pit latrines into DAWASA waste stabilization ponds. Generally emptying services are inadequate and ill equipped. There are also small scale operators, operating portable pumps or tanks and service areas where large cess pit emptiers cannot reach. Generally most low income households do not hire liquid waste emptier services. Often filled up pit latrines are emptied through a manual system which is locally known as “kutapisha”. This involves digging a pit by the side of a filled pit latrine (if space condition allow) and waste then is emptied manually in the side pit, thereafter the side pit is covered with gravel. In situation where space on plot is not sufficient to apply “kutapisha” system, normally a new pit latrine is dug in one of the habitable rooms in the outer-building, thereafter the filled up pit is sealed and converted into a habitable room. This is the practice in the densely built unplanned housing areas in the inner or intermediate city areas (Kombe and Kreibich 2002). Guidelines for siting and construction of on-site disposal systems are practically not available (Mato 2002:40).

Some NGOs and CBOs in some communities have taken initiatives to introduce improved sanitation systems. These refer to initiatives by Plan International to introduce Ventilated Improved Pit latrines (VIP) in Buguruni.

The National Water Policy (2002) sets a framework for achieving an efficient development and management of the urban water supply and sewerage services. One of the key provision and aim of the policy is to harmonise the existing legislation and associated regulations, particularly those which do not adequately meet the emerging water management challenges. These include the Water Utilisation (Control and Regulation) Act in 1981.

The regulatory and institutional framework for water resources management is provided for under the water utilisation (Control and Regulation) Act. No.42 of 1974, referred to as the Principal Act and its Amendment Act No.10 of 1981 and written Laws (Miscellaneous) Act. No. 17 of 1989 and General (Regulations) Amendment. The Act as amended, declare that all water in the country is vested in the United Republic of Tanzania, sets conditions on the use of water and authorises the Principal Water Officer to be responsible for setting policy and allocate water rights at the national level.

3. CHARACTERISTICS AND TRENDS OF THE WATER SUPPLY AND SANITATION

3.1 Environmental conditions and water resources

Extension (km²) and components of the catchment area

The city region of Dar es Salaam contains the water sheds of four perennial rivers, the Mpiji which forms the northern city boundary, the Msimbazi which flows to the north of the city centre and the Kisiga and Mzinga rivers which flow into the harbour area south of the city as well as a number of smaller water courses which are at times dry for up to six months of the year such as Nyakasangwe, Tegeta, Mbezi, Sinza, Tabata and Meneva. Essentially however, Ruvu basin is the primary source of water supply to the urban as well as peri-urban areas of Dar es Salaam city. This basin consists of wide plains and large mountain ranges. The entire Ruvu river catchment system covers an area of about 17,930 km².

Precipitation

Ruvu river originates from the Uluguru mountains in Morogoro Region. The mean annual rainfall of up to 2500 mm has been recorded on the eastern slopes of Uluguru mountains. The western part of these mountains lies in the shadow and therefore the annual mean rainfall is relatively small. The Nguru-Rubeho mountains complex receives between 800-1200 mm, while the Ugaguru mountains receives mean annual rainfall ranging from 1000-1800 mm. Rainfall is much less in the plains near the coast region where annual mean rainfall ranges from 800–1000 mm.

Alternative water resources to be developed within the catchment area

Studies (Elmcrest group, 2000), have indicated that on the basis of the existing abstraction rates and projected urban population growth, Ruvu water resources alone will not be able to safely meet the increase demand from the city in the next decade in the absence of river regulation. The Government of Tanzania has initiated a number of important interventions aimed at expansion of supplies, integrated basin management and improved upper catchment management. Project alternatives for improved water resources management were evaluated by JICA (1994) and these have now been further refined. Current alternative water resources development option include impoundment on the upper or lower Ruvu aimed at capturing peak wet seasons run-off, and releasing this during the dry season. Detailed studies on the alternative water sources for Dar es Salaam city have however not been carried out. However, DAWASA intends to carry out studies on improvement of future water supply in Dar es Salaam city. These studies include: Preparation of water resources master Plan and water supply strategic plan and preliminary designs. Development of water resources master plan for Dar es Salaam city will include assessment of surface and groundwater under which the following studies are to be carried out:

- Assessment of future water needs for Dar es Salaam city
- Assessment of surface water sources
- Aquifer safe yield, recharge potential and water quality
- Aquifer saline intrusion potential

In terms of the existing water demand, Elmcrest (2000) has proposed rehabilitation requirement to the existing intake and treatment plants and has concluded that with no additional abstractions from either upper or lower Ruvu, the lower Ruvu basin has adequate supplies to sustain the current demand.

Reclamation (recycling) of water

Wastewater can be re-used for several purposes such as enhancement of recreational facilities, industrial water supplies, ground water recharge and direct re-use in portable supplies. In water scarce areas water recycling may constitute a major portion of the available resource. In Dar es Salaam city and Tanzania in general however, the extent at which water is recycled for different uses has not been established. Isolated cases of water recycling in industries where water supplied for cooling purposes for example in power plants, is recycled for other uses within the industry have been observed. Cases of using raw domestic wastewater or insufficiently treated wastewater for irrigation purposes have also been reported especially in small scale urban agriculture.

Rain water harvesting

Rainwater harvesting (RWH) can be defined as the process of collecting rainfall runoff from a catchment area and concentrating it for use in a target area. Various research works on RWH in Tanzania were carried out between 1992 and 2001 through the support of IPTRID which is an internationally-funded programme aimed at promoting technology and research in irrigation and drainage in and by developing countries. These researches aimed to develop improved cropping systems based on RWH and to promote awareness of importance of RWH. In terms of domestic and industrial use however, rainwater harvesting in Dar es Salaam city is generally limited and in many cases it is used by individual households to complement the supply from DAWASA.

Desalination

Desalination is a separation process used to reduce the dissolved salt content of saline water to a usable level. All desalination processes involve three liquid streams: the saline feed water (brackish water or seawater), low-salinity product water, and very saline concentrate (brine or reject water). The product water of the desalination process is generally water with less than 500 mg/l dissolved solids, which is suitable for most domestic, industrial, and agricultural uses. The most significant costs associated with desalination include capital cost, costs of electricity, membrane replacement, and labor. As such all desalination techniques are energy-intensive. Because of the high costs involved in Tanzania desalination of sea water is not currently practiced.

Inter-basin resources (water imports/inter-basin transfers)

Few studies on the inter basin between Ruvu catchment area and other possible basins have been carried. Elmcrest (2000), citing Howard Humphreys (1989) conducted a study related to transferring some water from Rufiji river to Ruvu river. Also river basin transfer between Wami and Ruvu rivers has been studied by Kalinga (1998) who indicated that the low flows in Ruvu river coincides with the low flow in Wami and that the low flows in Wami are much less than those in Ruvu river suggesting that the inter-basin between Ruvu and Wami rivers is not possible.

Based on the available information therefore the possibility of inter basin resources to increase the flow in Ruvu river seems to be minimal. This suggests that the reliable resource to augment water supply in Dar es Salaam is ground water and at the mean time effect the necessary rehabilitation in order to increase the abstractions from the Ruvu sources to the design capacities.

Water abstractions

Water supply for various uses in Dar es Salaam city is abstracted from ground water sources as well as Ruvu and Mtoni rivers. Mtoni water source is located about 10 km from the city

centre, while Ruvu river (upper and lower) is located about 60 km from the Dar es Salaam city centre. Map 5 indicates the location of the three surface water sources for the city of Dar es Salaam.

Map 5: Location of the three surface water sources for Dar es Salaam city

There is varying information about the water sources capacity, utilisation and actual supply in Dar es Salaam city. Table 2 presents the most recent information from DAWASA which indicate that lower Ruvu is the main supplier (182,000m³/day) while the abstraction from Mtoni is only 9,000m³/day.

Table 2: Abstraction of water from various water sources in Dare s Salaam city

Water source	Existing treatment capacity (m³/day)
Upper Ruvu	82,000
Lower Ruvu	182,000
Mtoni	9,000
Bore holes	35,000
Total	308,000

The maximum and minimum water flows in Ruvu river has been established to be 1.72 and 1180 m³/s, respectively, while maximum and minimum flow rates in Mtoni river has been established to be 0.036 and 2.9 m³/s, respectively. Based on the maximum flow rates, the amount of water that can be abstracted from the river (existing treatment capacity) in relation to the flow rates has been established to be 0.08, 0.18 and 3.9% in upper Ruvu, lower Ruvu and Mtoni, respectively (Figure 2).

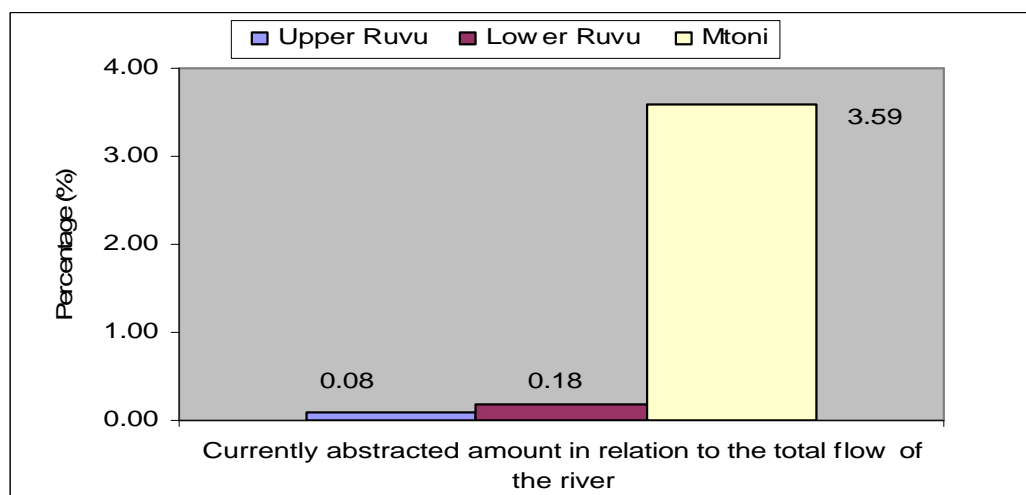


Figure 2: Abstraction of water from Ruvu river in relation to the flow rates of the river

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

3.2 Characteristics and trends of water supply and sanitation services

Water supply and use per activity

Before the commissioning of Mtoni and Ruvu water works in the 1950s, open wells were in use in Dar es Salaam since the early 1890s. In the early 1930s boreholes connected to the water supply system were commissioned. As the city population increased, over-pumping led to the incursion of saline water into the borehole system. In the 1952, Mtoni surface water works was commissioned to substitute boreholes. Later 1959, two additional water supply works were constructed at Upper and Lower Ruvu. The existing capacity of different water sources to supply water to Dar es Salaam city (both from surface and ground water sources) is about 308,000m³/day. Out of this however substantial amount of water is lost through leakages and wastage as will be discussed later in this report. Water demand is between 300,000 and 360,000 m³/day (Kyessi 2003; Kyessi and Kironde 1999). Table 3 indicates water demand and supply for Dar es Salaam city between 1991 and 2001. Another study (Elmcrest 2000) taking into account 53% leakages and wastage has established water demand for Dar es Salaam city to be 361,293, 314,421 and 499,866 (m³/day) for the years 1995, 2000 and 2015, respectively (Table 4).

Table 3: Water demand and supply for Dar es Salaam in 1991 and 2001

Use category	Demand (m ³ /day)		Supply (m ³ /day)		Overall deficit (m ³ /day)	
	1991	2001	1991	2001	1991	2001
Domestic	107,400	240,000	27,600	55,400	79,800	184,600
Industry	35,800	80,000	9,200	18,000	26,600	62,000
Institutional	17,900	40,000	4,600	9,000	13,000	31,000
Commercial	17,900	40,000	4,600	9,000	13,000	31,000
TOTAL	179,000	400,000	46,000	91,400	133,000	308,000

Source: Mbilinyi, 2001 and Kyessi 2002

Table 4: Projected daily water demand for Dar es Salaam city

Use category and wastage	Water demands (m ³ /day)		
	1995	2000	2015
Domestic	113,641	144,654	271,367
Industrial	15,133	18,786	32,126
Institutional	9,735	13,928	26,470
Commercial	9,570	11,070	17,770
Sub-total	148,079	188,438	347,733
Leakage/wastage	53%	45%	20%
	166,089	84,971	87,500
Average demand	314,168	273,409	434,666
Maximum Daily demand (m³/day)	361,293	314,421	499,866

Source: Elmcrest (2000)

Some non-quantified amounts of water is supplied to Bagamoyo and Kibaha towns from the main sources to the city, and 18,000m³/day is supplied to settlements in villages and settlements along water transmission lines, which include PUI areas. Table 3 indicates that domestic water consumption amounts to 60% of the total demand while Table 4 suggest this value to range from 31–54% for the years 1995 to 2015.

Substantial amount of water is obtained from ground water sources. In 1997 for example a total of 193 boreholes with a capacity of 18,000m³/day were drilled in the city, under emergency water supply program. The boreholes which are fitted with pumps have substantially alleviated the problem of water shortages especially in low income areas during dry season. However, the safe yield of the aquifer is unknown and the quality of the water produced from boreholes is doubtful. The total water production capacity is estimated to be 308,000m³/day. Most low income areas in the city including those in the inner city areas however experience severe shortage of water. Those in the peri-urban areas away from the trunk lines suffer most because often there are neither secondary nor tertiary distributor lines. As may be expected, Tungi and Stakashari are not exception, almost all household depend on water from deep and shallows. Because the supply from wells is salty, some households buy water for drinking and cooking from water vendors. A study conducted recently (Water-Aid 2001) on how low income residents felt about the problems and impending changes being proposed to resolve water supply problems in Dar es Salaam revealed mixed reactions. Upon being asked what she thought about DAWASA, one of the housewife retorted, “they should all be fired”. Another squinted her eyes, gave a muffed curse and then said, “I hate them”. Even though these views may be considered extreme, fair or unfair, they nonetheless depict some of the sentiments held by some households over DAWASA ability to solve water problems in Dar es Salaam.

Unaccounted for water

Between 35% and 53% of the water pumped from the three water works is lost through leakages and wastage (Kyessi and Kironde, 1999 and DCC, 1995). Elmcrest (2000) has described these leakages and wastage as an accounted for water which includes leakages from the pipes, illegal or unregistered connections, unauthorised use of water for irrigation, fish rearing, resale of water or water use for construction purposes. In 1995, out of the 100,520 connected private water consumers, only 57,858 (58%) were registered. None of the 76,700 kiosk operators were registered. Based on 1995 conditions, only 23% of water produced was paid for by users (Kyessi and Kironde 1999). 53% of the water produced from the three sources is unaccounted for and therefore yields no revenue (ibid).¹⁰

¹⁰ Unaccounted for water refers to water pumped into the system but not reaching customers.

Water quality

The quality of water in Tanzania is regulated by the Water Utilisation Control and regulation Act of 1974 as amended in 1981. The Act also defines receiving water bodies by three categories namely; water suitable for drinking, water suitable for feeding livestock, fisheries and recreational, and water suitable for irrigation, and other industrial activities requiring water of standards lower than those of water in the upper categories. Recent studies (Elmcrest, 2000) have indicated that none of the three water treatment plants (upper Ruvu, lower Ruvu and Mtoni) can fully achieve WHO standards for drinking water quality. In another study (Ntukula et al 2001), analysed water samples at the upper Ruvu treatment plant and at some points between the water treatment plant and the city, results are presented in Table 5. This study concluded that the treatment process is efficient enough to make the piped water potable since the quality of water determined at different points in between the water treatment plant and Kimara terminal tanks 10 km from the city centre remained in a relatively good condition.

Table 5: Water analysis results between upper Ruvu and the city

Location	Ph	Turbidity (FAU)	TDS (PPM)	EC (ms/cm)	Colour (pt/col)	No3 (ppm)	Cl (ppm)	Bacterial count (Counts/100ml)	
								TC	FC
Plain sedimentation	8.07	158	60	0.13	610	2.70	14.2	1200	600
Pre-chlorination	8.19	143	70	0.13	590	3.01	21.3	300	230
In flocculation tank	7.36	63	60	0.13	159	2.11	21.3	260	220
Flocculated water	7.53	49	80	0.17	46	0.78	21.3	200	170
Settling basis	7.57	1	190	0.36	23	0.99	21.3	70	20
Filtered water	9.24	0	160	0.34	12	1.76	21.3	Nil	Nil
Piped water at the plant	8.47	0	100	0.23	7	0.99	28.4	Nil	Nil
Njuweni hotel (Kibaha)	8.01	2	70	0.15	24	2.1	28.4	Nil	Nil
Mbezi luis	7.85	0	80	0.16	13	0.9	31.9	Nil	Nil
Bahama mama (Ki- mara)	7.96	3	80	0.17	14	1.5	35.5	Nil	Nil
WHO (maximum limits	6.5 – 9.5	25	1500	3	50	1	600	Nil	Nil
TTS (maximum limit)	6.5 – 9.5	30	2000	3	50	1	600	Nil	Nil

Source: Mwaiselage, (2003)

In many areas of Dar es Salaam city however, apart from wastage, leakage also constitutes a potential source of water pollution, because ground water which has been polluted by on-site sanitation systems may penetrate into the pipes during low pressure periods. During high pressure periods, leaking pipes release water out, raising the ground water table in their vicinity. Chaggu et al (1994) have reported sewerage handling i.e. treatment and disposal of to be the main source of ground water pollution in Tanzania. Other studies especially those which were carried out in unplanned settlements and peri-urban areas have shown that the quality of water is not reliable, water from most sources including tap water and boreholes is unsafe, thus many households take precautionary measures such as boiling. Table 6 shows that water from boreholes meet neither the WHO standards nor the Tanzania Temporary Standards (TTS), primarily because of high levels of faecal coliform and chloride concentrations.

Table 6: Selected water quality parameters for boreholes and piped water in Dar es Salaam

Indicator	Bore-holes	Piped wa- ter	WHO Stan- dards	Temporary Tanzania stan- dards
SO ₄ (mg/l)	48.2	21.5	<400	<600
N-NO ₃ (mg/l)	2.86	0.68	<6.8	<50
Cl ⁻ (mg/l)	1388	63	<600	<800
Turbidity (NTV)	2	8	<25	<30
Total hardness	800	85	-	<600
TC (TC/100ml)	8	8	0	0
FC (FC/100ml)	2	7	0	0

Source: Chonya, 2001 and water quality laboratory (UCLAS), 2002 cited in URT 2003.

Also laboratory tests carried out between 1999 and 2001 revealed high nitrate levels and bacterial contamination in boreholes located in densely built settlements such as Buguruni, Manzese and Mabibo.

Population covered and water vending

Most consumers in the city face severe water shortage, for some households (12%) water shortage is occasional, but for most (88%) it is chronic (Mwandosya and Meena 1998). Only 33% of the households have private on plot connections. The supply is generally intermittent, some households with private connections go for up to three or more days without water flowing in their pipes. Even though unreliable water supply is a serious problem in most parts of the city, Temeke municipality, which accommodates about 30% of the city population, is the most affected. More than 50% of the Temeke municipal inhabitants rely on water from vendors who sell water using buckets and push carts (Kyessi 2003, citing Mbuligwe 2000). Generally, water vending is more common in Ilala and Temeke Municipalities than it is in Kinondoni Municipality (Mwandosya and Meena 1998). The key problems of water supply in Dar es Salaam include insufficient supply due to source limitations, aging of the pipes and leakage, unreliable supply due to pump failures and low pressure, inadequate network distribution including limited distribution of tertiary distribution, poor water quality due to contamination, illegal and uncoordinated connections including high consumption of treated water for irrigation and livestock keeping (DCC, 1992; Kyessi and Kironde, 1999; and DAWASA, 2003).

A study by Mwandosya and Meena (1998) established that there are at least six other sources of water apart from on-plot/house connection. The proportion of the city inhabitants relying on these sources and their income category are shown in Table 7.

Table 7: Relationship between source of water and income (percentage)

Source of water supply	Income category		
	High	Middle	Low
Neighbour	0.2	19.2	81.0
Public tap/Kiosk	1.2	51.9	46.9
Shallow well	-	4.3	96.0
Surface water	-	17.0	83.0
Vendors	0.2	13.3	86.1
Rain water	0.2	18.7	81.8

Source: Kyessi and Kironde (1999)

The main sources of water for vendors are public taps/kiosk (6.2%), private taps (52.9%) and surface sources (8.8%), shallow wells (19.1%) and others (2.9%). As may be expected, most low income households in the PUI areas depend on wells, vendors and rain water. Most vendors buy water which they sell to others. The price per 20 litre bucket ranges between TShs. 20/= and 500/= (US\$ 0.019 and US\$ 0.47). Average price is TShs.100/bucket. The price depends on the distance travelled, time taken (waiting time to get water), and the season of the year. During extended dry spells, vendors inflate water prices. Owing to inadequate flows during dry season coupled with supply interruptions caused by breakages and breakdowns and low pressure, vendors inflate water prices. Water prices are generally higher in low income areas compared to middle and high income settlements (Kironde and Kyessi, 1999). Most vendors in low income areas operate push carts; those in middle and high income often use vehicles with water tanks of about 9,000 litres.

Wastewater per activity

Wastewater is normally discharged from various points of water uses. These include domestic, industries, institutions and commercial centres. Detailed studies to establish the actual amount of wastewater that is discharged from various uses have not been carried out in Dar es Salaam. However, based on the available information on water supply pattern and assuming that wastewater generation normally amounts to 80% of the consumption, the amount of wastewater that is discharged from various uses has been established to be 36,800m³/day in 1991 and 73,120m³/day in 2001 (Table 8).

Table 8: Estimated wastewater discharged from various uses

Use category	Supply (m ³ /day)		Wastewater discharged (m ³ /day)	
	1991	2001	1991	2001
Domestic	27,600	55,400	22,080	44,320
Industrial	9,200	18,000	7,360	14,400
Institutional	4,600	9,000	3,680	7,200
Commercial	4,600	9,000	3,680	7,200
Total	46,000	91,400	36,800	73,120

Types of wastewater treatment applied

Selection of wastewater treatment technology depends on the "strength" of the sewage; land availability, capital and treatment requirements of the final effluent. Due to capital investment involved in mechanical wastewater treatment Sanitation Policy recommends that "in the selection of treatment method for wastewater due consideration shall be given to non-mechanical purification methods as a first priority". For that case WSP are the best option for wastewater treatment in Tanzania. As such less than 10-12% of the urban population in Tanzania have access to central sewerage system. In Dar es Salaam city for example the existing central sewerage system was constructed between the years 1948-1952, extended in 1956 and renovated in 1984. This system currently consists of about 130 km of sewers grouped into 11 zones and supported by 17 sewerage-pumping stations. This central sewerage system serves only about 10% of the city residents (Baruti et al 1992). Areas covered by this system include central business district (CBD), Kariakoo, Msasani, Mwenge and Ubungo industrial area. Sewage is collected and treated in Waste stabilisation Ponds (WSP) before being discharged into inland rivers (except for the sewer segment draining the city centre) which discharges the sewage into the sea via a screen chamber and sea outfall near Kivukoni front. Map 6 indicates the sewerage areas in Dar es Salaam city.

Map 6: Sewered areas in Dar es Salaam city

The existing WSPs in the city include: Those at Lugalo, Msasani, Ubungo, Airwing, Vingunguti, Ukonga, University of Dar es Salaam, Buguruni and Kurasini (Elmcrest 2000). WSPs provide what is referred to as secondary treatment (Peavy et al, 1985). In most cases secondary treatment is considered to be sufficient to prevent problems. However, where adequate dilution is not available or where or where discharge is to a delicate ecosystem advanced wastewater treatment may be required. The common layout (type of treatment) of WSP consists of an anaerobic pond, facultative pond followed by two maturation ponds normally arranged in series (Figure 3).

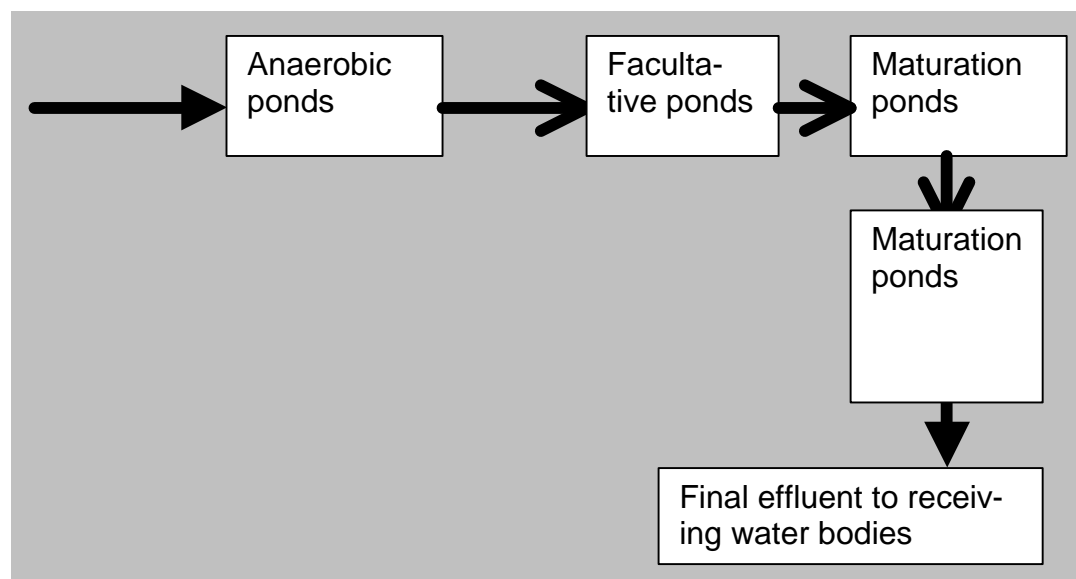


Figure 3: Typical wastewater treatment layout in waste stabilisation ponds

In terms of the types of treatment that occurs in the WSP it is worth noting that the anaerobic pond is mostly used to receive raw sewage from septic tanks or pit latrines from different residential households that are close or within the vicinity of the ponds as brought to the site by the vacuum tankers. Individual households normally hire these vacuum tankers. The processes that take place in facultative ponds include both aerobic and anaerobic, while maturation ponds are meant for final polishing including the removal of pathogens from the WSP effluents.

Apart from WSPs the major part of the Dar es Salaam city residents (about 88%) especially those in unplanned and peri-urban areas use on-site sanitation facilities encompassing both pit latrines (68%), and septic tanks (20%) as further illustrated in Figure 4.

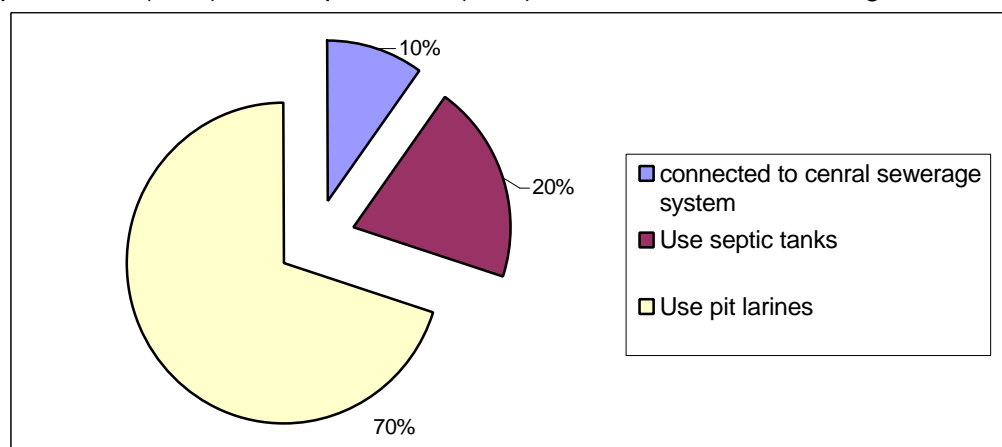


Figure 4: Percentage of the city population in relation to the method of treatment and disposal systems used in Dar es Salaam city.

Estimated volumes of wastewater treated before being released back to the environment

The collected wastewater in Dar es Salaam is treated mainly in the WSP. The total amount of wastewater that can be collected or directed to the existing WSP for treatment in the city has been estimated to be 25,833m³/per day. This amount has been arrived at based on the capacity of the existing WSPs in the city as shown in Table 9. The Ubungu WSP has the highest capacity (7,776m³/day) while Ukonga has the least (346m³/day). Some studies have however shown that many of the ponds are currently operating below their design capacity

due to lack of maintenance especially desludging of the ponds. Comparing the estimated amount of wastewater that was generated in 2001(see Table 8); the amount of wastewater that can be treated in the WSP is about 35% of the total wastewater generation in the city. The rest is either disposed of on-site or directly into the sea through the sea outfall or crudely disposed in receiving water bodies.

Table 9: Estimated volume of wastewater that can be treated before final disposal

Facility (WSP)	Influent (m ³ /day)	Pond area (ha)	Treatment process		
			Anaerobic pond	Facultative pond	Maturation pond
Msasani	5,184	4.08	2	1	4
Lugalo	3,456	3.18		2	4
University	3,197	1.52		1	6
Ubungo	7,776	2.69	1	1	4
Vingunguti	1,900	5.54	2	1	4
Buguruni	691	2.93		1	4
Air wing	518	0.54		1	4
Ukonga	346	0.2		1	4
Kurasini	2,765	2	2	1	4
Total	25,833				

On the other hand, Mato (2002) citing Haskoning and M-Kosult (1989) has estimated the total amount of wastewater from different sanitation facilities that crosses the water table line and thus discharging in ground water to be 47,000m³/day or 1.7x10⁷m³/year in 1988. Also the amount of pollution loads emanating from pit latrines and septic tanks that reaches the ground water was estimated (Table 10).

Table 10: Estimated pollution loads (kg/day) from pit latrines and septic tank systems reaching the ground water resources in Dar es Salaam in 1991.

Parameter	Pit latrines	Septic tanks	Total
BOD ₅	15,282	7,641	22,923
COD	16,131	8,068	24,199
Suspended Solids (SS)	6,116	3,832	9,948
Dissolved solids	97,857	61,128	158,985
Total-N	4,829	3,018	7,847
Total-P	915	572	1,487

Source: Mato, (2002) citing Haskoning and M-Konsult (1989)

Impact of wastewater disposal

The effluent from the septic tanks and pit latrines that is allowed to percolate into the soils represents a potential source of ground water pollution. As such the on-site sanitation systems in Dar es Salaam city is now considered as diffuse sources of ground water pollution. Although septic tanks are designed to operate without threatening groundwater resources, in many case however the septic tanks and other on-site excreta disposal systems experience functional and operational problems that are largely based on poor design and or citing requirements. Excessive septic tanks and pit latrines densities in many unplanned and pre-urban areas have degraded ground water quality with high concentrations of nitrates, bacteria, and organic matter concentrations. In areas with high water table such as Sinza, Mlakuwa, Kiwalani, Manzese and Majumba sita, the sewage is disposed of directly into ground-water i.e. below the ground water table line with the vicinities of the pit latrines or soak away pits of the septic tanks. It is obvious that such practises lead to serious faecal and organic pollution of unconfined aquifers and may render the ground water unfit for human consump-

tion. Public health and environmental effects observed in the affected areas also include contamination of piped water (Chaggu *et al.*, 1996). A Study on the number of cases for the top ten diseases reported at the Magomeni Health Centre in Dar es Salaam city (Mbuligwe, 1995) indicated a very high incidence of malaria (36.8%) and diarrhoea (7%) in areas with malfunctioning ST systems. Similarly, many cases of cholera epidemic have been reported in the city over the past one-year whereby between 20–30 cholera patients are currently admitted at the special cholera patients treatment wards in the city. Table 11 shows the percentage of the reported cases of water related diseases in Dar es Salaam city between 1991 and 1995.

Table 11: Water related diseases in Dar es Salaam city

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

Source: Mwaiselage, (2003)

Table 3 indicates that between 1991 and 1995 the reported water related diseases that are largely caused by contaminated water supply and poor or lack of sanitation facilities were about 60% of all the diseases that were reported in the city. The highest cases (37.22%) were for malaria while the least reported cases (0.01%) were typhoid. In addition to environmental and health effects which lead to poor accessibility and unsightly conditions, malfunctioning on-site excreta disposal systems can cause a decrease in property value, leading to loss of socio-economic benefits in the affected areas.

Quality of wastewater before treatment

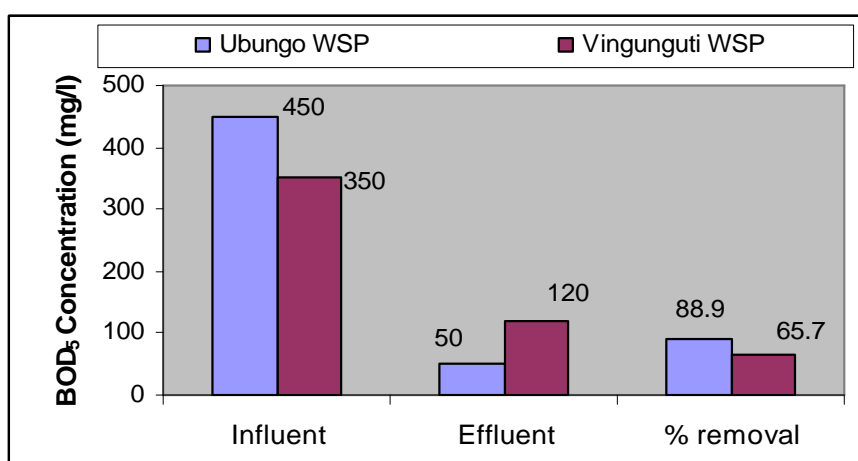
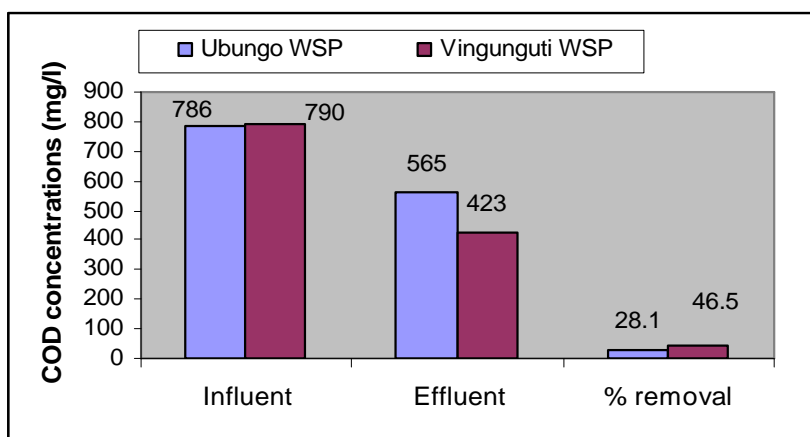
Wastewater treatment is aimed at preventing the threat to human health from waste-related diseases (WHO, 1989). Additionally, it seeks to maintain an acceptable ecosystem habitat of the receiving waters in which it is discharged (Fernandez, 1997). In many developing countries including Tanzania, however, one of the major infrastructure services whose demand has surpassed the population growth especially in urban centres is wastewater treatment and human excreta management. The problems related to inadequate wastewater treatment facilities are compounded by lack of proper operation and maintenance of the existing wastewater collection and disposals facilities. For example Kayombo *et al.*, (1998) have reported most of the existing WSPs to be discharging effluents, which do not conform to the Tanzanian standards for final effluent disposal as specified in the Water Utilisation (Control and Regulation) (Amendment) Act, (1981). The main reasons for this range from poor operation and maintenance, overloading of the WSPs to poor design. An analysis of the effluent from some selected WSPs in Tanzania indicated high BOD₅, COD and FC values in the final effluent as presented in Table 12.

Table 12: Performance of some WSPs in the removal of BOD₅, COD and FC

Pond system	Influent			Effluent			Flow rates (m ³ /day)
	BOD ₅ (mg/l)	COD (mg/l)	FC (No/100ml)	BOD ₅ (mg/l)	COD (mg/l)	FC (No/100ml)	
MWATEX	145	688	-	-	-	-	806
MUTEX	134	338	-	-	-	-	1322
Arusha	350	1200	1 x 10 ⁷	250	980	4 x 10 ⁵	5400
Ubungo	450	786	1 x 10 ⁸	50	565	4 x 10 ⁵	4023
Vingunguti	350	790	1 x 10 ⁸	120	423	3 x 10 ⁶	687

(Source: Kayombo *et al.*, 1998)

Figures 5 and 6 indicates BOD₅ and COD influent, effluent and percentage removal rates, respectively in two WSPs (Ubungo and Vingunguti) which are located in Dar es Salaam city. BOD₅ percentage removal in the two ponds 88.9 (Ubungo) and 65.7 (Vingunguti) seems to be attractive as compared to COD percentage removal (28.1 in Ubungo and 46.5 in Vingunguti ponds). In terms of the final effluent quality however, the concentrations are higher than those recommended by The Water Utilisation (Control and Regulation) (Amendment) Act, (1981) for wastewater effluent meant for direct discharge into receiving water bodies in Tanzania. In another study Elmcrest (2000), found out that 5 out of 9 WSP in Dar es Salaam achieved BOD₅ concentration of 20 mg/l, while only 2 WSP out of 9 achieved the recommended local bacteriological quality standards.

**Figure 5: Effluent and influent BOD₅ concentration in Ubungo and Vingunguti WSPs****Figure 6: Effluent and influent COD concentration in Ubungo and Vingunguti WSPs**

Studies carried out at Ubungo and Vingunguti WSP have indicated that faecal coli forms (FC) influent are within the magnitude of 8 logs (1×10^8 FC/100ml) while the effluent were in the magnitude of 5 logs in Ubungo ponds (3 logs units removal) and 6 logs in Vingunguti WSP (2 logs removal). In both cases however, the final effluent quality does not comply with the recommended Tanzania standards.

Current wastewater treatment standards for selected parameters

Depending on the location and nature of the final discharge point, many countries in the world have set wastewater treatment standards that should be met prior to disposal of the final effluents. In Tanzania, The Water Utilisation (Control and Regulation) (Amendment) Act, (1981) has recommended 10mg/l BOD₅ for wastewater, which is suitable for re-cycling and re-use in irrigation and other industrial activities, and between 30 to 40 mg/l BOD₅ effluent for direct discharge into receiving water bodies. Table 13 presents other guidelines for other parameters as recommended by The Water Utilisation (Control and Regulation) (Amendment) Act, (1981) for wastewater effluent meant for direct discharge into receiving water bodies in Tanzania.

Table 13: Standards for wastewater effluents for direct discharge in water bodies in Tanzania

Parameter	Units	Maximum permissible concentration
Suspended solids	mg/l	Not to form sludge or scum in the receiving water
Temperature	^o C	Not to cause any increase of the receiving water more than 5 ^o C
BOD ₅	mg/l	30 – 40 (depending on the temperature of measurement)
DO	mg/l	3.0
Ammonia (NH ₄)	mg/l	2.0
Nitrates (NO ₃)	mg/l	50
Nitrites (NO ₂)	mg/l	1.0
PH		6.5–8.5
FC and TC	No/100 ml	Not mentioned

Source: Water Utilisation (Control and Regulation) (Amendment) Act, (1981)

3.3 Techno-Infrastructure Development

Pumping and treatment of most of the water supplied to the city inhabitants is done at Lower and Upper Ruvu intake sources. Mtoni pumps only 2.9% of supply. All the treated water is pumped into the two reservoirs at Kimara and University and thereafter distributed by gravity. Even though parts of the main trunk line (1375 mm) have been replaced, due to leakages between 35 – 50% of the produced water is lost. This apart, the poor state of the secondary distribution network as well as haphazard and substandard private service line connections also increase water supply problems in the city. Many households, especially in the newly developed middle and high income housing neighbourhoods have installed own tertiary water supply lines, most of these lines run long distances, often more than a kilometre or two from secondary pipes installed by DAWASA.

It is estimated that more than 70% of the city residents experience low water pressure for most periods of the year, at times water supplied is brown or muddy. Furthermore, most of the water supplied is inadequately treated due to malfunctioning treatment plants (URT 2002:1). For instance a bulky of the water supply from the Lower Ruvu Source is not adequately treated because the system is often out of order (GoT 2003). Frequent incidences of water related infections such as diarrhoea, cholera and typhoid in the city may be attributed

to use of unsafe water including supply from taps (Kironde and Kyessi 1999). Recently the Guardian spotted a vendor fetching water from a small stream along Sam Nujoma Road in Dar es Salaam for selling to people. Upon being interviewed by the reporter the vendor said: "We usually collect this water at night. And then sell to people, no authority can pursue us at night (The Guardian Newspaper 2771172003).

The existing sewer system covers a total of 170 km which is organised in 11 sub systems and supported by 17 pumping stations and 9 waste stabilisation ponds. With exception of the city centre system, which has a sea outfall, the rest operate with WSPs treatment facilities. Many WSPs are not operating effectively due to lack of maintenance (DCC 1992).

As noted, pit latrines are the most dominant on-site sanitation system. These are prevalent because they are cheap to construct, easy to operate by most households. A study conducted by the Sustainable Dar es Salaam Project (SDP) in 1992, revealed that about 380,000 of the city inhabitants did not have even elementary sanitation facilities. Owing to high housing densities especially in unplanned areas, today the number of households without sanitation facilities could be much higher (Kombe and Volker 2002; 2003). In densely built informal settlements such as Keko Mwanga in Dar es Salaam or Daraja Mbili in Arusha use of plastic bags (what is referred to as flying toilets in Nairobi) is not uncommon. The use of Ventilated Improved Pit Latrines (VIP) is generally low and limited to specific project sites, such as Buguruni VIP project.

An ambitious Water Master Plan for the city was prepared in 1980, but lack of funds frustrated implementation of the proposals. One of the major steps, which have been taken to improve water and sanitation services in the city, is contracting a private operator to develop and manage the water supply and sewerage services.

In 1997 African Development Bank (AfDB) resolved to support rehabilitation and operations of city water facilities, however AfDB suspended processing of the project until modalities for involving the private sector operators/developers and privatisation of DAWASA operations were carried out. Effective July 2003 credit to facilitate implementation of Dar es Salaam Water Supply and Sanitation Programme (DWSSP) was secured. The programme comprise two main components the privately operated system by City Water Services (CWS) and a Community Water Supply and Sanitation Programme (CWSSP) to be managed by local communities. The DWSSP major goal is to provide a reliable affordable and sustainable WSS service to all categories of consumers. This is intended to be achieved by:

Improving DAWASA technical operations by replacing and/or repairing water production, transmission, storage and distribution facilities and waste water collection and treatment facilities that have lacked maintenance over the years;

Extending piped water supply service to unserved areas by implementing a balanced program of construction of primary, secondary and tertiary distribution pipes and a commercial policy that will favour connections of households;

Upgrading DAWASA commercial operations to industry standards, reducing physical and commercial unaccounted for water and increasing collection of bills.

Enhancing DAWASA financial situation by gradually raising the Customer Tariff to a level that will initially cover operation and maintenance (O&M) costs, service long term debt and contribute to the capital expenditure program and eventually compare with the Long Run Marginal Cost (LRMC) of supplying drinking water and disposing of wastewater.

Improving services to low income households by implementing community based projects in areas not readily serviced by the conventional service networks as well as increasing the number of water kiosks and standpipes in areas with low income households¹¹.

¹¹ Community refer to ward or Subward (*Mtaa*). The criteria for picking legible community are: low income households/areas with inadequate water services; Cholera prone areas; hazard free land; seriously deficient of water supply and areas which are far away from existing or proposed water sources. A community is expected to be approximately 170,000 people.

The CWSSP project component focuses on the improvement of water supply and sanitation services in the areas that will not be addressed by the PO, especially residential areas inhabited by the poor including peri urban areas. CWSSP focus is on non-conventional water supply systems.

Under the DWSSP, rehabilitation and expansion of water supply and sewerage services will be undertaken as a long term strategy but with a five year (2002 – 2007), Immediate Investment Programme component that will focus on water supply production, transmission, storage, distribution including connection facilities, rehabilitation of WSPs, sewers pumping stations, sea outfall and rehabilitation of the existing sewers will also be covered.

The CWSSP therefore aims at providing a minimum WSS service to low income communities including those in the PUI such as Tungi and Stakashari. The improvement of WSS will mainly focus on independent water supply distribution systems supplied from point sources (wells and boreholes) or a bulky supply from DAWASA distribution system, and on-site sanitation facilities.

In accordance with the privatization protocol, DAWASA has been transformed into a holding company –DAWASA Public Granting Authority, charged with the responsibility of managing CWSSP. It will also monitor PO's (CWS) performance and oversee the rehabilitation of the water and sewerage system in the city. The new institutional structure defines roles and mandates of the various actors. DAWASA-PGA is required to advertise, select and subcontract NGOs to undertake water supply and sanitation projects in the local communities. NGOs are required to work in collaboration with local communities and CBOs, so as to enhance participation and ownership of the project. DAWASA-PGA will also be responsible for the implementation of water supply and sewerage improvement program under Dar es Salaam Water and Sewerage Program (DWSSP). DAWASA will remain the WSS assets holder it will therefore also remain a key player in asset planning and management and directly be answerable to the GoT.

The main function of the CWS includes installing customer meters, installing new connections, operating and maintaining the assets, issuing water and sewerage bills and collecting revenues. CWS will also undertake rehabilitation of selected works.

The Ministry of Water and Livestock Development will apart from issuing abstraction rights and licenses, take charge of the overall policy formulation. On the other hand, whilst Ministry of Finance is responsible for mobilizing and disbursing financial resources. The Energy and Water Utilities Regulatory Agency (EWURA) Act, which the government passed in 2001, establishes EWURA as a Government regulator of the WSS services. EWURA will be responsible for monitoring, auditing reporting and ensuring compliance, by DAWASA and CWS with contractual obligations government regulations, legislation, and operating licenses. It will also monitor the quality of supply and services to the consumer as well as check tariffs. In short it will police the Private Operator (CWS) and DAWASA. An independent Auditor will be appointed to carry out technical and financial audit of both DAWASA and PO, also see Figures 7 and 8. The National Environmental Management Council's (NEMC) role is to ensure compliance with environmental standards related to for instance disposal of waste into receiving water bodies, the emission of odours, and gases, and construction activities related to control of erosion.

It is also worthy underlining here that as a result of the reform, and in accordance with the new institutional framework, the city population will be broadly divided into two main categories of water consumers; namely consumers under DAWASA-PGA and those under CWS. Urban households in PUI will mainly fall under the CWSSP. As alluded to earlier, DAWASA will appoint NGOs to implement CWSSP projects. How much these reforms, institutions settings and the regulatory framework will improve WSS also among the PUI poor remains to be seen.

Recently the Ministry of Water and Livestock Development announced that it will provide 25 liters (per person per day) of tap water for free to poor urban households. It is however not yet clear how the free water will be managed and by whom. Beside identification of poor urban households and how cost for the free supply will be met, are yet to be resolved. This is particularly difficult in a country such as Tanzania where the informal sector dominates the household economy.

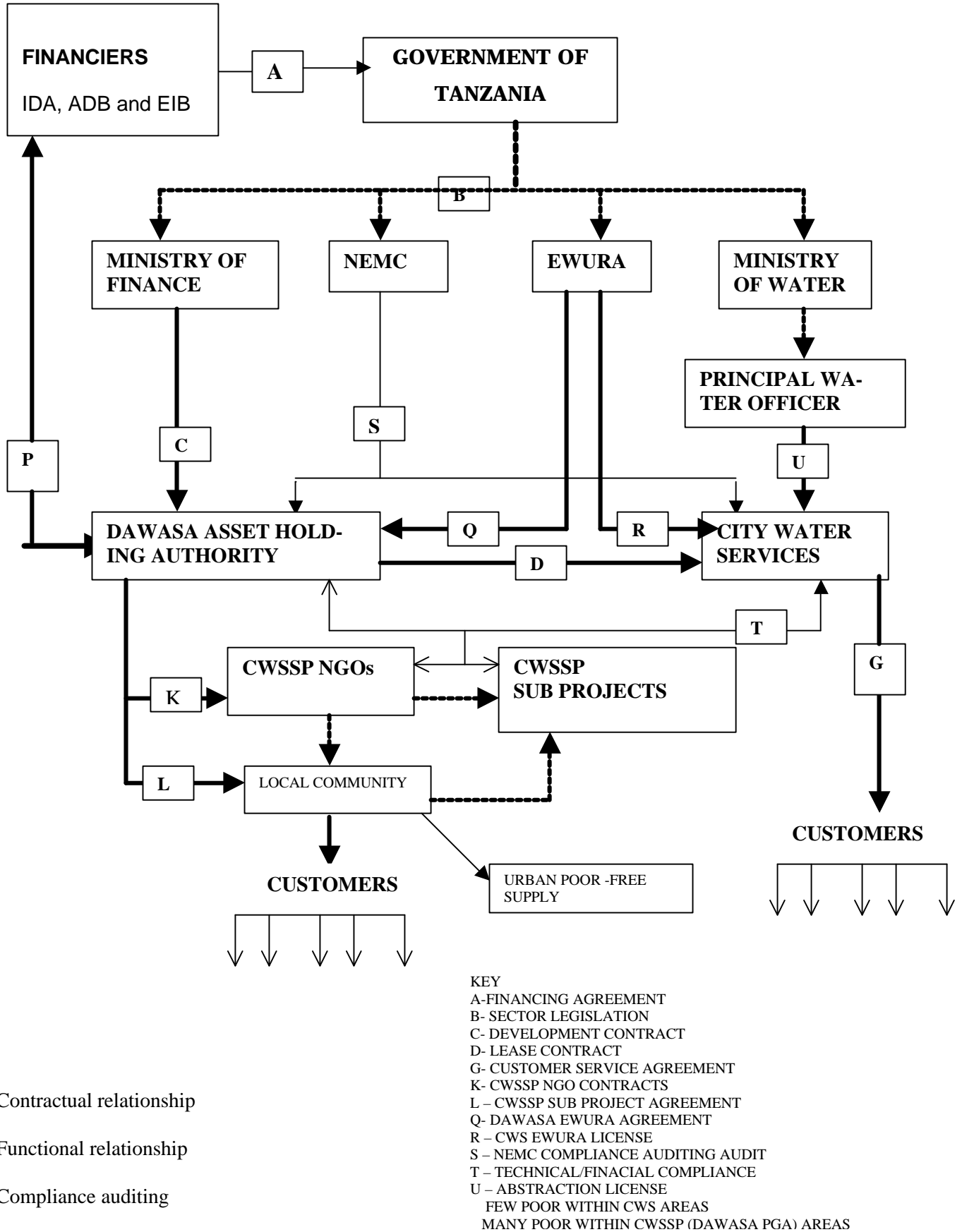
Rights and obligations

Water and sewerage customers will be entitled to have such rights as the right to be connected, the right to receive water supply (within the current capabilities of the utility), and the right to a responsive customer service. These customer rights come with obligations, one of which includes the committed obligation to pay bills in full and on time. CWS has drafted a customer contract, which specifies these rights and obligations for both parties. The terms of which apply to all customers, existing and future.

Tariffs

Water and sewerage customer will be billed in accordance with a new tariff structure as will be set for in the development contract.

Recent discussions with the DAWASA officials revealed that in so far as institutional setting for the Community Water and Sanitation Improvement Programme is concerned, a number of issues which are to be resolved. Some of these issues have been covered in section 4.



Contractual relationship

Functional relationship

Compliance auditing

Figure 7: Contractual and functional arrangement of the DWSSP

Figure 8: Key Actors and their roles in DWSSP Programme (Source: DAWASA)**3.4 Economic and Financial Aspects**

Until recently, the provision of water and sewerage services was a direct responsibility of the central and local governments. Central Government Ministries, Parastatal Organisations and Urban Councils established specialised departments and units to provide these services. This was done without substantively involving other stakeholders, in the private, popular or community sectors. By so doing, the government was largely relying on its own and donor resources to fund the construction, operation and maintenance of WSS services. Continued dependency on the declining government and donor resources coupled with rapid population growth has significantly contributed to the low level and poor quality of WSS services in the city (URT 1997).

DAWASA is presently billing about 100,000 water customers as well as 20,000 sewerage customers. It does not meter the water produced and distributed, bills it charges its customers are prepared on the basis of estimations (GoT, 2003). The water tariff structure in the city is differentiated among the following consumer categories; domestic, institutional, commercial, industrial, agriculture, expatriates, concrete blocks makers and large scale water vendors (tanks). Domestic consumers are charged a flat rate, regardless of their income. Expatriates, concrete blocks makers and water sellers by tanks have special rates. In theory, consumers in urban areas are supposed to pay full cost for the water services, however in practice tariffs are below the average or marginal cost of production. Implying that central government has been providing subsidies that pay for construction costs as well as most operation and maintenance costs. Table 14 compares water tariff and cost of supplying domestic water in the city. In 2003 charges were TShs 391/m³ for residential use.

Table 14: Domestic water tariffs (TShs) and cost of supplying water per 1000 gallons (4.5 m³)¹²

<i>Year</i>	<i>Tariff</i>	<i>Average Cost</i>
1984	13.5	9.4
1985	13.5	11.5
1986	13.5	20.7
1987	13.5	28.6
1988	57.5	51.8
1989	57.5	376.6
1990	57.5	196.2
1991	57.5	259.9
1992	100.0	377.3
1993	120.0	557.4
1994	140.0	468.2
1995	160.0	433.0
1996	-	200.0
1997	-	200.0
2003	391 ¹³	

Between 1985 and 1995, annual operational budget deficit recorded by DAWASA grew from 74 mill. TShs to 2728 mill. TShs. The deficit was largely a result of low tariff, high operating costs and poor revenue collection, accumulated arrears, poor records about consumers, unregistered connections and leakage. Infact, only about 65% of the customers pay their bills regularly, 35% the customers connected to water network either pay irregularly or do not pay at all. Besides, the 76,700 water kiosks operators do not pay either (URT 1995a). In 1995, only 23% of water produced was paid for (Kyessi 2002). As result of poor revenue collection, before engagement of the private operator DAWASA collection was just sufficient to cover its personnel and chemical costs. Recent studies show that most households are willing to pay for water (Mwandosya and Meena 1998; Mujwahuzi 1994). Water prices in Tungi and Stakishari vary depending on the sources. Supply from manually operated deep wells cost TShs. 5/= per bucket, whereas that from motor operated wells costs TShs. 10/= per bucket. Water supplied by vendors costs between TShs. 50/= and 100 per bucket depending on season, during dry season prices may rise to TShs. 150/= or more. Price are solely determined by the suppliers i.e. vendors and owners of the wells. Apart from the piped water supply system which is under construction and which will be pumped into an overhead reservoir tank before it is distributed there is no any other WSS project on-going in the study areas. It should be noted that because of the chronic water shortage and poor quality of ground water sources, water vending has in recent years become an important livelihood opportunity particularly among youth in many settlements in the city. The following direct quotes from BBC series (Photo Journal: Water seller) an interview with a water vendor in Dar es Salaam recently illustrates the foregoing: "...for me water is real life; my monthly income is guaranteed at US\$ 30 per from one household only".

Infact households which are currently selling water to other inhabitants in one of the study areas (Tungi) complained bitterly that when the new piped system funded by the Water Aid is operational, they will loose customers and their main source of the livelihood. Generally will-

¹² In November 2003, 1US\$ was equivalent to TShs.1050.

¹³ Plus 30% for customers connected to sewer.

ingness to pay is higher among low income groups, probably because they experience more severe problems resulting from unreliable water supply.

Under the privatisation reforms, DAWASA will spend US\$ 165 mill. to rehabilitate and extend water supply and sewerage services in the city under the DWSSP. Projects in this component will be executed under the Immediate Investment Programme during the 2002 – 2005 period. The government (GoT) has received this credit from three international financiers projects. The financiers are:

The International Development Association (IDA)

The African Development Bank (AfDB)

The European Investment Bank (EIB)

The CWSSP schemes will be funded by IDA and AfDB.

Direct employment generated by the existing water supply the two study areas is generally limited. However if one considers the production chain including women running food stalls, processing of boutiques or operating local brew shops, a fairly significant number of jobs is created.

Water from most wells in the city is often salty, therefore many people would prefer alternative non-salty sources, such as that supplied by vendors in Tungi. However, considering the increasing poverty high incidences unemployment and restrained income generation activities most households cannot afford water supplied by vendors. In fact an average low income household size (4 – 5 persons) which consumes say only 4 or 5 buckets of water per day would spend about a third of its take home income (TShs.50,000 or 50U\$ per month) on water purchase from vendors; if it uses deep well sources its expenditure would however down to between TShs.750 and 1500, i.e. between 1.5% and 3% of the monthly income of a salaried public servant.

3.5 Policy Institutional Environment

The main shortfall in the National Water Policy of 1991, which gave rise to the review, centred on the implementation strategies. For instance the 1991 policy emphasised the role and position of the central government as the sole investor, implementer and manager of the water projects. The policy also over emphasised that the central government has the responsibility of protecting water sources while according little protection to environmental issues. Most important, private sector potentials were neglected. Most of these deficits have been addressed by the new (2002) National Water Policy. Among other things, the sweeping reforms effected have lead to the review of the Water Utilisation Act. The reforms have also outlined new institutional framework for effective management of water resources, as well as envisages establishment of a strong institutional setup for enforcement of water legislation; water resources exploitation; water resources assessment both quality and quantity; water allocation; pollution control as well as catchment management. The reforms also ensure participation of stakeholders and clear definition of their roles and responsibilities. Steps have also been taken to establish Urban Water and Sewer Authorities (UWSAs) as autonomous public bodies responsible to their own Boards and not to a city or national government body (Water Aid 2001). The Boards are among other things, responsible for setting consumer tariffs. The government i.e. the Ministry of Water and Livestock however, appoints the Board members and provides subsidies to cover operational costs of these authorities.

Besides, efforts to involve other stakeholders especially the private sector have been taken. This includes recent (July 2003) privatisation of DAWASA operations. One of the main roles of DAWASA will be monitor performance of the Private Operators and implement community water supply and sanitation projects in areas not assigned to Private Operator. The city council has taken measures to issue contracts and licenses to private companies and individuals to provide water supply and waste collection services. Since the launching of the new Water Policy, water has been considered an economic good for which consumers are required to pay their consumption. The new policy advocates establishment of community level water users associations and groups (URT 2003:23 – 25), as well as full participation of

beneficiaries/ stakeholders in planning, construction, operation, maintenance and management of community based domestic water supply schemes. It also recognises the changing role of the government from service provider to that of co-ordination, policy and guidelines formulation and regulation.

Apart from the Water Utilisation (control and regulation) Act (1974) as amended in 1981, there are also other water and sanitation related laws and policies. These include:

- *National Environmental Policy (1997)*
This inter alia aims to achieve sustainable development through use of natural resources and safeguard of the environment. The policy focuses on the satisfaction of basic needs of the citizens with the cognisance on protecting the environment.
- *National Human Settlement Policy (2000)*
Among the key concerns of the policy is to improve the level of the provision of infrastructure and social services for sustainable human settlement development. Infrastructure and services are considered back-borne to economic and development activities.
- *The National Environmental Management Council (NEMC) Act (1983)*
NEMC is the national advisory body responsible for coordination and stimulation of national environmental management matters and the prevention of pollution and damage. The council is therefore responsible for specifying standards, norms and criteria for quality of the environment and proposals for legislation on environmental issues.

In 1997, new legislation was passed creating separate Urban Water Supply Authorities (UWSAs) in each of the 18 smaller urban centres. UWSAs are supposed to be autonomous public and self financing institutions.

Besides, according to the Poverty Reduction Strategy Paper (PRSP), water supply and basic health are among the 9 strategic poverty reduction sectors and activities outlined in the 3-year medium term poverty reduction and growth strategy. Others are primary education, rural roads, agriculture, HIV/AIDS, enhanced business environment for private enterprise and improved governance. In this regard it appears that the state has taken a step towards the right direction to improve potable water supply.

As regards sanitation, the policy has focussed on the transfer of sewerage services from the Local Municipal Authorities to the Urban Water and Sanitation Authorities (UWSAs). On site sanitation remains a household 'self provision' action, which is subject to sporadic regulation by the health departments of the municipal authorities. Therefore, at present there exists no policy regarding on-site sanitation. Pointed out earlier, following the privatisation of DAWASA, two water supply and management system are proposed. The private system managed by the Private operator the city water services and the community and water sanitation system programme to be managed by DAWASA.

The Community Water Supply and Sanitation (CWSS) component of the CIP (2002 – 2005) will mainly focus on supporting community-based initiatives in water supply in low income communities. Implementation of CWSSP is a specific intervention intended to ensure that the DWSSP adequately takes aboard low income household under a minimum WSS service level strategy. This involves development independent water supply distribution systems supplied from point sources (i.e. boreholes or wells) or a bulk water supply from DAWASA distribution system and on-site sanitation systems. The (CWSS) project envisages establishing institutional arrangements for sustainable operation and management of water supply in low income areas including peri urban areas. It will also support community sanitation sub-projects in housing neighbourhoods with no access to sewers. The key components are:

Community outreach, Participatory Hygiene and Awareness Creation Programme include raising community awareness about hygiene in respect of cholera and other water borne diseases.

Planning Construction and operating sustainable water supply and environmental sanitation sub-projects, this includes institutional development, technical assistance and training programme.

The IDA and AfDB Financial assistance to CWSSP schemes is limited to US\$20 per capital with a ceiling of US\$ 50,000 per sub-project i.e. per community project. This will cover equipments (pumps and pipes) and construction. DAWASA expects that a total of 50 water supply and sanitation schemes will be implemented in the city. Specialised NGOs will be appointed to work with local communities in identifying needs, design and implementation of their projects and train community groups to manage WSS services¹⁴. Fees for the NGOs will be limited to 25% of the supply and construction costs with a ceiling set at US\$ 12,500 per scheme or community project. Community groups will be responsible for overall management including maintaining CWSS schemes, ensuring equitable distribution to community members and keeping records on technical and financial matters and reporting the same to DAWASA. CWSSP will be implemented through participatory approaches where local communities are expected to closely work with NGOs and participate in all stages of projects. They are also required to contribute at least 5% of the estimated construction costs. It is not certain or clear whether or not the two study areas will be covered under the 50 CWSSP schemes. However, from the discussions held recently with the Water Aid Project Manager, it unlikely that the US\$ 50,000 will not be sufficient to cover improvement of both water supply and sanitation. Presently costs for providing a community with water (bore hole, pump network and reserve tank) is about US\$40,000; subsequently it is likely that the target to cover 50 communities will not be achieved. On the other hand in the case of Tungi, additional finances will be provided, the system being developed by Water Aid could be extended to cover most areas.

DAWASA will be responsible for procuring some of the materials such as pumps, control panels, pipes and fittings, whereas NGOs will procure other materials including aggregates, cement, timber etc. as well as supervise the construction on behalf of DAWASA.

The new institutional setting is summarised on figure 2 and 3.

3.6 Social Political Aspects

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

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

There are two or three factors which, in the case of Tanzania led to the privatisation of water supply. On the one hand is the for an alternative and better manager of WSS services following persistent failure by DAWASA to meet growing demand for water supply in the city. In this regard, customers fatigue with level of service provided by DAWASA forced the government search for other options. On the other hand, there has been pressure from above or outside, particularly exercised by multinational organisations such as the IMF. Kjellen (2002) citing afroe.com (2001) reports that review conditions attached to loans for 40 countries Tanzania included had condition of water privatisation or full cost recovery attached to IMF loan agreement. At macro-economic reform level, it is also worthy note that the GoT has been

¹⁴ Water Aid is one of the NGOs which has been appointed to assist and work with communities under the CWSSP schemes (Discussions with Water Aid Manager 19th November 2003).

privatising in order to get rid of loss-making parastatal organisation, so far more than 75% the over 400 parastatal organisations have already been privatised.

The process of privatising water services started in 1997 and was only accomplished in 2003. This is after several failed initiative including an attempt for a joint venture between government and private operate. Initial bidders including seven international companies which bided in 1998 failed because they did not fulfil the requirements. In some cases privatisation of the water sector failed government did not have the cash required as equity. At the end of 1998, the government decided to lease to a private operator and restructure DAWASA. In 2002 rebidding only one company met the conditions. In February 2003 a ten years lease contract was signed, while handover of the operations started in July 2003 (Kjellen 2003).

As a result of the privatization of DAWASA, Dar es Salaam Water Supply and Sanitation Program (DWSSP) was established.

In many urban communities, the division of labour at household level follows traditional social norms. Therefore, collection, storage and use of water for domestic purposes are mainly the responsibility of women. Women and children travel long distances and queues to get water. An exception exists among few middle and high income households in that some males use light trucks for fetching water.

Public sector reform in Tanzania including involvement of the private sector in water supply especially privatisation of DAWASA operations is an issue that has and is still being discussed at various organs. Some pressure groups have particularly challenged privatisation strategy arguing that it will adversely affect the poor and accentuate problems arising from water shortage among the poor. Others have noted that this will improve water and sanitation services in the city. It is too early to judge what the outcomes of the privatisation of DAWASA operations will be, however, given the pathetic conditions of WSS services available in most areas occupied by the poor including PUI areas, and the financial resource implications necessary to significantly improve WSS the concerns by pressure groups seem justifiable.

Social and Political Conflicts around WSS

For decades water supply and sanitation services provided by DAWASA have been poor and unsatisfactory, subsequently various conflicts have emerged, these include:

- Refusal by customers to pay bills for water ostensibly because they are billed even when their taps have been dry for months or years. The author confessed that he has been receiving bills for the last seven years for his undeveloped plot, even though water ceased to flow and tap was uprooted at least ten years ago.
- Poor quality services including intermittent water supply or supply of muddy water. Many customers have suffered ill-health and in turn accused DAWASA of failure to meet users' expectations.
- DAWASA has also failed to provide secondary lines in the new housing neighbourhoods. Besides, service lines connection process is bureaucratic and inefficient. Many a time an applicant has to negotiate with the inspectors oil the wheels if ones application has to receive prompt action. There are also allegations that DAWASA exercises discrimination against the poor in low income unplanned settlements in providing water and sanitation services, many poor contend that the middle and high income areas receive priority during rationing periods while the poor are left to fend for themselves.

4. CONCLUSION

The rapid population growth, coupled with sprawling nature of urbanisation in Dar es Salaam city underline the demand side of the WSS. Declining public resources capacities resulting from weak billing and revenue collection, an outdated tariff structure, and chronic under-investment for the past 20 years, occasioned by escalating provision costs, leakages, poor records and high operational costs and most importantly, disregard of stakeholders role in the provision and management explain failures on supply side, at the same time, underline the challenges facing the on-going reforms and stakeholders in WSS in general. The critical issues which emerge from this review are:

Water and Sanitation

- Given the magnitude of the WSS deficits alarming urbanisation trends and increasing urban poor population particularly in the PUI areas of the city which do not have access to safe potable water and sanitation services, the present options to be pioneered by the Private Operator (CWS) and the Community Water Supply and Sanitation Programme (DAWASA) PGA are unlikely to cope with the rapidly expanding PUI informal settlements. This is particularly because there are quite few NGOs with the capacity to support in WSS improvement and undertake the immense capacity building tasks outlined in the CWSSP protocol.
- Privatisation of DAWASA WSS system is a part of the global trends and sweeping socio-economic and political reforms which have been taking place in the country starting from the mid 1980s. In the case of WSS, public sector inefficiencies coupled with unmanageable government fiscal burden, seem to have been some of the main driving forces. One of the major challenges which the new system has to address is how to reconcile social-political interests (viz. water is a social good) economic realities (consumers have to pay costs for what they consume).
- The privatisation of some of the DAWASA operations presupposes that chronic problems such as water leakages, unauthorised connections and poor billing problems will be checked out within a reasonable time if the business interests of PO are to be met. Poor records keeping (data base) of consumers and informal nature of the urban land development in Dar es Salaam appear to be serious impediments.
- Even though the poor appear to be more willing to pay for improved and reliable WSS, the question is how much are they ready willing to pay. This is a critical consideration because of the increasing poverty among many urban households.
- The consensus seems to be that the Private Operator will operate efficiently, in turn increase water quality and quantity. The new roles and position of DAWASA are no doubt demanding and presuppose existence of strong and effective capacity to supervise, closely monitor and regulate POs.
- Majorities of the city residents including those living in most peri urban informal housing do not depend on the formal WSS supply system managed hitherto by DAWASA. Because of chronic problems associated with inaccessibility to WSS services, they have opted for other non-conventional options, some of most of which constitute public health risk. Majority of PUI depend on boreholes and traditional water sources, only a small fraction can afford water supplied by the water vendors. Similarly sewer system is largely underdeveloped only 10% of the population in the city is connected. About 90% use pit latrines (low-income households), the rest depend on central sewer and septic tanks (medium and high-income households). It is unlikely that DAWASA-PGA, can improve WSS in the teeming PUI without building on the existing systems. The concern here is that so far the reforms have focused on the introduction of new systems (i.e. CWS and CWSSP) without attempts to examine the potentials of the privately managed non-conventional bore hole systems providing WSS in many PUI areas such as Tungi. This seems to be an omission that might undermine the success of the CWSSP. The private actors in WSS especially those

who have developed a networked (piped) system are filling in a substantial part of the WSS deficits in the PUI.

- A mechanism for ensuring equity in WSS provisioning particularly among the very poor, who cannot afford charges for water has to be explored in a city which is primarily informal and largely not structured economically and socially. The major challenge here is not only how to identify the very poor who cannot afford WSS tariffs and how the costs for covering their consumption can be met but also how to handle possible political repercussions arising from providing basic service such as water on the basis of socio-economic categories of users.
- Some local communities have organised themselves under CBOs, sometimes with donor support to set-up own locally managed water supply systems. The CWSSP programme intends to ensure that beneficiary community fully participates in the WSS improvement in their areas. The major challenge however is how to ensure efficient management of the system once, it handled over to the local communities. This is also the major concern of the leading NGO on water sector, Water Aid. Authors' experience in a water project be implemented with a community (Hanna Nassif Project in Dar es Salaam) leads to the same concern.
- Under the new arrangements the CWS is a system managed by professionals while CWSSP is ultimately administered by the community itself. While the arrangements appear reasonable and attractive particularly in term of empowering communities to manage their system, the question regarding quality control of the WSS managed by the community vs. the CWS cannot be ignored. This a challenge which has to be addressed also

Poor WSS Service and Options for the Low Income Households

- Low income households have suffered most as a result of poor WSS services provision by DAWASA. For instance, they spent a higher proportion of their income on water compared to higher income households. Some households spend a lot of hours searching for or queuing for water. Those living in areas where they have access to water from wells, risk health problems because of contamination or use of saline water. In short, because the poor pays dearly, poverty is accentuated.
- There are no mechanisms for monitoring or regulating activities of small water vendors or waste collectors. The implications of this are costly, particularly for the poor.
- The most dominant sanitation system namely pit latrine represents an option that is easily accessible and affordable by low income and poor households, especially those living in PUI-where plenty of land exists for digging latrines. This is likely to remain the main option for poor households, despite imminent public health and environmental problems.
- Most households in informal or unplanned areas do not dislodge their pit latrines. When a latrine fills up, a new one is dug or a system referred as "*kutapisha*" is deployed to empty the filled up latrines. Either option represents environmental and public health problems as housing densities increase. Again the poor suffer most.
- Water vending, particularly by small operators, is an important sector not only because it is supporting the low income people or filling the public sector deficit, but more important this is a source of employment for many young people as well as households involved in water vending.

On going Reforms

- On going reforms guided by the National Water Policy (2002) envisage decentralised participatory WSS planning, implementation, operation and management. Critical issues concerning users participation, ownership and roles in the WSS improvement have been underscored. The question, however, is how can WSS sustainably be improved amidst increasing household poverty and other contextual problems outlined.

Further, what institutional reforms and structures, including re-orientation of the management instruments, are necessary to ensure improvement of WSS.

- One of the major challenges is therefore how to improve WSS, particularly among the low income households in the PUI, who are presently fending for themselves and thus increasingly under threat, socially and economically.

There is no doubt persistent poor performance by DAWASA, especially increasing failure to provide sufficient and reliable water supply and sanitation services coupled with the inability to maintain existing systems call for search for alternatives and intervention. Commensurate with the reform on-going in other public sector areas, privatisation has been adopted. According to the agreement, the POs will focus only on a section of the city population, primarily those who are easily accessible and can pay. The WSS improvement for the majority, especially poor households, will be undertaken by DAWASA-PGA under Community Water Supply and Sanitation Programme. There are politically motivated statements that poor urban households will be given water for free. What resource capacities DAWASA-PGA has to meet the expectation of the poor as well as how to identify the poor in situation where incomes for most households are largely informal remain unresolved challenges.

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