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POVERTY REDUCTION AND ENVIRONMENT AND ENERGY

**SERVICES AND SUPPLY CHAINS: THE ROLE OF THE DOMESTIC  
PRIVATE SECTOR IN WATER SERVICE DELIVERY IN TANZANIA**





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# **Services and supply chains: The role of the domestic private sector in water service delivery in Tanzania**

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**United Nations Development Programme**

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# CONTENTS

<i>Content</i>	<i>Page</i>
List of Acronyms and Abbreviations	vi
Executive Summary	1
1. Introduction	2
2. Background and context	4
3. Methodology	8
4. Small-scale water vendors: Types and organization	10
4.1 Fixed-point vendors	10
4.2 Mobile vendors	10
4.3 Supply chains	11
5. Water vending business models and the market for water	12
5.1 Non-mobile vendors	12
5.2 Mobile vendors	14
6. Prices, price-setting and revenue	17
7. Affordability, reliability and safety of small-scale water supply services	19
7.1 Targeting low-income households for improved access to water	20
8. Regulatory issues	22
9. Policy recommendations	23
9.1 Strengthen capacity of the utility	23
9.2 Shorten supply chains	23
9.3 Target the private sector	24
9.4 Support community provision	25
9.5 Learn from existing water delivery models	25
10. Conclusion	26
References	27
Annex A: Context and background	29
Annex B: Subcontracting water services to the private sector	31
Annex C: Dar es Salaam water sources	33
Annex D: DAWASCO	34
Annex E: Water access in Dar es Salaam	36
Annex G: Profiles of research districts	38
Annex F: Water tariffs	40

## LIST OF ACRONYMS AND ABBREVIATIONS

CBO	Community Based Organization
CDS	City Delivery Services
DAWASA	Dar es Salaam Water and Sewerage Authorities
DAWASCO	Dar es Salaam Water and Sewerage Corporation
DUWSAs	District Urban Water and Sewerage Authorities
EWURA	Energy and Water Utilities Regulatory Authority
MDG	Millennium Development Goal
NBS	National Bureau of Statistics
NGO	Non-governmental Organization
OECD	Organisation for Economic Co-operation and Development
PER	Public Expenditure Review
SWAp	Sector Wide Approach
UWSAs	Urban Water and Sewerage Authorities
WSDP	Water Sector Development Programme



## EXECUTIVE SUMMARY

Private water vendors provide a means by which households without an individual piped connection to the utility network access water across Tanzania's capital city — Dar es Salaam. Perhaps surprisingly, the most expensive water originates from a public utility tap. This is because the water is transported by vendors, and the long supply chain translates into substantial mark-up on price. In terms of quality, users of transported water cannot be classified as having access to 'safe' water, as defined in Millennium Development Goal (MDG) terms. This is mainly to do with the fact that quality is not monitored between the source and the end user. Households in Dar es Salaam describe that much of the borehole water is too salty to drink, and they therefore prefer — and pay a premium for — utility water delivered by mobile vendors. Paradoxically, then, the poorest end users pay a higher price for water that does not qualify as safe or 'improved'. This raises questions about the conceptual accuracy of present definitions of 'access' to safe drinking water.

Policy intervention is urgently required to address the inequality in access to safe water. Ultimately, comprehensive coverage by a responsive public provider is required. Meanwhile, immediate options include: 1) Support for the private sector. This could include providing finance to strengthen small-scale piped networks and treatment to improve water quality; 2) Support for community provision. This approach may provide water more cheaply than private vendors with less rent extraction; and 3) Learning from the private sector. Where low-income areas lack piped water infrastructure, an option is for the utility to provide water via its own tankers so that quality could be assured and revenue would reach the utility, and possibly fund future infrastructure investments.



## 1. INTRODUCTION

This report presents findings from a review of the service activities of informal private water vendors in Dar es Salaam. Tanzania's capital is a rapidly growing city, and around 70 percent of the population lacks proper housing and lives in informal settlements. Large parts of the city remain unserved by the water utility and many of those who have access to the piped network suffer from intermittent supply. As a result, small-scale private water vendors provide an essential service for many, in particular low-income households in the city.

Based on a small-sample survey of the operations of small-scale private vendors, the report finds that this segment of Dar es Salaam's water sector considers water selling a business, just like any other. Vendors have shown agility in responding to gaps in public provision, and provide water in areas that would not otherwise be served. Yet, the overall result is an extremely costly service which heavily penalizes low-income households. The system that has evolved is highly fragmented, with some lengthy supply chains and a markup on prices at each stage.

Interviews with vendors, community leaders and end users in three districts of the city demonstrate that some low-income households located far from the utility infrastructure are buying water at the end of the private supply chain at a price equivalent to over US\$17/m<sup>3</sup>.<sup>1</sup> This is almost 30 times the price paid by those who have a household connection to the city utility's piped network (US\$0.59), and 17 times the average price paid per cubic metre in Organisation for Economic Co-operation and Development (OECD) countries (Foster and Briceño-Garmendia, 2010). The poorer households pay such high prices not because they can afford to, but because there is no alternative. Water is an absolute necessity which has to be given priority in household spending.

The study looked in detail at the different types of small-scale private providers and recorded considerable diversity among them. Each type faces unique operational challenges, and cost profiles vary according to the nature and scale of operations. For end users, this translates into a large variability in water prices. Tariffs charged by private vendors escalate the more transportation is involved and the longer the supply chain. Prices are also higher for water sold in smaller quantities. Those who live furthest from the piped system and lack storage — typically low-income residents in informal urban or peri-urban settlements — pay the highest prices.

Looking at the interactions between different private water sellers, this research finds that vendors tend to cooperate with each other rather than compete on price. There was some non-price competition observed among non-mobile vendors. Rather than attempting to undercut each other, mobile vendors gain greater benefit from mutual support. Maintaining a reliable service for regular customers was of greater value than trying to increase market share by lowering prices and risk losing the assistance of other vendors.

It also emerged that the distinction between water sources and types of end user is not clear-cut. It is often assumed that low-income households use water from kiosks and boreholes while piped utility water is used only by the relatively wealthy. However, this research found that low-income households were paying a premium to access utility water delivered via various third party providers. Kiosks were often not functioning and borehole water was considered to be of poor quality. This has created a situation, where end users are paying a high price for vendor water that does not qualify as 'safe' under the MDGs. On top of that, this water is usually much more

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<sup>1</sup> The Tanzanian Shilling has been converted at the rate of 1,447 to the US dollar, the official rate on 14 December 2010 ([www.xe.com](http://www.xe.com)).



expensive than, for instance, water from a protected borehole, which is considered to be safe in MDG terms. This finding suggests that further research is needed to properly define what it means to have ‘access to safe water’.

Private water vendors present a policy challenge. Despite their important role for water access in the city, the majority of small-scale private providers — apart from those licensed to sell utility water from a designated tap — fall outside the scope of regulation. Quality is not monitored and price is set at the vendors’ own discretion. They provide an essential service to a large proportion of Dar es Salaam’s residents and support livelihoods in low-income areas. At the same time, they are a manifestation of a vastly inefficient system that is fragmented, individualized and extremely regressive. In the long term, the findings point to the need for a coherent, inclusive and socially responsive public utility that provides safe drinking water to all residents of the city. For the short term, this report considers policy measures targeting small-scale water vendors, which could contribute to lowering prices and improving physical access to safe water for low-income communities.

This report is organized as follows: Section 2 presents the background to the current water supply situation in Dar es Salaam, reviewing the history, policy and institutional framework in place. Section 3 sets out the methodology for the research. Section 4 gives an overview of the different types of small-scale water vendors operating in Dar es Salaam. Section 5 analyses the business models of the different types of vendors making up the supply side of the water market. Section 6 looks at the demand side of this market, and provides an analysis of the effects of small-scale water vending on low-income households. This is followed by an analysis of the affordability and quality of drinking water available to low-income households in section 7. Section 8 takes a look at problems involving the regulation of water supply, both public and private, followed by policy implications in section 9. Section 10 concludes the report.



## 2. BACKGROUND AND CONTEXT

The United Republic of Tanzania is rapidly urbanizing. The population of Dar es Salaam is expected to reach nearly 3.5 million by 2015 — up from 2.5 million in 2002 (NBS, 2008). This rapid increase in Dar es Salaam's population has led to increased demand for basic services. At the same time, urban growth has largely been associated with an expansion of informal settlements. The great majority of the city's population lives in unplanned and informal settlements, lacking access to appropriate basic services and housing. City planning has so far failed to identify solutions to the challenges related to recognizing and meeting the needs of slum dwellers. In 2000, public reform led to the decentralization of the Dar es Salaam City Council's service operations into three municipalities — Kinondoni, Ilala and Temeke.

Responsibility for providing water supply and sewerage services in the country rests with the Ministry of Water and Irrigation. The Ministry has produced a series of sector policy and strategy documents since the early 1970s. The latest National Water Policy (2002) has a target of providing universal access to safe water and sanitation by 2025 with the involvement of communities and the private sector (URT, 2002). This reflects a changing policy approach, with the government's role shifting away from the direct provision of services to coordination, policy formulation and regulation (URT, 2006).

As part of the government's commitment to decentralization, 20 Urban Water and Sewerage Authorities (UWSAs) were established across the country with 107 District Urban Water and Sewerage Authorities (DUWSAs). Performance in some of these authorities has improved since reform, but even the best performers are unable to cover capital expenditure. Rather, they continue to rely on the central budget. The share of foreign funding in the water sector has also increased substantially in recent years. Around 75 percent of the 2007–2008 water sector budget was foreign-funded, making water sector development highly dependent on donor support. In response, the Government of Tanzania has adopted a new Sector Wide Approach (SWAp) to coordinate donor funding. However, demand for finance far outstrips supply.

In Dar es Salaam, two public sector institutions are officially responsible for the provision of water and sewerage services. The Dar es Salaam Water and Sewerage Authority (DAWASA) is the owner of the city's water supply infrastructure. Meanwhile, the operational management of supply has been delegated to a public utility, Dar es Salaam Water and Sewerage Corporation (DAWASCO). This institutional framework is the outcome of a failed attempt at a full-fledged privatization of the city's water sector (de Waal and Cooksey, 2008). DAWASCO was established following the cancellation of the contract between DAWASA and the foreign-owned private utility City Water Services Ltd. in 2005. There has been very little subcontracting of activities to the private sector since (see annex B).

Nearly 90 percent of the city's formal water supply originates from the Ruvu River, and the rest is provided by DAWASA boreholes (see annex C). Total water production for the city comes to around 300,000 cubic metres a day — although approximately half of this is lost through leakages. At the same time, demand (including industrial consumption) is nearer to 400,000. There is some new investment taking place with the World Bank-financed Dar es Salaam Water Supply and Sanitation Programme, which is upgrading the network and supporting some community projects. In addition, the Millennium Challenge Account is funding ongoing projects to upgrade the Lower Ruvu treatment plant as well as specialized capacity-building for DAWASCO. However, as is the case with the rest of the country, there are not enough funds to meet demand for investment. DAWASA is unable to recover its



costs, and continues to rely on subsidies from the Ministry of Water and Irrigation for operations and maintenance costs as well as capital investment (Van den Berg et al., 2009).

Much of the infrastructure in the city was established during colonial years, more than 30 years ago, and is located in the city's more affluent areas (Bourque, 2010). There is a north-south divide in water access in Dar es Salaam largely because the main water sources, the Lower and Upper Ruvu treatment plants, are located north and west of the city (Kjellén, 2006). Figure 1 shows the distribution of the DAWASA piped network. The purple shaded area to the north is served by the Lower Ruvu and the yellow shaded area to the west of the city receives water from the Upper Ruvu. Other shaded parts receive water from a water treatment plant in Mtoni and a number of boreholes.<sup>2</sup> The map shows large areas that are not shaded at all, and these receive no direct service from the formal piped network. According to DAWASA, only a quarter of the city's residents receive piped water (URT, 2010b). In the absence of sufficient quantities of safe water, the high-lying areas and those farthest from the Ruvu River suffer most in times of shortage (Kjellén, 2006).

**Figure 1: Dar es Salaam Water Network service coverage map**



Source: DAWASCO.

<sup>2</sup> The Mtoni treatment plant is the only water source supplying the southern part of the city. Although the plant's capacity has increased since it was built in the mid-1950s, this is still insufficient to satisfy demand.



Throughout Dar es Salaam, water supply is highly unreliable. Breakdowns in water production, power interruptions and decaying pipes are among the critical problems facing the water sector. Spaghetti networks are common. They form a tangle of long, small-diameter and often low-quality pipes connecting individual households each to the main pipes, legally and illegally. The net impact is reduced pressure in the system, leading to intermittent supply. Because piped and unpiped modes of water provision are highly interlinked, this does not only affect connected households. Kjellén (2006) describes water access as an archipelago with urban reticulation systems concentrated in 'islands', rather than a coherent network. The areas in between rely on the serviced islands by means of alternative, primarily non-piped, distribution systems that include private water vendors.

Since taking over management of the city's water in 2005, the water utility DAWASCO has introduced new organizational systems, designed to improve efficiency.<sup>3</sup> Under this model, the company's activities are divided into 12 areas of operation; four per municipality. Each operational area is semi-autonomous, and is administered by an area manager who is responsible for water distribution, revenue collection and customer care services. Performance results are recorded by area and published each month (DAWASCO, 2010).

Despite these institutional changes, overall performance of the utility remains below target (see annex D). In 2008/09, DAWASCO failed to meet more than half of the targets set out in the Lease Agreement with DAWASA (EWURA, 2010). Non-revenue water, for example, was estimated to be around 55 percent. This poor performance is attributed to a mix of causes, including low metering efficiency, a high level of leakages and substantial illegal consumption (DAWASCO, 2010). Internal organizational challenges facing the company include an unreliable customer database, low institutional and human capacities, resulting in inaccurate meter reading and billing, and low staff morale and motivation. Externally, these problems have translated into a strained relationship between DAWASCO customers and staff, characterized by a mixture of distrust and collusion (DAWASCO, 2010).

About half of all connections are inactive because of a combination of inadequate water supply and disconnections due to non-payment. Increasing the number of active connections is constrained by several factors. There is a common perception among water officials of a low willingness among the public to pay for water. This situation is the product, in part, of illegal consumption and, in part, of the existence of alternative water sources, namely boreholes and illegal connections, which came into existence, in the first place, because of poor public water supply. Additional challenges include the unplanned nature of informal settlements and the existence of so-called 'water pirates' (DAWASCO, 2010), a reference to those who access water via an illegal connection, either for their own consumption or for resale, and those who purchase water from DAWASA at a low (and subsidized) rate and then resell the water via tanker trucks at a substantial markup.<sup>4</sup>

The tariff for metered connections in Dar es Salaam is shown in table 1. For non-metered connections, the tariff is a flat rate and ranges across different locations, from Tshs 15,935 (US\$11) a month in Tabata (Ilala municipality) to Tshs 37,185 (US\$26) a month in Kinondoni. This discrepancy is justified by the authorities based on assumptions about variations in water consumption (EWURA, 2009). According to the official tariff guidelines of the regulator (see section 5), kiosks and public taps are supposed to charge a commercial tariff of Tshs 1,000 (US\$0.69) per m<sup>3</sup>. Operators pay Tshs 858 (US\$0.59) per m<sup>3</sup> to DAWASCO, leaving them with a balance of Tshs 142 (US\$0.10) per m<sup>3</sup>.

3 Consultancy support was received from the Ugandan corporatized utility, National Water and Sewerage Corporation (NWSC).

4 Interview with DAWASCO on 18 August 2010.



**Table 1: DAWASCO tariff scheme for metered connections**

	Tshs/m <sup>3</sup>	US\$/m <sup>3</sup>
0-5 m <sup>3</sup>	637	0.44
>5 m <sup>3</sup> and non-domestic	858	0.59

Source: EWURA, 2009.

New connections are financed by individual households (to cover materials and excavation). In addition, the household has to pay a deposit of Tshs 50,000 (US\$34) for the water meter.<sup>5</sup> In theory, households are not allowed to become connected if they are located more than 300 metres from a DAWASCO supply line.<sup>6</sup> However, in practice, households located even further from the supply line, which can afford to pay the cost of materials, do connect. Many households have done so, some connecting from as far as a kilometre away. This contributes to the spaghetti style network.

It is difficult to estimate with much accuracy the proportion of the population that has access to safe water (annex E). In the latest Water Sector Status Report (2010), DAWASA estimates that less than a quarter of the 4 million-plus residents in Dar es Salaam have a piped connection to the utility network. The rest rely on private vendors. Despite their growing significance, informal water sellers only feature in sector policy as an unfortunate manifestation of the weaknesses of the city's utility. As the report notes, 'Prices are entirely market driven and water quality completely unguaranteed. Clearly this form of private sector participation should be replaced with a public service or at a minimum with effective regulation' (URT, 2010b, p. 54).

While effective regulation and the expansion of the piped water network are indeed the steps necessary to solve the water access problem in Dar es Salaam, in practice these solutions have proven difficult to achieve.

The rapidly growing informal areas are largely outside the reach of utility services. Residents here rely on an extensive network of unregulated private sector providers. Informal water vendors have become more or less permanent actors in the water sector, filling the service gap left by the deficits of the formal water supply system. A study by Wateraid in 2003 estimated that there were about 4,000 such water vendors in Temeke municipality alone. In fact, the expanding market share of small-scale private water vendors faces little threat from improved water and sanitation services (Kombe and Kyessi, 2008). Kjellén (2006) outlines the history of water vending in Dar es Salaam, stating that it was informally privatized a long time ago by way of small-scale private vending. This report discusses some of the key complexities and challenges that have led to this situation.

<sup>5</sup> Interview with DAWASCO Commercial Manager on 18 August 2010.

<sup>6</sup> Interview with DAWASCO on 20 August 2010.



## 3. METHODOLOGY

The aim of this research is to enhance the understanding of the organization and operation of private water providers in Dar es Salaam and the type of services they provide to low-income households. Findings draw on desk research as well as empirical evidence gathered through interviews with private providers and the end users, who rely on their services. The focus of the empirical research was on those elements of water vending that were more easily observable and could be verified. Interviews addressed both supply and demand side issues. This includes the tracing of supply chains from the water source (DAWASCO water point or private borehole), through the different intermediary vendors, to those that made the final delivery to households. Household interviews focused on challenges and obstacles that shape access to water for low-income households. They also revealed some of the coping mechanisms practiced by households in the face of water scarcity. Water tariffs were verified at the different stages of water vending, with buyers and sellers alike.<sup>7</sup>

Three survey locations (Kimara, Tungi and Vingunguti) were selected; one from each of the three municipalities making up Dar es Salaam (see map in figure 1). They were chosen for their diversity in terms of socio-economic profile and water supply characteristics. The expectation was that they would provide a more nuanced picture of what shapes water access for low-income households as well as the community coping mechanisms adopted in response.

**Kimara** is located in the north of Dar es Salaam within Kinondoni municipality and consists of low- and middle-income households. DAWASA infrastructure has been constructed in the area. But, supply and access remain limited, in part because of the hilly terrain. The majority of households therefore rely on DAWASCO's public kiosks or mobile vendors for water distribution.

**Tungi** is located in the south of the city in Kigamboni, Temeke municipality. The community comprises a mix of low- and middle-income households. DAWASA's network has not yet been extended to reach this area. Self-supply of water (deep boreholes and shallow wells) and mobile vendors are the only forms of water provision available to residents in this area.

**Vingunguti** is near the city centre in Ilala municipality and consists predominantly of low-income households. Until recently (1990s), residents in Vingunguti received a regular supply of water from the existing DAWASA piped network. Due to growth in consumption in the northern part of the city, coupled with ageing infrastructure, however, water no longer reaches the area regularly. Local residents now rely mainly on private boreholes and mobile vendors for water supply.

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<sup>7</sup> Our initial approach was to carry out a survey of water vendors and of households to find out about patterns of sales and consumption. However, we revised our approach slightly during the course of the research as a result of emerging findings. In our interviews with water vendors, it became clear that most were reluctant to share information, particularly regarding their income and costs associated with vending as well as their income from other sources. While they gave us values for these in some cases, our view is that they cannot be regarded as reliable. Furthermore, interviews with households demonstrated that, while there was variation across the city, in a particular area, very similar stories were repeated with regard to issues of water access. We found that those who were suffering higher levels of deprivation sometimes tended to put a positive face on difficult circumstances. Thus, some of the interviewees, who spent considerable time and money obtaining water would describe themselves as satisfied with the water delivery system. After 10 interviews in each area, a decision was made to use more resources to interview vendors to cover the range of vendor activity, checking their responses against what we had learned from households. Given that some of the information provided to us was of questionable quality, our research angle shifted.



In each of the survey locations, initial meetings were held with the local council at the *mtaa*<sup>8</sup> level to learn about local water issues and to seek advice on where to start the research. The researchers were accompanied on interviews by a member of the local *mtaa* council. This council member highlighted areas and issues that were of particular interest following the initial discussion in the *mtaa*. The sampling process was not random. The researchers were directed by the council member to primary-source vendors and, from there, to mobile vendors. A total of 30 households and 23 vendors were interviewed. To strengthen the validity of the findings drawn from this relatively small sample, considerable time was spent confirming them with local community leaders. In addition, the issues regarding water access were found to be common across households in a given location. More details on the methodology are available in annex F.

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<sup>8</sup> The *mtaa* is the smallest governing body in the city. The word is translated as ‘street’ but it is larger than this, typically comprising a few thousand households.



## 4. SMALL-SCALE WATER VENDORS: TYPES AND ORGANIZATION

There are many types of private water vendors in Dar es Salaam. The two main categories are fixed-point and mobile vendors.

### 4.1 Fixed-point vendors

**DAWASCO water points** sell utility supplied water from their tap on a large scale. Some are designated to sell to tanker trucks only. In Kimara alone, there are 17 DAWASCO water points. These vendors receive water via the utility network three days a week, sometimes four. Usually, the days of supply follow a fixed schedule, allowing tap water vendors to foresee when they will be open for business. This also increases the predictability of supply for customers, although DAWASCO in principle can switch off supply on a day-to-day basis, without informing vendors or end users.

**Private boreholes and wells** constitute a key source of access in areas where there is no other water source (Tungi) and where water infrastructure exists but supply is infrequent (Vingunguti). There is considerable diversity in the scale of these operations. Some households have shallow wells in their yards, which neighbours are able to access free of charge. Others rely on a single tap from which they sell water by the jerry can. Some residents in Tungi and Vingunguti operate boreholes on a bigger scale, supporting several taps from which pushcart vendors fill jerry cans for resale. Also in Vingunguti, entrepreneurs have constructed small-scale piped networks, supplying water to several dwellings.

**Water kiosks without a piped connection** sell DAWASCO water even in areas that are beyond the reach of the utility's piped network. These vendors rely on tanker trucks transporting DAWASCO water to fill their 5m<sup>3</sup> or 10m<sup>3</sup> fixed storage tanks. From the kiosks, the water is sold to individuals or to pushcart vendors, who purchase water by the jerry can. This water is much more expensive than water obtained directly from private boreholes, but the quality and taste are regarded by many end users as superior. There were examples of this in Kimara and Vingunguti.

**Community provision** is beyond the scope of this study. In the course of the research, however, two community-based service providers were encountered; one in Tungi and one in neighbouring Ferry. One had expanded considerably to supply 12 public taps as well as 125 in-house connections. It is managed by a Water Committee comprised of eight members, who are elected by the community for a three-year term. The other community-provided service was supplied by a borehole owned by the community. The pump operating the borehole is managed by an individual, who pays a monthly fee of Tshs 5,500 (US\$3.80) to the local council. Because this is a hand-operated pump it has suffered from competition from other boreholes in the area, which operate with electric pumps. In times of power outage — which are fairly frequent — the community-owned pump, however, does well. While these two community projects seem resilient, a third project in a neighbouring ward collapsed soon after its inception.

### 4.2 Mobile vendors

**Water tankers and trucks** distribute water across Dar es Salaam. Tanker trucks are often refurbished fuel delivery lorries that have been cleaned and repainted. Operating under the scheme known as 'water-by-tank', operators may



load their tanks at one of the 23 official water-by-tank water points operated by DAWASCO (see sub-section 4.1). They primarily supply households and offices as well as industries such as steel and soft drinks manufacturers. The tankers usually have a capacity of 5m<sup>3</sup> or 10m<sup>3</sup>. In one of the study locations, Kimara, there are also numerous smaller trucks buying and selling water. These are usually pick-up trucks that have space on the back for three large containers each of which holds one cubic metre (1,000 litres) of water. Some are able to complete five trips in a single day, but an average of three daily trips is the norm. Many take the water to neighbouring King'ong'o, which is virtually dependent on truck deliveries for water supply.

Sometimes, when DAWASCO water is in short supply, tankers and trucks have to drive around the area looking for alternative water sources. If they travel further than usual to obtain water, the vendor may increase the price he charges. Tankers and trucks will sometimes carry river water if they are requested to supply water for construction purposes. There is no guarantee that the tanks are properly cleaned before refilling them with water for drinking purposes. This makes water quality unreliable for end users.

**Pushcart vendors** transport 20-litre jerry cans on pushcarts or bicycles. A single pushcart can carry as many as 30 jerry cans at a time. A bicycle can be loaded with about eight jerry cans. The vendors buy from a variety of water sources (DAWASCO taps, boreholes, water kiosks with fixed storage tanks or trucks) and resell to households. This type of water vending is physically very demanding, as the water is heavy. Pushcart vendors therefore tend to cover shorter distances than tanker and pick-up truck vendors. They gain their competitive advantage from the ability to reach households located in streets that are too narrow for a vehicle to enter. This allows for a much more extensive reach of door-to-door water services into areas that would not otherwise have access.

### 4.3 Supply chains

Table 2 summarizes the different structures of supply chains by which water is transferred from the primary water source to the end user via different types of vendors. The most direct mode of supply is one by which water is transferred directly from the source to the end user, either via a piped connection or collected by a household member directly at the source in jerry-can containers. Some water goes through a single intermediary vendor, such as a tanker, pick-up truck or pushcart vendor, before it reaches the end user. And some households consume water that has been transferred through even more complex supply chains.

The longest supply chains encountered in this research transferred water from utility DAWASCO tap to a tanker to a fixed storage tank, from where it was sold to a pushcart vendor, who transported the water by jerry can to the end user. In summary, the processes by which households rely on the private sector for water supply vary significantly and can include several transfer layers.

**Table 2. Private water vendor supply chains**

Fixed source	Mobile sources				
Borehole/well/ DAWASCO →	End user				
	Pushcart →	End user			
	Tanker/pick-up truck →	End user			
		Pushcart →	End user		
		Storage tank vendor →	End user		
		Pushcart →		- End user	



## 5. WATER VENDING BUSINESS MODELS AND THE MARKET FOR WATER

This section analyses different operational and business aspects of the small-scale private sector for water in Dar es Salaam. The overall findings of the survey are: (i) vendors are a diverse group (see section 4); (ii) the market for water is growing and becoming more sophisticated in parts of the city; and (iii) the interconnectedness of fixed point and mobile vendors create complex supply chains. Borehole water, for example, is delivered by pipes, while utility water is delivered by pushcart.

Private water vendors in Dar es Salaam treat water as an economic commodity. They operate like traders in any other commodity, minimizing costs, charging what the market will bear, responding to the needs of customers, and keeping an eye on their competitors. Water is traded along supply chains as any other good might be, with additional costs and markups along the way. Despite such similarities, the market for water differs across locations. While it is relatively undeveloped in Tungi, it is quite sophisticated in Vingunguti. Here, external entrepreneurs have entered the community in response to business opportunities created by water scarcity. Such 'opportunistic' providers are essential to ensuring access to water for many people, particularly for those at the bottom of the income ladder. Water supply has also created livelihoods for many, and not just for those selling the water: entrepreneurs have employees; they hire trucks and pushcarts; they rent land; they buy storage tanks, pumps and generators and so on.

Water sellers were asked about their costs and revenue as well as the opportunities and threats facing their business in order to understand more about their business operations. However, apart from the cost of water, expenditure and revenue data could not be externally verified. It is therefore not possible to provide a detailed account of the profitability of water businesses. The broad trends and issues facing different types of businesses are, however, discussed below.

### 5.1 Non-mobile vendors

Non-mobile water vending primarily refers to a business model, where water is sold from a DAWASCO tap, or from a private borehole or well. A third variation exists in areas that have not yet been reached by piped utility infrastructure. Here, DAWASCO water is transported by tanker to kiosks that store and resell water from a number of fixed water tanks.

The main cost incurred by DAWASCO water vendors (in Kimara) are bulk water charges paid to DAWASCO. Additional costs incur from keeping the yard clean and accessible for tankers, trucks and in some cases pushcarts or end users.

The water sold by DAWASCO tap water vendors is metered. The utility charges a subsidized tariff per cubic metre, while customers pay per unit of 20-litre jerry can containers. This allows vendors to collect a decent profit. Some vendors were undertaking supplementary revenue generating activities at the site, such as a retail shop or mechanics workshop. DAWASCO tap water vendors in Kimara all sold water at the same price. The price charged was, however, higher than the flat rate specified by the regulator, Energy and Water Utilities Regulatory Authority (EWURA) (see table 1). Both features could be symptoms of collusion in price setting.



While tap water vendors differentiated little in terms of product and price, the businesses differed in other ways to create a competitive edge. DAWASCO vendors cater to loyal customers, for example, by allowing them to jump the queue to reduce the time spent on filling their containers. Pick-up truck operators buying water at these taps indicated that their choice of vendor was not determined by price (as these were consistent across sellers). Rather, preference was given to vendors offering convenience of location and to those who were faster in filling the tanks on the trucks. Otherwise, the main competitive edge assumed by non-mobile vendors is in storage capacity, which ensures reliability of supply. A seller with a large underground storage tank never runs out of water. Vendors without storage, on the other hand, are unable to operate on days when the utility cuts off the water supply.

In Vingunguti — unlike the other study areas — a number of DAWASCO-supplied water points have been established by entrepreneurs from outside the community. They have deliberately targeted the area because high levels of water scarcity provide consistently high demand for water. It is, however, not just lack of water that determines an area's business potential. According to vendors interviewed, this is also affected by the income of the local community, the availability of more affordable alternative water sources as well as local water use practices. One DAWASCO water vendor who had water businesses in two parts of the city reported that operations in one location (Manzese) were more profitable because customers here used his water for everything (drinking, cooking, washing, cleaning). In the other location (Vingunguti), alternative water sources were available. This meant that customers used cheaper borehole water for cooking, washing and cleaning. They only used DAWASCO water for drinking. In summary, private entrepreneurs will find some areas more profitable than others. And they typically prefer locations where they have more market power and where consumers have higher incomes.

Vendors selling water from a private borehole are primarily located in Tungi and Vingunguti. For this type of business, the main expense — after the initial start-up investment — is for electricity use. In Vingunguti, some entrepreneurs have constructed sophisticated piped networks, connecting five or six households to a well. The well also supplies one or more taps, where individuals from households that are not directly connected to the network can fill their jerry cans. Households wishing to get a piped connection have to pay the full costs of pipe-laying and buy a large 500-litre storage tank. They are sometimes charged a one-off joining fee of Tshs 15,000 (US\$10). Borehole vendors charge connected households a monthly flat fee, ranging between Tshs 15,000 (US\$10) and Tshs 20,000 (US\$13.47). Because connections are unmetered the volume of consumption has no impact on the cost of water services.

While supply is unmetered in these small piped networks, it is not unlimited. Some vendors allowed water to flow all night (to fill up households' 500-litre storage tanks). Other vendors provided water to households during the day only. Typically, these vendors do not allow households to resell the water they receive. If a household is caught reselling water, they get disconnected. Apart from these supply restrictions, however, borehole owners have no control over how much water the households consume.

The borehole and well water vendors interviewed in Vingunguti generally reported facing little competition from other vendors. Rather, there were signs of collusion, with the price for borehole water being uniform across the area. Product differentiation is primarily in terms of quality, as groundwater is more salty in some places than in others.

In terms of livelihoods, some borehole vendors reported that they had no alternative income source apart from water vending. Others had various ongoing business ventures. The vendors interviewed reported that water



vending was a good business, providing enough money to cover expenses for food and school fees. There was no systematic record of the volume of sales from the boreholes. Vendors were generally not concerned about how much water they produced or sold. Some reported that they would consider expanding production by purchasing a more effective pump or constructing a second borehole. Such investments are, however, contingent on the availability of capital.

Other factors shaping the investment behaviour of private water providers include available alternative groundwater sources. In Tungi, for example, households can easily access cheap or free water, albeit of a lower quality, from private wells. This limits the returns on private capital investment for water providers and may explain why there have been no tankers or trucks serving the area. Only recently did a single truck start offering door-to-door delivery of jerry cans. This means that the owner of a large borehole, located some two kilometres from the main residential and business area, has become a monopolistic provider of drinking water. Households that depend on borehole water therefore pay a price for drinking water that is much higher than what would have been the case under full competition. The well supplies water to a series of water vending points from which numerous pushcart vendors fill jerry cans for resale. Because the borehole owner in Tungi is a monopolistic provider, he could increase profits by charging a higher price and expanding production further. He could also expand his market coverage further by providing his own mobile services. However, he chooses not to, viewing water production as more of a social project. Charges are kept low and the rate is determined solely with a view to cost recovery. In addition, water is supplied free of charge to a local hospital, schools, religious groups, single parents and poor households.

In some locations that are beyond the reach of the utility network, water kiosks with large bulk-water storage tanks constitute the main source of drinking water. Businesses or individuals buy DAWASCO water from tanker trucks and resell the water by the jerry can. In Vingunguti, vendors buy water in bulk from a tanker truck at a rate of between Tshs 70,000 (US\$48) and Tshs 95,000 (US\$66) per 10,000 litres. Price variability corresponds to the availability of DAWASCO water. Water supplied by tanker trucks is often transported a considerable distance, for example, from Kawe, which is some 25km away from Vingunguti. Water is stored in large tanks (5,000 litre capacity). One vendor said that the amount he buys varies, depending on how much he expects to sell. On a good day he is usually able to sell 5,000 litres. On bad days, however, his sales may be closer to 2,000 to 3,000 litres. The water is sold to individuals and households in units of 20-litre jerry cans at a rate of Tshs 250 to Tshs 300 (depending on how much the vendor was charged by the tanker truck operator). Thus, if on a good day 5,000 litres are sold, the total revenue earned will be in the range of Tshs 62,500 (US\$43) to Tshs 75,000 (US\$52). This translates into a markup of around Tshs 27,500 (US\$19) per day. The main costs for this type of business are the purchase of tanker water and the upfront cost of the water storage tanks which are around Tshs 750,000 (US\$500) each. Each station typically has three tanks. Other costs include rent for the land and salaries.

## 5.2 Mobile vendors

Some mobile vendors distribute water across the city in tankers and in smaller tanks on the back of pick-up trucks. Others transport water by carrying 20-litre jerry cans which are distributed by pushcart and bicycle. Despite differences in the scale of operations, these mobile vendors have some similarities, particularly in the ways they cooperate with each other.



**Tanker trucks** of 10,000-litre capacity fill up at various filling stations around the city. The official rate charged to fill a 10,000-litre tank with water from a designated DAWASCO ‘water-by-tank’ station is Tshs 12,000 (US\$8). But, according to the truck operators interviewed, DAWASCO stations often run dry. This leaves truck operators with two alternatives: they can either purchase their water from a privately operated tap at a higher rate (Tshs 20,000 or US\$14), or fill up their tanks with borehole water for a lower rate of Tshs 7,000 (US\$4.84).

Operators of tanker trucks charge anything from Tshs 45,000 (US\$31) to Tshs 70,000 (US\$48) for a full tank load. There are, however, reports of deliveries for as much as Tshs 150,000 (US\$104) for a single tank load. The main reason for this large price difference is the distance travelled to deliver water. The price is typically fixed between sellers, although truck operators sometimes negotiate prices with their customers on an individual basis.

At the time of the survey, water in Dar es Salaam was in short supply and that restricted the operations of tanker truck operators. Water was not readily available and vendors had to queue up to fill their tanks. This limited the number of trips they could make in a single day, which was costing them revenue. The resulting situation was one of surplus demand.<sup>9</sup>

Vendors selling **water by pick-up truck** in Kimara fill storage tanks of 1 m<sup>3</sup> for Tshs 2,000 (US\$1.38) per tank from a DAWASCO station. By reselling the tanks at a rate of Tshs 8-10,000, (US\$5.53–US\$6.91) they are able to collect a profit of Tshs 6,000–8,000 (US\$4.15–US\$5.53) per tank. With a typical capacity of trucks to transport three tanks at a time, this comes to a profit of around US\$12–US\$16 per trip. Some truck operators reported undertaking up to five trips a day. But, three trips seemed to be the norm. This translates into a daily profit margin of anywhere between US\$36 and US\$103. Out of this, the operator has to pay for truck rental and petrol use. Additionally, this type of business typically requires at least two people to operate well. Many truck drivers operating out of Kimara reported transporting water primarily to neighbouring King’ong’o. Residents here are virtually dependent on pick-up truck vendors for their water supply. Deliveries to the area have increased since the quality of the road has improved. Truck operators fill household storage tanks, but also sell water by the jerry can to individuals and pushcart vendors.<sup>10</sup>

**Pushcart vendors** interviewed paid between Tshs 30-50 to fill a 20-litre jerry can, either from a DAWASCO water point (in Kimara), from a borehole (Tungi and Vingunguti), or from a tanker truck vendor of transported DAWASCO water (Kimara and Vingunguti). They sell this for Tshs 250-400 per jerry can or for as much as Tshs 500 if they have to travel far. This seems like a big markup, but pushcart vending is a time-consuming activity. If it weren’t for the high markup, these vendors might not generate an adequate daily income.

Vendors in Tungi, for example, fill their jerry cans for Tshs 30 and resell them for Tshs 250-300. For a pushcart of, say 30 jerry cans, it will then cost Tshs 900 to fill a full load. The vendor can expect to receive Tshs 7,500 from sales. The associated markup is Tshs 6,600 (US\$4.50) per round trip, but the profit could be considerably less if the vendor has to pay rent on the pushcart — typically charged at around Tshs 2,000 (US\$1.34) a day. Because the water source is some distance from downtown Tungi, it takes 15 minutes to push the empty cart to the water source and another hour to clean and fill the tanks. Finally, it takes approximately 1.5 hours to push a full pushcart load along the dirt road back to town (the weight is around 900 kg) and several more hours to distribute water to customers.

<sup>9</sup> Discussions with water tanker drivers in Mikocheni on 3 December 2010.

<sup>10</sup> One vendor said that he arrives at a specified location and beeps his horn to announce his arrival, and locals come with their jerry cans to buy water from him.



Because a single round trip takes several hours, vendors reported that they could manage a maximum of only two trips a day.

Among mobile vendors generally (tankers, trucks and pushcarts) there seems to be a high degree of cooperation. Vendors reported that there was a single price for water in a given area and that they supported each other. Tanker truck operators would, for instance, phone each other to determine where water was available at a specific source. Both tanker truck operators and pushcart vendors said they would ask another vendor to serve a regular customer for them if for some reason they were unable to do so themselves. Thus, although the vendors are operating as individuals, they seem to be of the understanding that they derive greater benefit from cooperating as part of a group than from attempting to undercut other vendors.

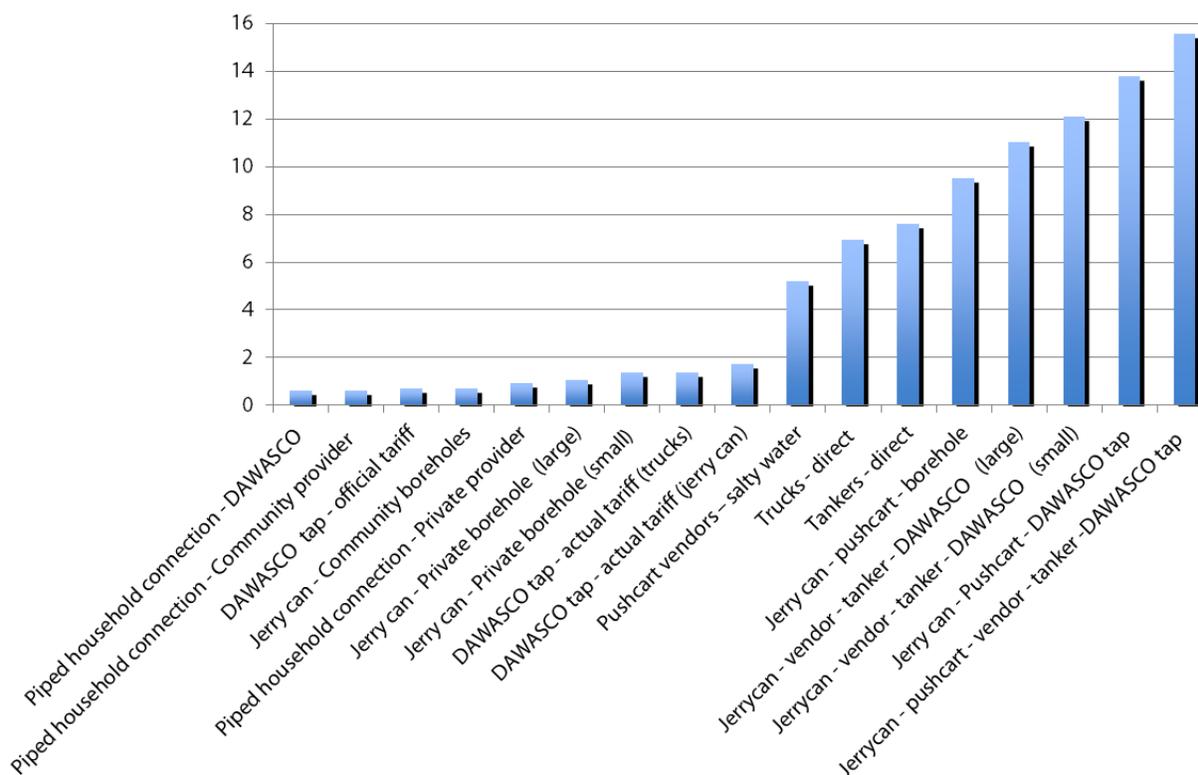
All mobile vendors that were encountered in the research were male, mainly reflecting the physical demands of the job. Water vending provides livelihoods for many in low-income areas and is regarded as a 'good business' but the respondents interviewed were not making spectacular profits. Although pushcart vendors reported that they were able to put aside a small amount of money after paying for rent and food, their work is physically demanding, with many vendors working long hours (Bourque, 2010; Kjellén, 2006). While vendors might understate the revenue they earn from water selling, those interviewed did not seem to be amassing enormous levels of wealth.



## 6. PRICES, PRICE-SETTING AND REVENUE

In each of the three districts, price data was gathered for different types of water vendors (see annex G for more details). Figure 2 presents a comprehensive overview of water rates charged across Dar es Salaam. Rates are presented in US\$/m<sup>3</sup>, ranging from the cheapest mode of water service delivery to the most expensive. Most types of mobile vendors apply a tariff range contingent on location and distance travelled.

**Figure 2. Water tariffs in Dar es Salaam across water vendors (US\$ per m<sup>3</sup>)**



Source: Authors' interviews with vendors and end users.

Figure 2 shows that the cheapest water is obtained from a piped household connection to the utility (DAWASCO). It also conveys that water tariffs for other piped sources (community or private) are not much higher. Similarly, water purchased by the jerry can directly from taps or boreholes is still relatively cheap. Prices start to increase with the introduction of long-distance transportation and multi-layered supply chains.

Water from tankers and trucks is substantially more expensive than water obtained from a piped connection or directly from a fixed-point vendor. For the end user, longer supply chains typically translate into higher prices. The longest supply chain recorded was water delivered by tanker to a storage tank, from which it was sold to a pushcart vendor, who then sold it to the end user. Another trend emerging from the price data is that the tariff per



cubic metre is typically higher for water bought in smaller volumes. Jerry can water is more expensive than tanker water per unit, and water purchased in 20-litre containers is cheaper than when purchased in 10-litre ones. The difference in bulk water capacity between tanker trucks (10 m<sup>3</sup>) and pick-up trucks with three 1 m<sup>3</sup> storage tanks on the back similarly explains the variation in unit prices across these two types of vendors.

Water prices, however, do not only vary across vendor types. Each individual type of vendor also reported considerable price variability corresponding to varying demand and cost profiles. Tanker truck operators, for example, explained that their tariffs vary according to the distance travelled between the water source and the point of delivery. Tariffs charged by pushcart vendors demonstrated the highest degree of variation. Vendors take advantage of local scarcity conditions. The most expensive tariff reported was Tshs 500 for a 20-litre jerry can (US\$17/ m<sup>3</sup>) — almost 30 times the cost of water from a piped utility connection. Among the pick-up truck drivers interviewed — primarily operating locally in Kimara — the reported prices showed less variation.

There is a perception among households that some individuals are making large amounts of money from water vending, but operations and market characteristics are so diverse that it is difficult to generalize. Some kiosk owners reported that vending had enabled them to pay for their children's school fees. One tanker truck operator has managed to build a house for his family with his earnings from water vending.

The market for water does, however, present a potential for high rents to be extracted by private providers. This does not so much apply to pushcart vendors, or to truck drivers, who rent a truck to make three or four deliveries a day. The biggest rents can be earned by those who provide monopolistic services on a large scale. High rents can also be earned by those with several water businesses. Some vendors may be collusive. Many are suspected of being involved with DAWASCO staff in one way or another, which provides additional rent-seeking opportunities. In Kimara, for example, there were complaints that vendors seemed to get water more regularly than households. This led to suggestions that some vendors benefited from a special arrangement with DAWASCO. For a vendor it is particularly lucrative to have water when consumers do not have other means of ready access, thus creating fruitful conditions of both supply and demand for a strong market position. While it was impossible to verify such claims of collusion, they correspond with DAWASCO's own concerns about collusion between DAWASCO staff and certain vendors.

As the market for private water vending develops further, it seems likely that market power will become increasingly concentrated, enabling rent extraction on a larger scale. Furthermore, the collusion between DAWASCO staff and water vendors, conveyed by anecdotal reports, would establish conditions for more extreme exploitation. It may be that existing cartels do not become apparent until there are attempts to challenge them (Kjellén and McGranahan, 2006). For example, there were reports of acts of hostility and violence by vendors opposed to the expansion of DAWASCO kiosks around the time of the attempt to privatize water supply in Dar es Salaam by transferring DAWASA assets to the international consortium City Water in 2003. These acts seem to have been stirred by the threat this posed to vendors' livelihoods (de Waal and Cooksey, 2008).



## 7. AFFORDABILITY, RELIABILITY AND SAFETY OF SMALL-SCALE WATER SUPPLY SERVICES

While the poorest households are paying a very high price for water, this is not to say that water is affordable. Rather, they have no alternative. Some households have already reduced their water purchases to a bare minimum, for example, by obtaining all water for non-drinking purposes from alternative sources.

Consumers interviewed made it clear that water has to be obtained somehow. This means that households adopt coping strategies and a lifestyle that is shaped to accommodate high water tariffs. Many households consume very low amounts of drinking water, while using cheaper water for cleaning and washing. Water is also recycled. Households were asked whether they cut back on their expenditure on water in times of economic hardship, and most replied that they did not. What this indicates is not that tariffs are affordable, but rather that water consumption is already at a minimum and households cannot reduce it any further. A more common coping strategy seems to be a reduction in expenditure on other important household items.

Assessments of the incidence of water poverty often rely on a threshold of household expenditure on water of 5 percent of total household income. This threshold is applied, for example, in the Tanzania Public Expenditure Review (Van den Berg et al., 2009). Our research found that, although many households face high charges for water, few of those interviewed were spending more than five percent of their income on water (the commonly accepted poverty threshold for water). As already mentioned, this should not necessarily be taken as an indication of the affordability of water, but may rather demonstrate the ability of households to adopt effective coping strategies in the face of negative income shocks.

In Kimara, three out of ten households spend more than 5 percent of their income on water. In Vingunguti, the corresponding figure was two out of ten households, while in Tungi, none of the ten households interviewed spent more than 5 percent of their income on water. This is not to say that households are wealthier in Tungi or that water is significantly cheaper. Rather, households here have adopted strategies to manage their water consumption carefully, consuming only small amounts of water of drinking quality. Many consume only borehole water, which is plentiful, but has a high salt content. What these experiences tell us is that conventional broad-brush cut-off measures of water poverty need to be unpacked before judgements can be made about 'water access'. A more appropriate methodology for assessing water access may therefore be to measure water poverty in terms of consumption levels rather than as an expenditure-to-income ratio. UNDP (2006), for example, recommends a minimum threshold for daily water consumption of 20 litres per person.

In the same vein, levels of satisfaction with the reliability water services appeared to be contingent on the prevailing local conditions of water supply. In Tungi, where there is no supply of utility water, and households make careful use of different water sources, the majority said they were satisfied or very satisfied with water services. Meanwhile, in Kimara, where there is greater access to utility water, less than half the respondents were satisfied. Six out of ten were unsatisfied or very unsatisfied. Although the sample is small, interviews with households indicated differences in their perceived situation that may not fit with the actual circumstances. It seems that where delivery is consistently poor and there is no alternative, end users may consider themselves to be better off than in circumstances where the piped supply is available, yet erratic, or some households seem to have regular piped supplies while their neighbours do not. This finding indicates that responses to questions about household



perceptions of the reliability of supply may be informed by the respondents' relative access to services in a local community, rather than by absolute satisfaction levels that can be used for comparisons across regions.

Overall, most households considered the safety of their water to be acceptable, with just two households rating quality as 'poor'. There were complaints that much of the borehole water is too salty to drink, and households therefore tend to prefer — and pay a premium for — utility water delivered by mobile vendors. Paradoxically, then, the poorest end users are paying a higher price for water, which does not qualify as safe or 'improved' in MDG terms. Meanwhile, they are avoiding cheaper water, which according to MDG definitions is considered 'safe'. This raises questions about the conceptual accuracy of present definitions of 'access'.

There is no formal regulation of water quality in Tanzania, but households and vendors indicated that they prefer to obtain water from their regular provider. Some vendors indicated that they would ask another designated seller to serve their regular customers if for some reason they could not. This suggests that a relationship of trust is established between buyers and sellers, and that households have expectations of reliability and, presumably, quality from their regular providers. More research would be required, but this finding suggests that a kind of informal regulation is in place.

## 7.1 Targeting low-income households for improved access to water

The findings of this study demonstrate the agility of the private sector in filling gaps and innovating in response to a business opportunity. However, some private providers offer services, which are expensive, with the burden of high cost falling disproportionately on low-income households. This section considers the survey findings related to government initiatives to target poor households for improved water access, terms of affordability and physical access.

The Government of Tanzania has expressed an increasing interest in ensuring access to water for low-income households in urban areas. The Ministry of Water and Irrigation is currently implementing a study to establish baseline data on water supply and sanitation service levels in low-income areas along with information on small-scale private service providers. The objective is to enhance the pro-poor nature of sector policies and utility operations (URT, 2010b). The latest Water Sector Status Report (2010) provides an update on the 2002 policy goal of improving services to low-income groups. It highlights the fact that, despite subsidies, low-income households pay the highest price for water (URT 2010). Assessments should therefore take actual access rates rather than the size of subsidies as their performance measure.

There are two main factors shaping access to water in urban areas. First, there needs to be adequate bulk water supply in the area. Second, low-income households may need support in gaining access to this supply. Targeting efforts that go straight to the second, for example, providing subsidized connections and community kiosks, without addressing the first, will not be successful. Furthermore, once the first requirement has been satisfied, there may be less pressure to provide the second. Thus, when an area has sufficient water, households may access supplies from neighbours rather than using utility kiosks or paying for their own connections. In order to prevent the development of a two-tier water supply system, a consistent policy focus on equal access is required.

Due to the limited capacity of Dar es Salaam's main water sources, the Upper and Lower Ruvu treatment plants, having a connection to the piped network is no guarantee for securing actual access to water. Both plants are



located in the north of the city. This supply often gets exhausted before it reaches the most distant areas in the network. Thus, in some cases, even where the infrastructure exists, there is not sufficient bulk water (Vingunguti and to some extent the high-lying areas of Kimara). The deficiencies of the bulk water supply also mean that supplies are often intermittent. In such circumstances, a subsidized connection will not improve access. Merely establishing a kiosk will also be insufficient for ensuring reliable access to water.

Elsewhere, there is no infrastructure at all (Tungi). Efforts to extend the DAWASA network to the under- and unserved areas under study here have not yet been effective. Among the current challenges are difficulties in extending water pipes across long distances.

According to the 2010 public expenditure review (PER), tariffs for water need to be increased in order to finance investment and dampen consumption. The 'underpricing' of water in Tanzania is a major concern: Underpricing will result in tariffs failing to cover operation and maintenance costs and result in scarce budget resources being diverted away from expansion to finance basic operation and maintenance. At the same time, low tariffs tend to stimulate higher demand for water services, thus inflating investment requirements' (Van den Berg et al., 2010, p. 62).

Policies to address access for low-income households tend to assume a distinction between those who consume piped water (the wealthy) and those who buy from other sources (the non-wealthy). Presently, most piped water is consumed by rich households. The PER uses this to justify tariff increases. The idea is that poor households should be targeted by charging lower tariffs for standpipe water so that those who receive 'lower levels of service pay less than those that depend on better quality services' (van den Berg et al., 2009, p.xiii).

Our research indicates that a watertight distinction between piped and non-piped water sources may not properly describe reality. For example, DAWASCO water reaches far beyond the tap, with prices increasing with each link in the supply chain. Additionally, data from the National Bureau of Statistics (NBS) indicate that more than 18 percent of the presently unconnected population rely on a DAWASCO water vendor for their water supply (see annex E). More than 50 percent obtain water from a neighbour's piped connection. Thus, an increase in DAWASCO tariffs will affect not just those with piped connections, but the majority of the population, which relies on third parties for their water supply.

Vendors are quick to pass on any increase in costs to end users (for example, if water is transported over longer distances or electricity prices increase pumping costs for boreholes). Similarly, an increase in the DAWASCO tariff will most definitely lead to an increase in the tariff paid by households that depend on water vendors. There is, however, equally the risk that reducing the rate at which water vendors purchase water will simply translate into more rents for the vendors, without any gain necessarily being passed on to end users. The above findings indicate that in order to ensure effective targeting, more careful policy analysis is needed to understand the ways in which low-income households access water.



## 8. REGULATORY ISSUES

Regulation within the water sector is the responsibility of EWURA. But, EWURA only regulates formal water authorities, including DAWASA and DAWASCO (EWURA 2010). Similar to traders and producers in any other informal market, small-scale private water vendors operate in a regulatory vacuum. While they extend water services to areas that would not otherwise be served, these vendors raise a number of concerns, notably related to price and quality. In addition, the market for small-scale water vending seems to suffer from high levels of collusion and corruption, in which DAWASCO staff are complicit.

There are two elements of formal regulation that are supposed to apply to the operations of independent water vendors. But neither seems to have had any tangible impact. First, private vendors — as small businesses — are supposed to obtain a business license in order to operate. In reality, none do (Kjellén, 2006). Secondly, EWURA has attempted to regulate the price at which water is sold by official vendors. In response to the high tariffs charged by small-scale private water vendors, EWURA introduced new tariff regulation in June 2010. A fixed official tariff rate of Tshs 20 for a 20-litre container was established for all public standpipes. However, implementation of the tariff scheme has failed. A study by Uwazi (2010) of 40 randomly selected kiosks found that 15 were not functional and all the remaining 25 charged a tariff higher than that specified by the regulator.

Consistent with Uwazi's report, our own research found that in Kimara DAWASCO vendors interviewed charged a uniform rate of Tshs 50 per jerry can — well above the rate of Tshs 20 (US\$0.01) set by EWURA. This was the case even where vendors displayed the EWURA notice, informing customers of the official (and lower) tariff. Pushcart vendors interviewed at these taps said they knew of no kiosk in the area that charged the EWURA tariff. A further concern raised by Uwazi was that making local authorities responsible for ensuring tariff implementation creates a conflict of interest. Not only are they responsible for ensuring that the tariff is implemented, but they also raise revenue by renting kiosks to operators, who have to charge a higher price for water to recoup the cost of the rent (Uwazi, 2010).

A further regulatory concern with private vendors is that private water vendors have not been formally established as businesses. Consistent with the nature of other business operations in Dar es Salaam they remain largely informal. Traditional regulation approaches would require some kind of registration of businesses. This, however, would be difficult to enforce and may deter entrepreneurs if it means they have to register. One concern relates to taxes. Vendors are also reluctant to formalize because this would require them to engage in lengthy bureaucratic processes (see sub-section 2.1).

These findings suggest that an innovative approach to regulation that is based on the context is required. The failure to enforce the existing regulation raises concerns about the likely efficacy of additional formal regulatory measures. If there are difficulties in regulating the fixed-point DAWASCO vendors, the challenges of regulating mobile vendors will be even greater. Interventions are more likely to succeed the less they rely on bureaucratic procedures. More research is required, as is a piloting of policy measures. Possible interventions include a licensing scheme for tanker truck operators, which meet a certain minimum level of quality standards. In addition, there could be consideration given to bottom-up regulation, for example, where end users are supplied with testing kits to enable them to test the safety of their water themselves.



## 9. POLICY RECOMMENDATIONS

This study has analysed the market for small-scale private water vending in Dar es Salaam. It reveals that small-scale private vendors are filling gaps in provision left by the public utility. But prices are high, the system is fragmented, and provision is selective and guided by profit incentives.

Water is increasingly traded as an economic good. This implies a high scarcity value for the poor. They treat a 20-litre container of drinking water with great care. In contrast, those who rely on piped connections to fill swimming pools, and who pay a fraction of the price paid by poor households for their water, value water differently. In a market system, access to water is based on purchasing power, rather than need. Such a delivery system fails to honour the principles formulated in the July 2010 UN Resolution, which recognizes access to clean water and sanitation as a human right.<sup>11</sup>

In the long term, the findings of this study point to the need for strengthening state capacity. This should ensure the creation of a comprehensive, socially oriented public utility as well as cohesive urban planning, which includes informal areas. Meanwhile, shorter-term measures are needed to improve services for low-income households that cannot afford to wait until the utility is operating efficiently and urban planning is inclusive. A number of relevant policy interventions are discussed below.

### 9.1 Strengthen capacity of the utility

Despite their current failings in reaching the poor, the public utilities DAWASA and DAWASCO are characterized by economies of scale, public scrutiny and a social mandate that private vendors are not. The weaknesses of the public utility in Dar es Salaam have been the drivers of water sector reform since the early 1990s, when private sector participation in the water sector first came on the agenda (de Waal and Cooksey, 2008). For several years, policy was focused on privatization, which was expected to turn performance around. In reality, however, privatization of water provision in Dar es Salaam has led to an already poor situation deteriorating further. Performance is now more closely monitored, but the network suffers severe leakages. Corruption and illegal consumption further hamper revenue collection and, by implication, performance. DAWASCO currently lacks credibility, particularly in the wake of a recent corruption scandal.<sup>12</sup>

Greater attention needs to be paid to the root causes of the public utility's poor performance. These include corruption, low staff morale and weak infrastructure. Without a deeper understanding of these performance constraints, policies will not bring about a strengthening of the utility.

### 9.2 Shorten supply chains

This research clearly demonstrates that the high cost of water associated with small-scale water provision is due not just to private sector markups but also real transportation and storage costs. Multi-level supply chains also tend to compromise water quality. Short-term measures need to be introduced to directly address these issues. Options include:

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11 [www.un.org/News/Press/docs/2010/ga10967.doc.htm](http://www.un.org/News/Press/docs/2010/ga10967.doc.htm)

12 DAWASCO accused of swindling millions via inflated water bills, *Business Time*, Tanzania, 11 February 2011, [www.businessstime.co.tz](http://www.businessstime.co.tz)



**More off-grid provision:** There are challenges in providing bulk water via the piped network to the entire city. Leakages and ‘spaghetization’ as well as rapidly growing urban areas mean that large areas are not serviced by piped supply. In response to this, the private sector and community organizations have established smaller independent piped networks that provide water at low cost to a cluster of neighbouring houses. One alternative to extending the DAWASCO piped network would be to support the expansion of these small-scale piped systems. Implementation could be undertaken either by the private sector, by communities or by DAWASCO.

**Create strategic bulk water supply points:** In order to lower transportation costs for tankers and trucks, consideration can be given to establishing DAWASCO bulk water supply points closer to the areas of demand. This would significantly reduce the distance travelled and possibly cut out intermediary suppliers. The expected net effect would be a downward pressure on price.

**Introduce DAWASCO tankers:** There is a perception that tanker truck operators are collecting large profits from water vending. They receive water from DAWASCO at a fixed (and subsidized) rate. However, the subsidy effect is rarely passed on to consumers. One pro-poor solution would be for DAWASCO to deliver water by means of the company’s own tanker trucks. Alternatively some kind of concession model could be introduced for working with the private sector in order to improve quality and lower the scope for price hiking. Under this system, it would also be easier to ring-fence profits for re-investment in the sector.

### 9.3 Target the private sector

Private vendors play an important role in Dar es Salaam’s water delivery system and cannot be ignored. Despite their significance, however, informal providers have so far typically not featured in sector policy, other than as a symptom of the poor performance of the public utility. The current situation presents a policy paradox: Clearly, a system where poor households pay so much more than wealthy ones for their water is not acceptable. Yet, without the services provided by private water vendors, poor households would be even worse off. In addition, water vending is an important income source for many households living in low-income areas and thus has social benefits in terms of employment and livelihoods.

Policy approaches can either clamp down on private vendors or attempt to simultaneously encourage and improve their activities, for example, by lowering their costs. It may be that different approaches are appropriate for different types of water vending activities. For example, borehole water sellers face issues that are different from those faced by pushcart vendors. And tanker trucks may face an entirely different set of challenges.

A more supportive and enabling environment for private vendors could, arguably, improve the services they provide. McGranahan et al. (2006) recommend improving supply chains for water vendors in order to improve water services for end users. Possible initiatives could include (i) provision of microfinance to facilitate expansion of the services provided by water enterprises; (ii) support for water treatment solutions to improve the quality of water provided by small-scale private providers; and (iii) improvement of relations between the utility and water entrepreneurs in Dar es Salaam.

There is, however, no guarantee that improved conditions for vendors will benefit end users. Even with more market entrants, our research suggests that prices may not fall. Vendors do not — at least overtly — compete on price. There is also considerable occasion for opportunism and exploitation. Providers have an incentive to



cut corners on quality to increase their profits. A distinction would need to be made between well-intentioned entrepreneurs and the ‘water pirates’ mentioned above — something which may be difficult to achieve in practice.

#### 9.4 Support community provision

The community approach is a viable alternative to private sector provision and the associated high cost of water. It could also help fill the delivery gaps of the public sector. But community provision has a mixed record and results cannot be guaranteed. Some community projects are effective while others fail. Being community-run is no guarantee for equitable access.<sup>13</sup> On the other hand, this research suggests that top-down processes are not going to result in improvements in water service delivery any time soon. Thus, policy may be more effective if focused on local solutions.

Often, community management of water services fails because of weak or lacking capacities in the community. Although not the focus of this research, some community projects were reviewed. This was the case where they were operating in the case study areas. One community project, in Tungi, did not last (the motor was stolen). Meanwhile, the Ferry community project has grown and amassed considerable reserves in a community bank account. This project has benefited from existing managerial and engineering capacities in the local community to manage the project.

A possible policy option is to extend the reach of community provision by means of training and mentoring. Representatives of successful and long-established community projects could visit other communities to share experiences.

#### 9.5 Learn from existing water delivery models

The debate on water sector reform tends to become narrowed down to a binary distinction between private and public sector provision. This is usually based on an assumed divergence in the underlying motivations guiding these different types of provision. However, the reality — as this research has shown — much more closely represents a spectrum, including various forms of public-private partnerships.

Motives may be complex. Elinor Ostrom (2005) has analysed the behaviour of entrepreneurs. She says that their motivation is diverse, and includes endeavours (i) to improve services to their own communities; (ii) to share the burden in order to increase benefits; and (iii) to stimulate innovation. Other sources of motivation include the respect entrepreneurs receive (or expect to receive) from others, as well as the income they derive (or expect to derive) from their activities.

To illustrate, this study encountered a private entrepreneur (the borehole owner and monopolistic water provider in Tungi) whose price-setting behaviour was not guided by an attempt to increase sales and maximize profits. Rather, his business decisions were guided by a motive of community support. Such an approach is associated with a different set of benefits and costs. Above a certain level of income, an individual may derive greater benefit in terms of social standing and influence from improving community services than from increasing profits. For instance, local leaders who successfully managed a community project gained more from improving services to the community than from increasing personal income levels. Policy makers need to learn from existing water delivery solutions that have developed organically. By understanding the motives driving different entrepreneurs it becomes easier to affect their behaviour for the benefit of end users.

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<sup>13</sup> See Bakker (2008) for a discussion on common-pool resource management systems.



## 10. CONCLUSION

In practice, the system of water delivery in Dar es Salaam has moved away from that outlined in sector policy documents. First, there has been a shift away from collective state provision as well as from private provision under public supervision. Second, what has emerged instead is a situation of individualization, where households or small community units are responsible for sourcing their own water. This trend is evident in the responses of households, when asked who they thought was responsible for water delivery. In both Tungi and Vingunguti, where DAWASCO supplies are intermittent to non-existent, only six out of twenty were of the conviction that the government or the public utility was responsible for water provision. The majority believed it to be the responsibility of either the community, the individual or private vendors.

As others have argued (e.g., Kjellén, 2006), the system of water delivery in Dar es Salaam is a ‘tragedy of the commons’. The population, acting rationally as individuals, has created a system that is inferior (in terms of the proportion of the population with access to safe water) to one that is coordinated and integrated. This is illustrated by the ‘spaghettization’ of the water supply network and by the proliferation of private water vendors. The resulting system is highly inequitable. The case of Dar es Salaam shows the extreme outcomes resulting from an almost entirely market-driven system of water delivery.

The research findings demonstrate the need for a coordinated sector with a focus on improving conditions for low-income households. For the long term, the findings point to the value of a single, integrated, publicly managed, piped system. Such a system would benefit from economies of scale and can be designed to operate in the social interest.

While there are clear advantages of utility provision, weak capacity may constrain the effectiveness of performance. At present, problems associated with low capacity are pervasive in the system. First of all, the utility needs capacity strengthening. In order to address the multiple deprivations prevalent in informal settlements, a more general strengthening of the public sector institutions is required.

Until the utility’s capacity reaches the required threshold, alternative delivery models need to be recognized for the potential benefits they can offer the city’s residents. In the short term, therefore, innovative solutions are needed. Service delivery options vary across different areas. So do the quality of service delivery and conditions of water supply. Different areas have access to different quantities of groundwater resources and may be located closer to or further from DAWASCO’s piped network. One community may be effective at managing its resources while another lacks capacity. Similarly, some private vendors may be efficient and consumer responsive, while others are collusive and exploitative. Policy approaches need to be responsive to conditions on the ground. This includes taking into account existing models of water service provision that have developed organically.

A precondition for designing successful policies is that policy makers reassess the role of private vendors. Currently, they are perceived as a threat to the operations of the utility and as an unfortunate and unwanted side effect of its service delivery failure. However, their services are vital to the inhabitants of Dar es Salaam — in particular, the urban poor.



## ANNEX A: CONTEXT AND BACKGROUND

Dar es Salaam is reported to be the ninth fastest growing city in the world.<sup>14</sup> According to the latest Population and Housing Census (2002), the population of the city was 2.5 million in 2002 and expected to rise to 3,486,000 by 2015 (NBS, 2008). The average annual growth rate of the city's population is 4.3 percent. Residents in Dar es Salaam now make up over one third of the total urban population in Tanzania (UN-Habitat, 2009a, p.11)

The rapid growth in cities has mainly been caused by rural-urban migration. As a result, the urban growth has largely corresponded with an increase in the numbers living in informal settlements. By 1967, already 35 percent of the urban population was living in settlements. By 1995, 70 percent of the urban population of Tanzania was living in informal settlements and these settlements continue to grow rapidly (UN-Habitat 2010).

The rapid population growth over the last three decades has led to increased demand for basic services, infrastructure and improved governance. This has largely not been met. In 2000, Dar es Salaam City Council operations were decentralized into three municipalities — Kinondoni, Ilala and Temeke. Despite reforms, according to UN-Habitat, planning in the city continues to take place in a vacuum without following set plans and regulations. The result has been one of 'spatial disorder' (UN-Habitat, 2009a, p.9). The institutional frameworks have been particularly weak in terms of local government sources of revenue, quality of trained personnel, bureaucracy and transparency in land allocation (UN-Habitat, 2010). City planning is reported to be heavily centralized, so that "bureaucratic procedures at the centre hinder local government ability to perform and respond to rapid urbanization at the local level" (UN-Habitat, 2009b, p.16). Taken together, this means that the needs for basic services in urban informal settlements are not being met.

While those in informal settlements have some of the typical characteristics of informal housing — they suffer from overcrowding and lack adequate access to safe water, sanitation and other infrastructure — the Tanzanian situation is different from other scenarios in sub-Saharan Africa in two respects: first, residents of Tanzania have more tenure security than residents in most other informal settlements.<sup>15</sup> Second, the structural quality of housing is better than in other slums, which is probably related to the security of tenure. These characteristics in turn mean that the resident population in these areas is more diverse than in other countries (UN-Habitat, 2010).

The informal sector generates a large proportion of Dar es Salaam's total income. According to the 2005 Property and Business Formalisation Programme, about 98 percent of businesses in the city are informal and operate outside the legal system. Government measures to encourage more formality have been largely unsuccessful and the high level of informality is partly attributed to "excessive and bureaucratic regulations" that prevent small businesses from making the transition from informal to formal (UN-Habitat, 2009a, p.11). Small-scale private water vendors make up a growing subset of these informal businesses.

The history of Tanzania's water supply system dates back to the 1930s. Initially, it was limited to urban areas and farms owned by settlers. Beneficiaries contributed 25 percent of capital investment costs and the government financed the remaining 75 percent. To improve rural access, a 20-year Rural Water Supply Programme was introduced in 1971. Subsequent evaluations and reviews led to the 1991 Water Policy. This was replaced by the 2002

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<sup>14</sup> [www.citymayors.com/statistics/urban\\_growth1.html](http://www.citymayors.com/statistics/urban_growth1.html)

<sup>15</sup> So far, residents have had secure tenure but that looks set to change soon with the planned removal of some slums, in Tungi and Kigamboni for instance.



National Water Policy, which was intended to rectify all previous policy shortfalls (URT, 2002). The 2002 National Water Policy sets a target of universal access to safe water and sanitation by 2025. It identifies local communities and the private sector as important partners for achieving this goal. The 2006 National Water Sector Development Strategy sets out in more detail how the national target of universal water access is to be achieved (URT, 2006).

Public water sector funding has increased substantially in recent years. In 2004, the government initiated a doubling of budgetary resources to water and sanitation services from US\$60 million to US\$120 million. Donor funding has also increased rapidly in the past five years. However, actual spending has tended to fall short of the budgeted amounts. This is mainly because of delays in the release of funds and absorptive capacity constraints. Between 2001 and 2007, on average, only 25 percent of commitments were disbursed. In FY 2007/08, 75 percent of the water sector budget was foreign funded (excluding the Local Government Budget) (van den Berg et al., 2009).

In 2006, the Government of Tanzania adopted a SWAp framework for implementing the Water Sector Development Programme (WSDP) for the period 2006 to 2025. The objective was to integrate urban water utilities, small town and district utilities, local government authorities and national projects. Informal vendors do not feature in this framework. Total funding for the programme came to US\$1,204 million. By June 2010, 52 percent (US\$627m) had been disbursed (URT, 2010a). Under the WSDP, water and sanitation authorities, districts, small towns, national projects and local governments prepared development plans. But the financing available under WSDP fell far short of the demand (URT, 2010b).

Under the 2006 SWAp, the government's role was to be changed from the provision of services towards a focus on coordination, policy guideline formulation and regulation (URT, 2006). The SWAp acknowledges the particularly challenging circumstances of low-income groups. Not only do they lack adequate access to water and sanitation services, they also end up spending a disproportionate share of their income on water that is often unsafe (URT, 2002, p. 43). The policy fails to directly address the situation, promising to establish criteria for defining low-income groups and to encourage non-governmental organizations (NGOs) and community based organizations (CBOs) to work in low-income areas. The 2006 Strategy refers briefly to informal sellers, citing the "proliferation of unregulated water vendors and the use of unprotected water sources" as one of the problems following from the failure of the existing system to meet the demands of the population (URT, 2006, p.47). The recently enacted Water Supply and Sanitation Act, however, makes no mention of informal providers and refers only to utilities, water authorities and community-based groups (URT, 2009). The regulator, EWURA, established in 2001, which has the responsibility for regulation of water and sewerage and electricity services, does not regulate informal providers. Thus, such providers are seen only as a symptom of the failings of official policy (along with waterborne disease, illegal connections and the loss of productive time spent getting water).

The latest Water Sector Status Report (2010) provides an update to the 2002 policy goal of improving services to low-income groups and cites measures in place to increase the poverty focus of the sector. Specifically, the 2010 report highlights that low-income households pay more for their water and thus would benefit more from access than from subsidies (URT, 2010b, p.52). Water kiosks are currently the main means to provide access and a study of these by the Ministry of Water and Irrigation is on-going. Another study is being implemented to establish baseline data on water supply and sanitation service levels in low-income areas, including information on small-scale service providers, with the objective to increase the poverty focus of the sector. According to the Status Report, DAWASA estimates that less than a quarter of Dar es Salaam's more than 4 million residents receive piped water. The rest rely on vendors.



## ANNEX B: SUBCONTRACTING WATER SERVICES TO THE PRIVATE SECTOR

In many developing countries, the private sector is involved in the delivery of water both formally — subcontracted by a public utility — and informally. In Dar es Salaam, aside from construction contracts, private sector subcontracting has not been widespread in the water sector. Where subcontracting has taken place, it has not been successful. For example, a planned output-based aid programme scheduled for secondary towns did not materialize, in part because of a lack of capacity in the private sector. At the same time, the informal market for water is growing.

One of the objectives of the Tanzania's Water Supply and Sanitation Act (2009) is the “promotion of public sector and private sector partnership in the provision of water supply and sanitation services” (URT, 2009, p.433). However, efforts at such partnerships have so far not been successful in Dar es Salaam. The most notable failure in this respect is the collapsed attempt at privatizing the city's water service provider. In 2003, a lease to manage water services in the city was awarded to City Water (a consortium comprising Biwater from the United Kingdom, Gauff Ingenieure of Germany and the Tanzanian company, Superdoll). The contract was terminated after 20 months and a lengthy arbitration process followed. The final outcome of this process came out in favour of the Government of Tanzania.

Since then, the water utility in Dar es Salaam has been managed by DAWASCO, a publicly owned company with a lease arrangement with DAWASA. While the private sector is widely involved in construction of water infrastructure — for instance, a Chinese construction company has been contracted to lay down the piped network for upgrading the urban sewerage system in Dar es Salaam and other urban centres — efforts to engage the private sector in the implementation of service delivery have been less successful (Kombe and Kyessi, 2008).

As part of another privatization initiative, two contracts were awarded to City Delivery Services (CDS).<sup>16</sup> The first of these was for meter reading and billing services to customers in selected areas of Kinondoni Municipality. CDS signed up customers in their designated area and sent them monthly bills.<sup>17</sup> According to CDS, the revenue figures increased substantially as a result of the CDS contract. In an interview with DAWASCO, staff also spoke positively of working with CDS. The company was remunerated with an agreed share of the revenue it raised. However the contract was abandoned after about two years, when DAWASCO took over from City Water. According to CDS, there had been considerable opposition to their activities within DAWASA because of staff members' involvement in the collection of payments from illegally connected households (de Waal and Cooksey, 2008, p.12). In an interview with DAWASCO, we were told that the conclusion of the contract was a “management decision.”<sup>18</sup>

A second contract was awarded to CDS to collect debts from customers owing Tsh500,000 (US\$345) and above. Although the company managed to get some customers to pay, success was limited, primarily because most customers had genuine reasons for not paying the bills. These reasons include the following:

- a. Some customers lived in rented properties where water bills had accumulated from previous tenants. Because DAWASCO only deals with residing dwellers, landlords are not held accountable.

<sup>16</sup> CDS is a local company engaged in courier and logistics business in the city, not to be confused with City Water, the consortium engaged in the failed privatization contract.

<sup>17</sup> According to interview with Director of City Delivery Services, Mr Masudi Wanani.

<sup>18</sup> Interview with at DAWASCO official on 20 August 2010.



- b. Others were not receiving water services, but nonetheless continued to get the bills. They were willing to pay for the sewerage services they received, but understandably not for the water component of the bills.
- c. Others claimed that the bills were incorrect and exceeded the amount of water they consumed. They feared that other consumers were stealing their water.

A number of CBOs and NGOs are also involved in water service delivery (Kombe and Kyessi, 2008). A study in the *Journal of International Development* (Dill, 2010) documents two ways in which CBOs are involved: as intermediaries (constructing secondary piped networks close to DAWASA pipes) and as direct producers (usually in locations far removed from the main water lines). Community projects work differently. For example, the Hannanassif Community Development Association (HNCDA) in Kinondoni Municipality purchases a bulk supply from DAWASCO through a metered connection. The CBO then sells the water to residents from a series of kiosks located throughout the neighbourhood. The profit that the CBO makes on water sales is used for other things such as micro-credit loans to residents. The Hannanassif project has become the primary provider of drinking water to a community with more than 20,000 inhabitants (Dill, 2010).

Other communities have similar arrangements. A common feature for these communities is that they were all part of the Community Infrastructure Upgrading Programme of the Dar es Salaam Sustainable Cities Programme 1992–2003. Among other things, the Programme provided communities with financial and capacity-building support for upgrading housing, roads, solid water management and drainage.



## ANNEX C: DAR ES SALAAM WATER SOURCES

DAWASA serves the area of the City of Dar es Salaam as well as the secondary towns of Kibaha and Bagamoyo. The total population in this area is approximately 4 million. Dar es Salaam gets most of its water from the Ruvu River through two main schemes (Upper and Lower Ruvu) as well as from a small surface water scheme in Mtoni Area and some boreholes (see table 1C). Total production is around 300,000 cubic metres a day, while demand is around 450,000 (including industrial consumption). Half of the water supply, however, is lost via leakages.

**Table 1C. Dar es Salaam water sources**

Source	Date constructed	m <sup>3</sup> /day
Lower Ruvu	1975	182,000
Upper Ruvu	1959	82,000
Mtoni (Kizinga)	1947	9,000
Boreholes	dug from 1996–2008	27,000

*Source: IUCN, 2010.*

There are a number of ongoing initiatives to improve the water supply, which include:

- upgrading of the existing Lower Ruvu treatment plant from 182,000 to 270,000 cubic meters per day. Construction started in July 2010;
- upgrading of the Upper Ruvu from 82,000 to 140,000 cubic meters per day. At the time of writing, the project was at the design stage;
- construction of Kidunda Dam in Bagamoyo to regulate Ruvu River. Shortlisted firms submitted their proposals in July 2009. They are presently undergoing review. The nine-month assignment was expected to start in February 2011;
- development of underground water sources in Kimbiji and Mpera. Phase I, includes drilling 20 deep wells which will have a total production capacity of 260,000 cubic meters a day. Until now, DAWASA supply has never reached this area. This project provides the essential infrastructure for Kigamboni, which is planned to be developed as a satellite city. Water works goes hand in hand with expansion of the electricity network. Work on this started in September 2010.

Under the WSDP, some US\$175m has been allocated for the construction of secondary and tertiary distribution as well as for the rehabilitation of the three water treatment plants at Mtoni, Upper Ruvu and Lower Ruvu (URT, 2010a).



## ANNEX D: DAWASCO

DAWASA, created in 1997, is the owner of the city’s water supply while management of the supply has been delegated to DAWASCO. This institutional framework was initially established to facilitate the city’s short-lived water privatization (de Waal and Cooksey, 2008). Since the collapse of the privatization contract with City Water in 2005, DAWASCO has operated under a lease contract with DAWASA.

DAWASCO’s activities are divided into 17 geographical areas of operation: Bagamoyo, Boko, City Centre, Corporate, Ilala, Kawe, Kibaha, Kimara, Kinondoni, Magomeni, Tabata, Kisutu, Mtoni, Lower Ruvu, Upper Ruvu, Temeke and Mlandizi. For each area, an area manager is responsible for water distribution, revenue collection and customer care services (DAWASCO, 2010). This is a new management model where each area is semi-autonomous. Each month areas are ranked according to performance and the results are published. Table 1D shows performance indicators and targets for DAWASCO for 2008–2009. For most indicators, DAWASCO’s performance falls short of the target. Non-revenue water is particularly high and substantially above target. A high proportion — around half — of total connections are inactive.

**Table 1D: DAWASCO Performance indicators**

	2008–2009	Target
Non-revenue water (%)	55	40
Total number of connections	145,522	154,522
Number of new connections	4,240	9,000
Number of inactive connections	73,922	53,000
Revenue billing (TShs M)	24,550	40,000
Revenue collection (TShs M)	20,629	33,502
Volume of water produced (M - m <sup>3</sup> )	94	98

Source: DAWASCO, 2010.

DAWASCO prepares an operational plan every year and its 2010 plan sheds light on some of the reasons for the disappointing performance. The plan points to major challenges facing the company in terms of low levels of staff morale and motivation. First, the high rates of non-revenue water is attributed to a number of factors including low metering efficiency, high level of leakages, substantial illegal consumption and lack of source meters to ascertain supplied water. In addition, the plan notes “the existence of a big number of inactive or suppressed connections suggests coexistence of illegal consumption which is not billed” (DAWASCO, 2010, p.32). Second, the high number of inactive connections is also partly due to a combination of inadequate water supply and disconnection for non-payment. The plan proposes external factors that would need to be mitigated in order to reduce the number of inactive accounts. These include customers’ unwillingness to pay, illegal consumption and the existence of alternative sources of water supply. Finally, little willingness to pay, unreliability of supply in some areas, inadequate marketing strategies and “rampant water theft” also help explain low revenue collection rates (DAWASCO, 2010).

Overall, the 2010 plan lists further challenges facing the company which include an unreliable customer database, unrealistic and inaccurate bills delivered to customers, the existence of 21,000 unmetered customers, incomplete



inaccurate and delayed meter readings, low staff morale and commitment as well as “untrustworthiness and collusion between customers and staff” (DAWASCO, 2010, p.39). There is high demand for new connections but there are obstacles to providing these, which include alternative water sources (boreholes, illegal connections), unplanned settlements constraining the extension of services and the existence of ‘water pirates’. When asked what the term water pirates means, an official from DAWASCO defined them as individuals who use water pumps to extract water from the system to resell it, those who use illegal connections and those who fill tanker trucks with water from DAWASA for Tshs 10,000 (US\$6.91) and resell at a substantial profit for Tshs 50,000 (US\$34.55) or more.



## ANNEX E: WATER ACCESS IN DAR ES SALAAM

Estimates of the rate of access to safe water in Dar es Salaam vary dramatically and cannot be known with much certainty. As mentioned above, DAWASA estimated that only a quarter of the city’s residents receive piped water (URT, 2010b). According to UN-Habitat (2009a), only 25 percent of the city’s residents have access to utility water, with the remaining 75 percent living in unplanned or un-serviced areas. Others put the access rate considerably higher. According to the 2007 Household Budget Survey, rates of access to piped and other protected water sources are around 85.2 percent, down from 97 percent in the 1991–1992 period. Although estimates of the rate of access may vary, they consistently convey a message of steadily declining access to improved water sources since the early 1990s. Part of this is due to rapid population growth. The population more than doubled between 1991 and 2007. The service gap in access to improved water sources between poor and non-poor has also been increasing over the past 15 years (van den Berg et al., 2009).

In 2008, NBS conducted a study to provide baseline data on water access in the city (table 1E). The study covered 1,541 households of which 1,426 were in Dar es Salaam. Of the households in Dar es Salaam, only 6.4 percent had water piped into their dwelling and the majority of these (64 percent) lived in the relatively affluent municipality of Kinondoni. Over half of the households in the sample from Dar es Salaam obtained their water from a neighbour.

**Table 1E: Distribution of households by primary water source in Dar es Salaam**

Water Source	percentage
Piped supply into dwelling	6.4
Piped supply into yard	8.8
Piped supply into neighbour’s dwelling/yard	52.0
At a kiosk	7.5
At an institution	5.0
Water vendor	18.5
Other	1.8
<b>Total</b>	<b>100.0</b>

Source: NBS, 2008.

Estimates regarding the proportion of the population that relies on small-scale water vendors vary. There has been some research into the significance of different types of vendors. According to McGranahan et al. (2006), utility coverage through piped connections is the primary means of water access for only 42 percent of the population in Dar es Salaam. A further 4 percent are reached via public kiosks supplied with utility water. Resellers of utility water service 35 percent of the population. These include tanker trucks, pushcart vendors and private and communal boreholes. Finally, a small proportion of the population continue to obtain water from unprotected water sources.

According to the NBS survey (2008), 18.5 percent of households obtain water from a private vendor. Given current population estimates, this amounts to over 500,000 people. According to the NBS study, about 7 percent



of households reported getting water from kiosks and the majority of kiosks (74 percent) get their water from boreholes (NBS, 2008).

Customers of private vendors include both poor and affluent households as well as businesses and enterprises (food vendors, restaurants) in settlements far from the water network. Wealthier households that use vendors tend to have storage capacity and buy water in large volumes from tanker trucks. Tankers need roads and customers with storage capacity to operate and so are found primarily in higher income areas. Pushcart vendors, on the other hand, are more prevalent in urban informal settlements (McGranahan et al., 2006).

The main reason given by households for relying on water vendors was that other water sources were either too far away or were unreliable.

**Table 2E: Main reasons why households rely on private water vendors**

	Number	Other sources too far	Avoid congestion	Saves time	Other sources unreliable	Socio cultural reasons	Other
Kinondoni	134	59.7	26.9	34.3	64.9	2.2	41.0
Ilala	55	41.8	16.4	23.6	43.6	1.8	49.1
Temeke	75	24.0	5.3	6.7	13.3	5.3	78.7
Total DAWASA Area	264	45.7	18.5	45.7	45.7	3.0	53.6

Source: NBS, 2008.

Note: Respondents were requested to circle all reasons that applied, so some add up to more than 100 percent.



## ANNEX F: PROFILES OF RESEARCH DISTRICTS

**Kimara** is located in the northern part of the city. It is a ward with four *mtaa* areas, namely, Kimara-Matangini, Kimara-Baruti, Mavurunza and Kimara 'B'. It used to be a predominantly rural, farming area but many people have now migrated to the area developing along one of the main radial routes from Dar es Salaam. The estimated population is 66,270.<sup>19</sup> Few households have legal tenure and land is owned through customary procedures. This is a mixed ward with affluent areas and squatter areas consisting of households who do business, (small and medium sized), government officials and those in other formal employment.<sup>20</sup>

Virtually all water consumed in this area is supplied by DAWASCO but water supply is erratic. Water is available maybe three or four days a week but this is for connections close to the main pipe along the main road. For households further away, in King'ong'o (Kimara B), water is available sometimes once a week but often only once a month. Households store water when it is available, using buckets and jerry cans. Such a stored supply may last an average household two weeks.<sup>21</sup>

DAWASCO household connections have increased in numbers. However, water rarely flows through them. Households instead rely on vendors. There are often complaints that water flows to the taps of water sellers even when households are not receiving any water. Boreholes are rare in the area. Water is supplied by DAWASCO in one way or another. There are two community boreholes in King'ong'o.<sup>22</sup> Borehole water quality is less reliable than DAWASCO water. Few households consume borehole water but when there is no DAWASCO water in the area, water vendors obtain their water from these boreholes.

**Vingunguti** is a low-income unplanned settlement made up of four *mtaa* areas (Mtambani, Mtakuja, Kombo, Miembeni). It is located about 6 km from the city centre and is adjacent to the Pugu Road industrial area. The population is approximately 120,000.<sup>23</sup> Residents are typically self-employed, working for family businesses or as wage labourers in the nearby industries. Most houses are of poor quality and constructed out of cement blocks and iron sheet roofing. Public facilities available within Vingunguti include a government dispensary, a private hospital, government pre-primary, primary and secondary schools, several places of worship and food markets.

Until the late 1990s, Vingunguti received water regularly via the existing DAWASA network. Due to rising consumption in the northern part of the city, coupled with ageing infrastructure, water now does not reach the area regularly. There is DAWASCO infrastructure in the community. Many households have pipes and there are a number of DAWASCO kiosks but these receive water once a month or less.<sup>24</sup> Some costumers complained that they had not received water for several years.

Local residents now rely mainly on private boreholes and mobile vendors for water supply. Many in the community obtain water from boreholes. Mostly these are privately owned. There are two community-owned boreholes that

<sup>19</sup> Figure obtained from Ward Office, estimated from National Census 2002.

<sup>20</sup> Kimara has both public and private health facilities, and pre-primary, primary and secondary education facilities. There are several food markets in the area and, like any other place in the city, several places of worship.

<sup>21</sup> Interview with the Chairman of Kimara Mtaa on 1 December 2010.

<sup>22</sup> Interview with King'ong'o Water Committee on 1 December 2010.

<sup>23</sup> Interview with Vingunguti Ward Executive Director on 29 November 2010.

<sup>24</sup> Interview with Mtaa Executive Officer Mtambani, Vingunguti Ward on 2 December 2010.



are managed by a water committee in Mtambani *mtaa* but this is far from adequate for a population of around 8,000. In addition to the private boreholes, there are some water vendors that bring in DAWASCO water by tanker from other locations in the city and store it in large poly-tanks. They resell this water to individuals and pushcart vendors by the jerry can. Finally, there are pushcart vendors who sell both borehole and DAWASCO water. The latter is bought from non-mobile vendors.

**Tungi** (and Ferry) is a ward situated in Kigamboni area in Temeke in the south of the city. Tungi was until recently an *mtaa* within Kigamboni ward but was recently given ward status due to its growth in population. So far, the ward has only one *mtaa*. The ward is about 4.5 km<sup>2</sup> with an estimated population of 13,500. The area has mixed households. Residents of the area depend on various sources of income ranging from small family businesses, including fishing, to formal employment. The ward covers about 4.5 km<sup>2</sup> and has an estimated population of 13,500. Residents of the area depend on various sources of income ranging from small family businesses, fishing (close to Indian ocean and the fish market in Dar es Salaam) to formal employment. Tungi has a privately operated dispensary, public and private pre-primary schools and public primary and secondary schools. There are also several places of worship. There are no formal markets in the area and residents rely on the market in the nearby ward of Kigamboni.

DAWASCO does not supply any water to this area. Water comes from wells and boreholes. Some of these are managed by local communities, but most are owned by private operators. In addition, many households have shallow wells in their yard where they access water for their own consumption. Some allow neighbours to use this water freely without charge. Groundwater is plentiful, but it is mostly too salty to drink. Some households in the area have joined together to establish community boreholes.

Although the piped DAWASCO water supply does not reach the area, as elsewhere, there are two general classes of water. Most of the borehole water has a high salt content and is not good for drinking. However there is one well to the south of the area, some distance from the main residential area, which produces high quality water. The owner charges Tshs 30 per jerry can, which is the same as the price of water from other boreholes in the area but this one is located a few kilometres from the households that use it. Pushcart vendors who transport water between the boreholes and the households impose a considerable markup on the price. This means that, at the household level, the cost of delivered borehole water is substantially higher than water from alternative sources.



## ANNEX G: WATER TARIFFS

	Location	Tshs	litres	Tshs/m <sup>3</sup>	\$/m <sup>3</sup>
Household connection (DAWASCO)	Kimara	858	1,000	858	0.59
Household connection (community provider)	Tungi	870	1,000	870	0.60
DAWASCO tap (official tariff)	Kimara	1,000	1,000	1,000	0.69
Jerry can (community boreholes)	Tungi	20	20	1,000	0.69
Household connection (private piped)	Ving'ti	20,000	15,000	1,333	0.92
Jerry can (private borehole, large)	Ving'ti	30	20	1,500	1.03
Jerry can (private borehole)	Tungi	30	20	1,500	1.03
Jerry can (private borehole, small)	Ving'ti	20	10	2,000	1.38
DAWASCO tap actual tariff (trucks)	Kimara	2,000	1,000	2,000	1.38
DAWASCO tap actual tariff (jerry can)	Kimara	50–100	20	2,500	1.73
Pushcart vendors (salty water)	Tungi	150	20	7,500	5.18
Trucks to jerry cans and end users	Kimara	200	20	10,000	6.91
Tanker water direct from tanker	Ving'ti	70,000–150,000	10,000	7,000–9,500	4.83–10.37
Jerry can with borehole water bought from pushcart vendor	Ving'ti	250	20	12,500	8.63
Jerry can with imported DAWASCO water direct from kiosk (large)	Ving'ti	250–300	20	12,500–15,000	8.63–10.37
Pushcart vendors (good quality water)	Tungi	250–300	20	12,500–15,000	8.64–10.36
Jerry can with imported DAWASCO water direct from kiosk (small)	Ving'ti	150–200	10	15,000–20,000	10.37–13.82
Pushcart vendors with water from DAWASCO points	Kimara	300–500	20	15,000–25,000	10.36–17.23
Jerry can with imported DAWASCO water bought from pushcart vendor	Ving'ti	400–500	20	20,000–25,000	13.82–17.28



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