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THE GOVERNANCE OF MUNICIPAL SERVICES IN PERI-URBAN AREAS: THE CASE OF WATER SUPPLY IN DAR ES SALAAM CITY, TANZANIA

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ABSTRACT

The networked formal water in peri-urban areas is limited in urban Tanzania. Technical difficulties associated with extending water and sanitation infrastructure to peri-urban areas, problems in relation to land tenure, and economic costs are some of the elements that have contributed to the slow progress. However, there is scanty literature on the dynamics and governance of municipal services delivery in peri-urban areas, especially access to potable water and good sanitation. In addition, there is limited knowledge on the options for enhancing governance of water and sanitation services in the peri-urban areas in Tanzania. This paper is based on a case study of a settlement known as Muungano, in the peri-urban of Dar es Salaam City. The aim of the paper is to explore the governance of potable water and sanitation services. Specifically, the paper examines alternative options for improving the extent, affordability, and conditions of access to these services. The findings show that small scale water and sanitation providers (SSWSPs) are the main players in the provision of affordable water and sanitation services in the peri-urban settlements. It was further found out that the improved water and sanitation services contribute not only to better health, greater convenience and dignity (particularly for women), but also towards improved economic productivity. The results form an input towards policy measures that translate into action towards better access to improved governance of municipal basic infrastructure services in Peri-urban areas.

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INTRODUCTION

In recent years, a new and more sector-specific position is increasingly being advocated for the provision of water and sanitation services in the peri-urban areas (McGranahan and Satterthwaite, 2006). This approach shares some of the ideas contained in the "slum upgrading" view. However, it differs from the latter in a way that it has even less faith in governments' capacity to deliver investments for slum upgrading (ibid.). The new perspective considers urban water governance as predominantly bureaucratic, expert driven and non-inclusive (Norström, 2007; McGranahan and Satterthwaite, 2006). Centralised solutions are criticised for they place a heavy emphasis on high standard engineering solutions (Norström, 2007). Decentralised and more flexible forms of provision are considered more effective for the supply of water in squatter settlements and peri-urban areas (McGranahan and Satterthwaite 2006; Kyessi, 2005). The interest on this topic has also been on the rise amongst researchers and the multilateral institutions, including the World Bank, and the Department for International Development (DfID) as pointed out above (World Bank, 2003; Kariuki and Schwartz, 2005; Baker 2009, McGranahan, 2016).

Hence, the research project on which this paper is based aimed at establishing alternative options for improving the extent, affordability and conditions of access to potable water services in peri-urban areas. Small scale water and sanitation service providers in peri -urban areas are closely examined. Improved sanitation contributes, not only to better health (particularly of children), greater convenience and dignity (particularly for women), but also towards improved economic productivity (Bartram and Cairncross, 2010). This study provides baseline information pertaining to dynamics of municipal services delivery, focusing on access to potable water and sanitation services and the role of small scale water and sanitation providers in the peri-urban area of Dar es Salaam City. Peri-urban areas are the interface between the urban and rural areas (McConville, 2014; Norström, 2007). In most developing countries such areas are characterized by rapid population growth, a mixture of planned and un-planned settlements, inadequate service infrastructures, insecure land tenure, social tension, and environmental and health problems (McConville, 2014). According to Kombe and Lupala (2005) and Msangi (2011) as cited in Mapunda et al, (2018), Tanzanian context of peri-urban includes all the areas outside the urban built-up area. Such areas are dominated by mixed land uses typical of

the cities built up areas and their hinterland. Normally these areas are characterized by inadequate infrastructure services, rapid informal settlement growth that incorporates mixed social classes, as well as multiple land tenure regimes, such as statutory right of occupancy, customary, and quasi-customary tenures. The research focussed the following questions in this paper are:

- How water and sanitation services are provided in the peri-urban areas of Dar es Salaam City and who are the providers of these services?
- What is the quality of water and sanitation services and how affordable are they?
- What are the potential opportunities and challenges of extending piped water and sanitation services to peri-urban areas?

World trends

More than 60% of the world's population growth between 2008 and 2100 will be in Sub-Saharan Africa (32%) and South Asia (30%). Together, these regions are expected to account for half of world's population in 2100 (UNESCO 2018). An estimated 90% of the 3 billion people who are expected to be added to the population by 2050 will be in developing countries, many in regions that are already experiencing water stress and in areas where the current population does not have sustainable access to safe drinking water and adequate sanitation. More than 5 billion people – 67% of the world population - may not be connected to public sewerage systems in 2030. The demand for water originates from four main sources: agriculture, production of energy, industrial uses and human consumption. The main source of demand for human consumption comes from urban communities requiring water for drinking, sanitation and drainage. The urban population of the world is forecast to grow to 6.3 billion people by 2050 from 3.4 in 2009, representing both population growth and net migration from countryside to town (UN 2012). There is already a backlog un served urban population, and the number of people in cities who lack access to improved water supply and sanitation is estimated to have grown some 20% since the MDGs were introduced. Building on the experience of the MDGs, the 2030 Agenda for Sustainable Development has a more comprehensive goal for water, going beyond the issues of water supply and sanitation (UN 2017).

In accordance with the United Nations World Water Development Report (UN, 2017) measures to improve water resources management, increase access to safe drinking water and basic sanitation, and promote hygiene have the potential to improve the quality of the several billion individuals, reduce child mortality, improve maternal health, and reduce the burden of waterborne diseases. It is further reported that supporting women's access to, and their control over water, will in turn improve their access to secure sources of food and livelihoods, which will benefit their own health and that of their families. Understanding the multiple aspects and roles of water is crucial to governing it effectively. Water affects social welfare and economic development within a range of sectors (Ocloo, 2013). Water demands and uses are often managed in isolation of each other rather than as part of an overarching strategy to make the best use of water throughout society and the economy. Effective institutions can reduce natural, economic, technical and social uncertainties. However, the diverse structure of water management in dealing with various

resource and use/service-related issues is reflected in the complexity and fragmentation of the institutions that exist to govern and manage it.

Governance of urban water in the developing countries

Governance involves the response to and benefiting of all groups and individuals in society, particularly the urban poor, and the elimination of all forms of exclusion (Gisselquist, 2012). UNDP (1997) defines good governance as that which is “participatory, transparent, accountable, effective and equitable, and promotes the rule of law” (Bouque, 2010:29 citing UNDP, 1997:3). Elimination of all forms of exclusion also implies ensuring access to water and sanitation services by all groups and individuals. In Ghana, 63 percent of urban population do not have residential water connections. A large proportion of them rely on SSWSPs. In Accra, access to water through formal network declined significantly from 1992-3 to more recent years (Dagdeviren and Robertson, 2009) and tankers have formed water vendor associations (Kariuki and Schwartz, 2005). There have also been attempts of regulating informal providers’ activities by imposing restrictions on the number of days and hours they can operate.

In Kenya, where over 70 percent of urban population live in unplanned settlements, the urban proportion of population without residential water supply increased from around 40 to 50 per cent since the 1990s (Dagdeviren and Robertson, 2009). In recent years, the illegal connections in informal settlements have been formalised to reduce water losses and improve revenues. Still, a considerable proportion of the population relies on kiosks and small scale water and sanitation projects (SSWSPs) that carry water with bicycles and back loaders. Zambia has over 70 percent of its urban population living in unplanned settlements. The urban population's access to water through residential connections declined from around 53 to 40 percent since the 1990s (Dagdeviren and Robertson, 2009). Peri-urban water supply issues have been high on the agenda of the water regulator NWASCO, which has been promoting kiosks operated by private vendors as a medium term solution (Dagdeviren, 2008). There is almost no study on the country reflecting the perceptions and experiences of the peri-urban households and their coping strategies. In Tanzania, over 75% of the population live in informal settlements (Kombe and Kreibich, 2006; Francis, et al., 2018). The water supply system can be understood from two main sub-sectors, namely water resources, which is mainly related to the management of water as a resource, and supply system, which is associated with provision of water supply services. The latter covers the water supply in urban areas and it is the most exemplary and the focus of this paper.

Institutional framework for water and sanitation in Tanzania

The urban water supply in Tanzania is guided by a number of key statutes and policy instruments, including the National Water Policy (NAWAPO) of 2002; the Water Resources Management Act (WRMA) No.11 of 2009; the Water Supply and Sanitation Act No.12 of 2009; the National Water Sector Development Strategy (NWSDS) of 2006; the Energy and Water Utilities Regulatory Authority (EWURA) Act No.414 of 2004; the Local Government (Urban Authorities) Act No.7 of 1982; and the Dar es Salaam Water and Sewerage Act No.20 of 2001. The Water Resources Management Act and the Water

Supply and Sanitation Act form the core of the legal framework for water and sanitation in Tanzania (URT, 2010). The two acts are translated from the NAWAPO. The objective of WRMA is to ensure that the water resources of the nation are protected, used, developed, conserved, managed, and controlled in a sustainable manner. As its name suggests, this act is mainly for conservation of water as a resource, although it has some provisions, which are directly linked to service provision (water supply). The Water Supply and Sanitation Act of 2009 has the objective to promote and ensure the right of every person to have access to efficient, effective and sustainable water supply and sanitation services for all purposes. Meanwhile, NAWAPO provides for decentralisation of governance for water supply from central to local; encourages demand-responsive services in which users establish, own and manage the services. It also intends to uphold participation of men and women; and management at the lowest appropriate level, aspects that are reflected in the Water Supply and Sanitation Act. The NWSDS is a specific programme for facilitating implementation of the NAWAPO. It is a sectoral reform document for the improvement of water and sanitation services delivery in Tanzania. Its objectives include achieving a sustainable development of adequate, safe and clean water in the rural, the urban, and the peri-urban areas. NWSDS defines the characteristics of the entities that are legally authorized to provide water supply services (URT, 2010:13). These entities are:

- Water Supply and Sanitation Authorities (WSSAs - including the clustered ones);
- Community-Owned Water Supply Organizations (COWSOs); and
- Service Providers.

The Health Sector Strategic Plan IV (HSSP IV) contains many key national targets that are relevant to the WASH sector. Besides, HSSP IV contains the aim for the country to be free from open defecation, and for all schools to have adequate sanitary facilities. Table 1 summarizes the national targets.

Table 1. Key National targets for water and sanitation

Parameter	2010 Baseline	HSSP IV Target 2020
Access to safe drinking water	52%	75%
Access to minimum sanitary facilities	60%	90%

Source: UNICEF (2018).

For the case of Dar es Salaam City, the Dar es Salaam Water and Sewerage Authority (DAWASA) is the institution responsible for the development and management of water supply and sanitation assets, including the water generation and the supply network. Following some recent reforms, DAWASA has assumed roles that were under the defunct Dar es Salaam Water Supply Company (DAWASCO), including the provision of water and sanitation services to consumers and the collection of revenue, apart from planning and management of the water and sanitation network. Despite its efforts to supply potable water to every household, several challenges hinder their performance, especially to the peri-urban areas. Juma et al., (2018) listed some of the challenges including: insufficient water accessibility infrastructures, high cost and low-income, long distance and more time in accessing water, inaccessibility to clean and safe water and unreliability of water supply. The questions still unanswered are, what options are there to service the peri-urban areas? Is it possible to extend public-water system into those areas?

Theoretical and conceptual framework for water services provision in the peri-urban areas

The interactions between the various actors, and the power dynamics in these relationships, can be explained mainly by the institutional economic theory (IET) that originated from Douglas North in the 1990s. The IET is, however, elaborated through various supporting theories, including the organization theory, the collective action theory, the collaborative planning theory, and the network theory (Kyessi, 2011). North (1990) argues that the organization's opportunities are shaped by the society itself, and perhaps one example of this would be the various types of informal organizations that can exist. Action can occur by individuals or groups, and collective action theory. Olson (1965) argues that (rational and self-interested) individuals will not work as a group to achieve a common interest unless there is some sort of benefit from acting as part of a group. Benefits of participation in basic infrastructure improvement may include affordable service, ownership, and control accrued assets, creation of employment and income, improved living environment and health, acquisition of technical knowhow, creation of social cohesion and prestige in society (Kyessi, 2011).

This may in turn lead to inclusiveness, effective access and use of the provided services, cost recovery and eventual sustainability in the service provision. The institutional economic theory has thus been adopted in explaining the research phenomenon of institutions and cost recovery elements. Based on the literature reviewed, three main variables are adopted as relevant for this study on the delivery of water and sanitation in the peri-urban areas. These include: institutional factors, access and effective use factors and sustainability factors. The indicators for the institutional factors include: organisation, laws and regulations, collaboration, resources capacity, while the indicators for the access and effective use factors include: optimal use, reducing the health burden and existence of alternative options. The indicators for sustainability include: cost recovery, unit cost and cost sharing, reliability of system, employment and income generation and increasing asset base.

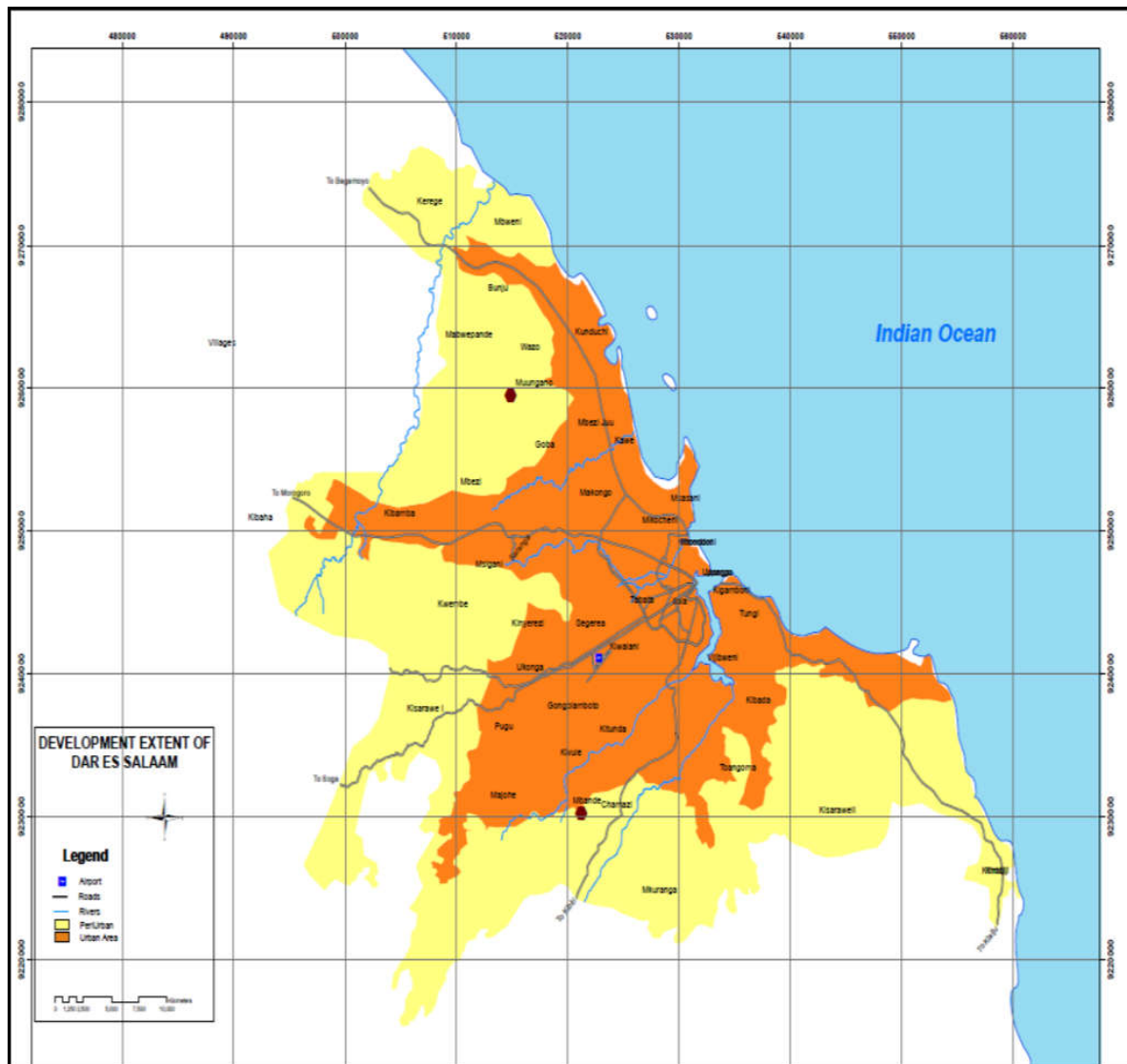
MATERIALS AND METHODS

Research setting

Dar es Salaam is the most urbanised of all Tanzanian cities, in terms of population size, spatial expansion and higher growth rates. Its total population (4,364,541 in 2012) makes 10% of the Mainland Tanzania's total population with a growth rate of 5.6% per annum (URT, 2013). The city's fast growth coupled with economic underperformances of the municipal authorities have rendered it difficult to provide adequate municipal service in terms of technical and social infrastructures to the peri-urban areas. However, alternatives have been hatched in providing potable water to peri-urban communities. Despite the pros and cons of the informal water providers, the donors and multilateral institutions are increasingly promoting an elevated role for SSWSPs and advocating greater formalisation of informal water providers (e.g. World Bank, 2003; Kariuki and Schwartz, 2005; and Baker, 2009). This research project aims at exploring alternative options for improving the extent, affordability, and conditions of access to potable water and sanitation services. "Informal Water and Sanitation Services Providers" in peri-urban areas will be closely examined.

Improved sanitation contributes not only to better health (particularly of children), greater convenience and dignity (particularly for women), but also towards improved economic productivity (Bartram and Cairncross, 2010). A case study strategy was preferred for the study which is contemporary in nature. In assessing the delivery of different forms of municipal services in peri-urban areas, this project focused on access to water supply and sanitation services. The framework of the project has been developed as an exploratory empirical study and designed as applied and a policy oriented research.

services is also common in the peri-urban areas of Dar es Salaam. Figure 1 shows the location of the selected study settlement. The implications of the emerging peri-urban urban land development pattern and its governance on demand and supply for water and sanitation systems are not apparent yet. In addition, the envisaged satellite towns and urban design projects in the peri-urban areas in the proposed Dar es Salaam City Master Plan (URT, 2015) are likely to put more pressure on the scarce public resources required for the provision of basic infrastructure services, such as water and sanitation.



Source: Own drawn

Figure 1. Map portraying Muungano settlement in the peri-urban of Dares Salaam City

Location of the study area

Dar es Salaam was selected since its peri-urban areas have been facing the challenge of inadequate municipal services delivery and thus getting supplies from different types of providers and governance structures for such services. Muungano settlement which was selected for this study is within the fringe area of Dar es Salaam and least served with formal water supply system thus, prompting emergence of multi-model water system. The multi-model incorporates informal water supply system involving numerous factors including small and large/bulky water vendors as well as individual households who support each other to supply potable water (see also Kombe et al, 2016). On-site sanitation

Sampling, data collection and analysis

The key players in water and sanitation services in the peri-urban areas were the population of interest. Hence, purposeful sampling was used to select key informants for structured and in-depth interviews/informal discussion. Questionnaires were administered to the community members (the beneficiaries) who were selected by way of households. A total of 61 households (about 5%) were drawn randomly from the study area, and the head or an adult member represented a particular household in the interviews. In addition, one Focus Group Discussion was conducted with the group of service providers in the selected peri-urban area. Since this research and analysis was designed to obtain information about the perceptions of

the primary stakeholders in water supply issues in the peri-urban areas, it applied four different forms of primary data gathering processes:

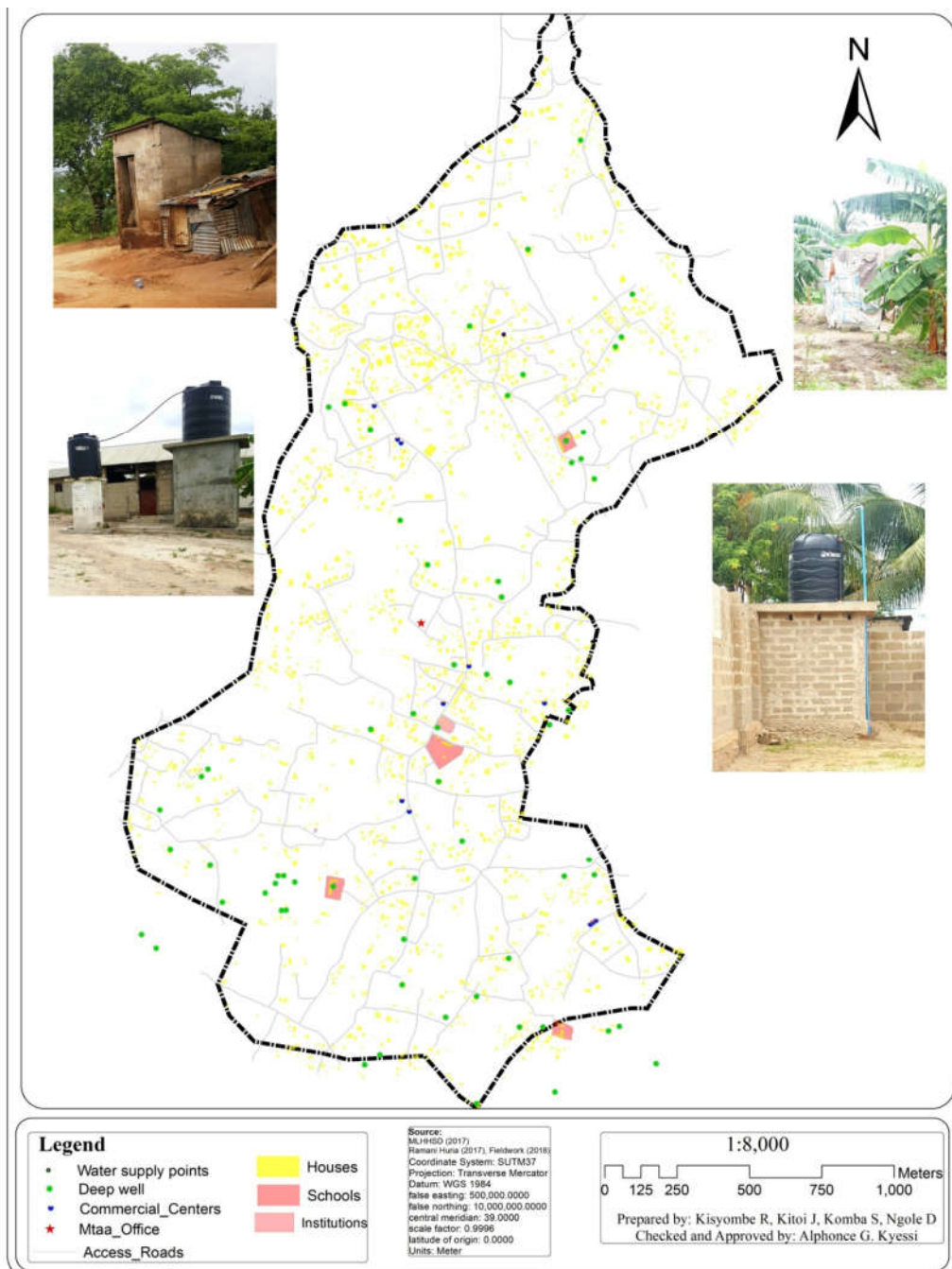
- Household interviews in the peri-urban areas and semi-structured interviews with community/civil society representatives;
- Semi-structured interviews and focus group discussions with the varieties of water suppliers in the settlement, including the water committee for the community-based water supply scheme;
- Semi-structured interviews with public authorities; e.g. government officials, municipal authorities, regulatory institutions, network providers; and
- Informal discussions with academics and other experts in the sector.

The collected data went through the standard format of cleaning and coding before analysis. The analysis was done using excel spreadsheet and SPSS software to generate tables, graphs and charts that summarized or highlighted interesting and important findings. Maps were also used to display distribution of the water supply services and the general existing situation.

RESULTS AND DISCUSSION

Profile of the Muungano study area

The Muungano settlement is located about 22 kilometres north of the Dar es Salaam CBD, off Bagamoyo Road. This peri-urban settlement is within the Goba Ward in Ubungo Municipality. Figure 2 presents the existing situation of the area, including the water supply sources.



Source: Field work, 2018

Figure 2. Muungano settlement updated base map

Muungano is a settlement with a Mtaa status administratively, having existed as part of the former Goba before the mid-1970s. The Muungano settlement started as an independent mtaa-level unit in the late 1970s. It is a mtaa with the largest area coverage in the ward. Currently the Muungano settlement has an estimated total population of 6200, with an average growth rate of 4.0 per annum. The settlement had a population of 5214 in 2012 according to the 2012 National Population Census (URT, 2013), a situation that also implies a growing demand for infrastructure services, including potable water and sanitation in the settlement. The proportion of households who reported that they earn less than TAS 50,000 (about US\$ 22) per month is small (4.9%), primarily because people tend to hide their income. 40% earn between TAS 200,000 (US\$ 88) and 400,000 (US\$ 176), while the average income is TAS373,000 (about US\$ 162) per a household. Muungano settlement is generally a deprived area in terms of infrastructure services, particularly road and storm water drainage (see Plate 1).



Plate 1. Road without storm water drainage system at Muungano settlement

However, it has electricity services, and many houses are connected. For education and health facilities this community mainly relies on the neighbouring settlements, whereas for water supply, the DAWASA supply line is old and out of order, and its services are very poor. Hence, private suppliers have got into the business of supplying water to the community, along with community-based suppliers. These service providers supply water from boreholes. Some have installed a network of pipes which supply water to some households on agreed terms.

Water supply in the study area

As highlighted, potable water supply in this peri-urban area of Dar es Salaam is by private service providers (>60%),

community-based schemes (<25%) and the public scheme whose service is very limited. Neither the Mtaa Water Committee of the Mtaa authorities nor the urban water authority (DAWASA) is regulating private service providers. The latter are therefore, operating freely, without any regulations or accountability. Water from the private schemes and the community-based scheme is generally available daily. The water that can be considered of better quality is accessible to at most 30% of the community. This is mainly due to the network coverage and low affordability. In terms of sanitation, all households in the settlement have access to house level sanitation facilities, mainly WCs (70%), followed by pit latrines.

Table 2. Potable water provision at Muungano in 2018

Service provision model	Number of Direct connections	Percentage of total
Public (DAWASA)	45	12.6
Community-based	65	18.3
Private	246	69.1
Total connections	356	100

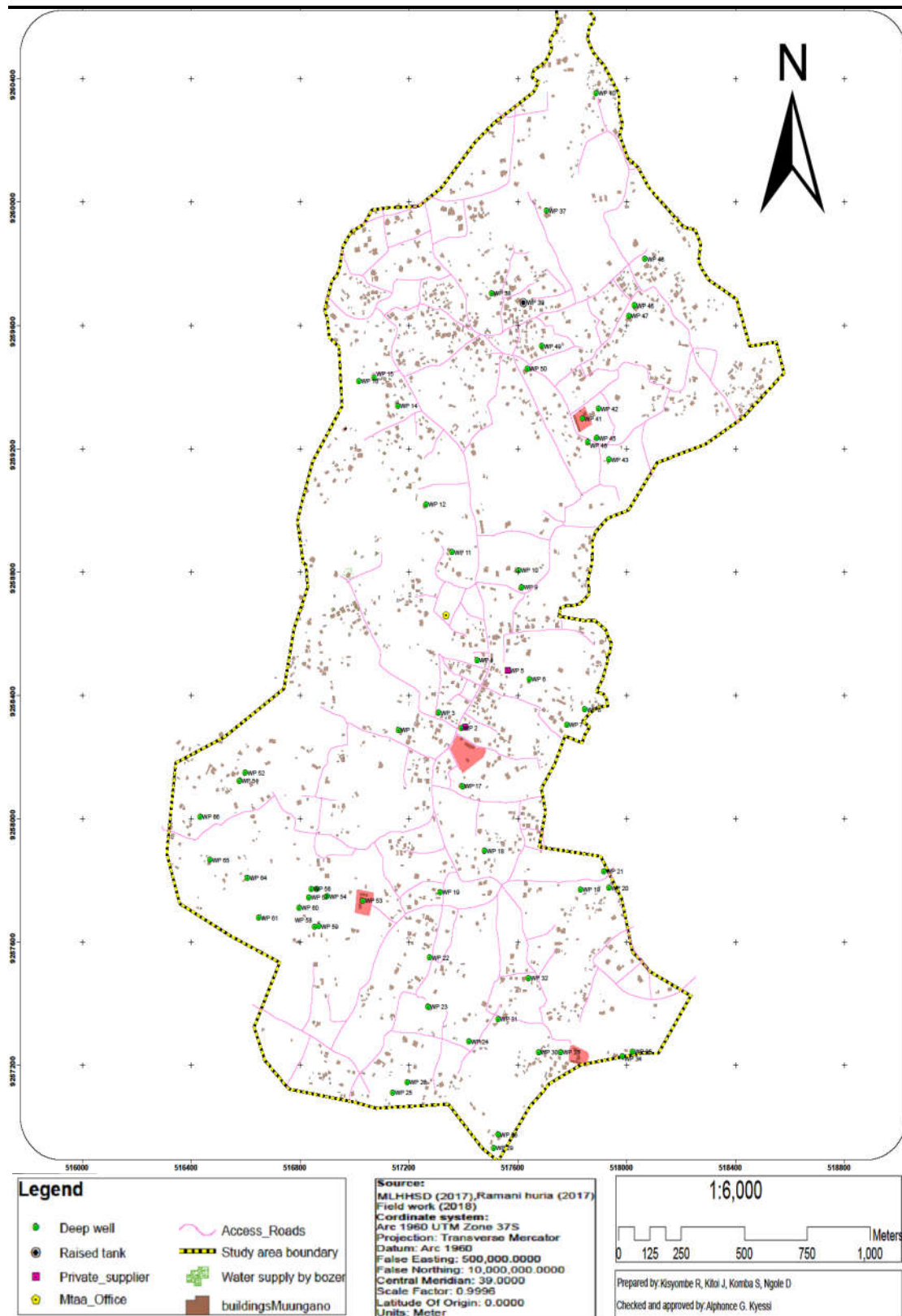
Table 2 indicates that private water supply is the most important model in comparison to the other options of water supply in this settlement, whereas the number of house connections by the DAWASA public water supply system is the least, constituting hardly a fifth of the private water connections. Furthermore, water supply by DAWASA existed before 2000, and is now once per month or longer. Similar to the DAWASA system, the number of houses that the community-based scheme serves is about a quarter of what the private scheme serves. While this water from the community-based scheme is available every day, its network coverage is limited, and the water is naturally slightly salty.



Plate 2. A water supply point under the community-based scheme at Muungano

Sources of water supply

Just as the case is with the provider models, there are different water sources in the settlement, varying in nature of their water quality and availability. Table 3 summarizes the main sources of potable water supply to the Muungano households, while Figure 3 presents the spatial distribution. The source referred to in Table 3 as a protected well, includes the private water supply system that supplies water to the community through piped networks. This source serves most households (59.3%). As per the Table, the piped water supply source in this case implies the DAWASA supply, characterized by scarce and unreliable supply. However, there are some households that draw water from the river valley, particularly because they are far from the reliable supply network, while others get water through bowsers/tankers on the same reason.



Source: Field Study, 2018

Figure 3. Sources and spatial distribution of potable water for Muungano Settlement

Table 3. Main sources of potable water at Muungano settlement

S/N	Water source	Percent
1	Canal/river	3.4
2	Protected well by the non-public suppliers	59.3
3	Protected spring	1.7
4	Piped water supply by the public suppliers	22.0
5	Bowser/tanker	13.6
	Total	100.0

Source: Field study, 2018.

The quality of the water from the valley is considered of the poorer quality, because it is vulnerable to contamination by animals, households upstream, as well as income generating activities such as car washing and food vending.

Figure 4 summarizes the community perception on the availability and reliability of water from the various sources in the settlement, a situation that compels the use of the multiple water sources by the community.

Box 1: Private water supply services at the Muungano settlement

For a long period, before early 2000s the Muungano community relied mainly on water vendors and shallow wells, especially along the valley, for their daily water supply. Some few houses had connection to the DAWASA public water system, from which some other households drew water. The situation became more challenging with the fast population growth, while the DAWASA supply became unreliable. This situation prompted intervention by the local government, which initiated a community-based water scheme in the mid-2000s. This system was initiated by the Kinondoni Municipal Council and funded by the Tanzania Breweries Limited (TBL). However, with more households shifting into the settlement, the supply could not meet the water demand for the population. Hence, private operators entered the business of supplying water to the community. Among these private water suppliers, Cudco is the most prominent.

Experience with Cudco private-based scheme of water supply:

Cudco is a resident who supplies water from a mechanized borehole which is located within the settlement. His scheme connects and serves directly 76 houses, using plastic pipe network, under a monthly payment arrangement for the service.

Private water suppliers at Muungano

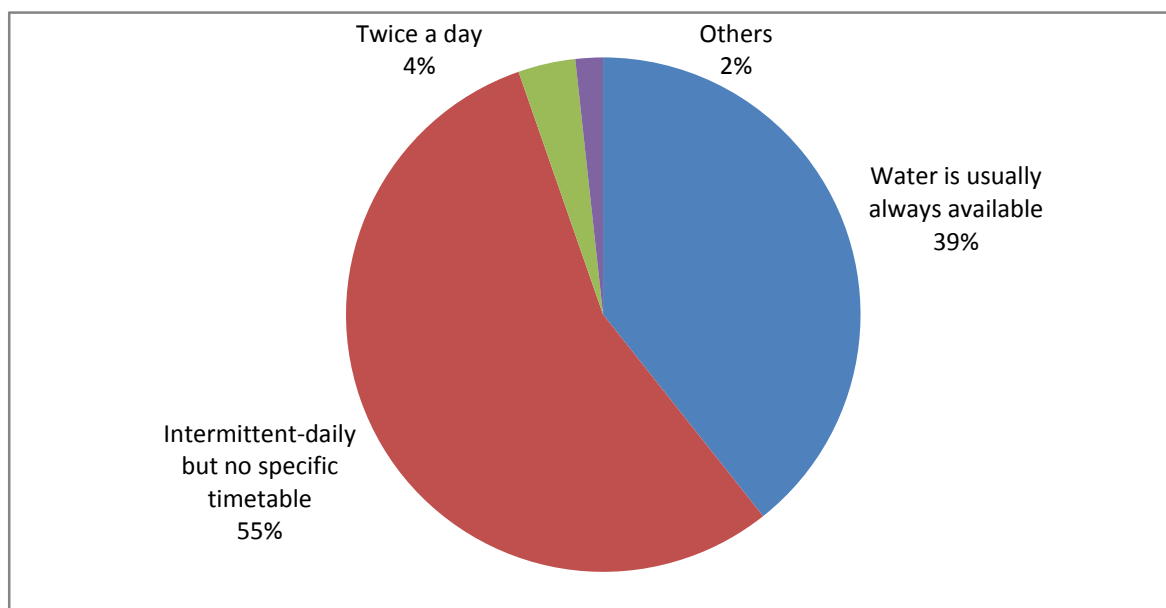
Supplier/name	Direct house connections
Cudco	76 (30.58%)
Said	32 (13.22%)
Kishimbo	28 (11.57%)
Shayo	23 (9.5%)
Mosque	41 (16.94%)
Others (private)	46 (18.18%)
Total connections	246

What makes Cudco a success story?

Cudco has so far been the most important service provider of potable water, having the highest number of direct water connections as compared to any other scheme in the settlement. Cudco has also managed to maintain acceptable quality of water supply to the satisfaction of his customers. When the customers notice water quality deterioration, Cudco uses a water quality purifier to ensure/ascertain good quality water supply.

Despite charging the highest price per cubic metre of water (TAS 8,000/-) this supplier has so far been the service provider with the highest number of customers in the settlement. Some other service providers charge as low as TAS 3,000, while DAWASA's rate is less than TAS 2,000 per cubic metre of water. These figures suggest that people are willing to pay more for better quality or improved services.

Source: Field study, 2018.



Source: Field Study, 2018

Figure 4. Water availability and reliability in Muungano Settlement

As it can be observed in Figure 4, slightly over one third of the interviewed households indicate that they continuously access water. However, slightly above a half of the respondents indicated high unreliability due to intermittent supply. Most of these households get water supply daily, but without any specific timetable. The interviewed households were dissatisfied due to low/poor water quality. Only about 40% of the households described the quality of the water they use as clean, while about 58% explained that the water they use is not safe. About 3% of the households use chemical disinfection processes, while about 68% boil the water so as to improve its safety. Apart from the water quality, the location of potable water sources is an important factor that explains the level of service in the settlement. Table 4 presents the locations of the various potable water sources at the Muungano settlement. Based on Table 4, about a third of the settlers depend on supply by neighbours, whereas the bulk (40%) rely on sources such as short wells, seasonal rivers, industrial packed water, and a mixture of some sources listed in the table. This shows that most cannot afford own connection, some of whom possibly due to low income.

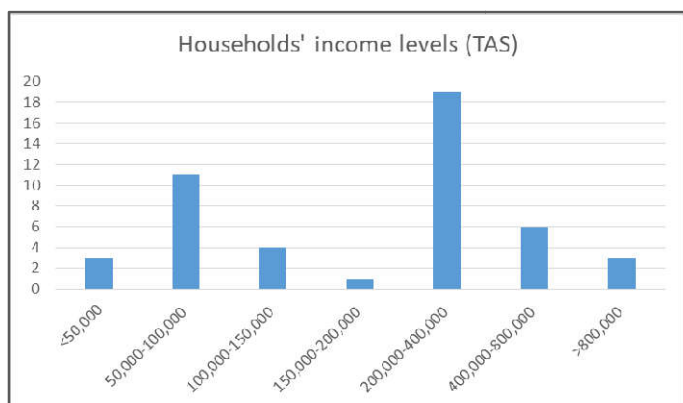
Table 4. The locations of potable water sources for the Muungano households

SN	Location of water source	User households Percentage
1	In-house connection	13.3
2	Within compound	5.0
3	Community water point within the settlement	3.3
4	Mobile water vendors	6.7
5	On neighbors plot compound	31.7
6	Others	40.0
	Total	100.0

Source: Field Study, 2018.

Water quality and affordability

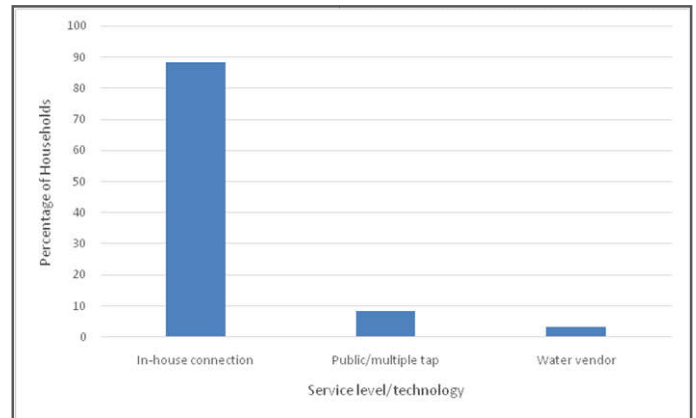
Water quality and affordability are two closely linked factors in analysing access to water supply. In overall terms, affordability does not seem to be a big problem to the majority of the Muungano households, as indicated by their income levels and what many households currently manage to pay for potable water. The proportion of households that earn less than TAS 50,000 (US\$ 22) per month is small (4.9%), and could be lower, since many people tend to hide the real income. Monthly household income level contributes to determining the local community affordability with respect to the basic costs of water supply and sanitation. Similarly, the decision on the level of service and technology could also be influenced by the community’s affordability levels, that is, the income levels of a particular community.



Source: Field Study, 2018.

Figure 5. Monthly income of households at Muungano

Figure 5 summarizes on the income levels, being an important component of affordability with implication on water quality and sanitation services. Affordability of households in the community could also be observed through the community’s preference on the type of technology, and their willingness to pay for it. The preference of the majority (89%) of the Muungano community is to extend the water supply services to their plot/house level (see Figure 6). This indicates the willingness of these households to pay for the supply, and pay more for improved services.



Source: Field study, 2018.

Figure 8. Households preference of service level and technology

Potable water distribution and proximity in the Muungano settlement

In this section, water supply distribution is presented in terms of the available water supply network and the proximity of the water sources. The water supply network, in its totality, covers only about a third of the whole settlement, putting together all the water supply models available in the settlement. Private individuals have managed to supply a networked system in the settlement (see Figure 7). In connection with the concentration of the water providers in some areas, the proximity of households to the water services varies from house to house, as can be seen in Figure 8. In essence, the figure on the proximity indicates the distance to individual water sources, or in other words the service network of each individual water source.

Water consumption and tariffs

The average daily water consumption at the Muungano settlement is 130 litres per household, implying an average monthly consumption of 3900 litres per month, which is almost 4 units. Considering the current water price in the settlement (TAS 100 per 20 litres bucket), a household pays an average of TAS 5,000 per one unit, particularly for households that do not pay on monthly basis. With improved services, the prices can be as low as TAS 1,500, which is slightly above a quarter of what the Muungano people are currently paying. This implies an opportunity for improved network, since it may make the Muungano residents pay less but enjoy better water supply services.

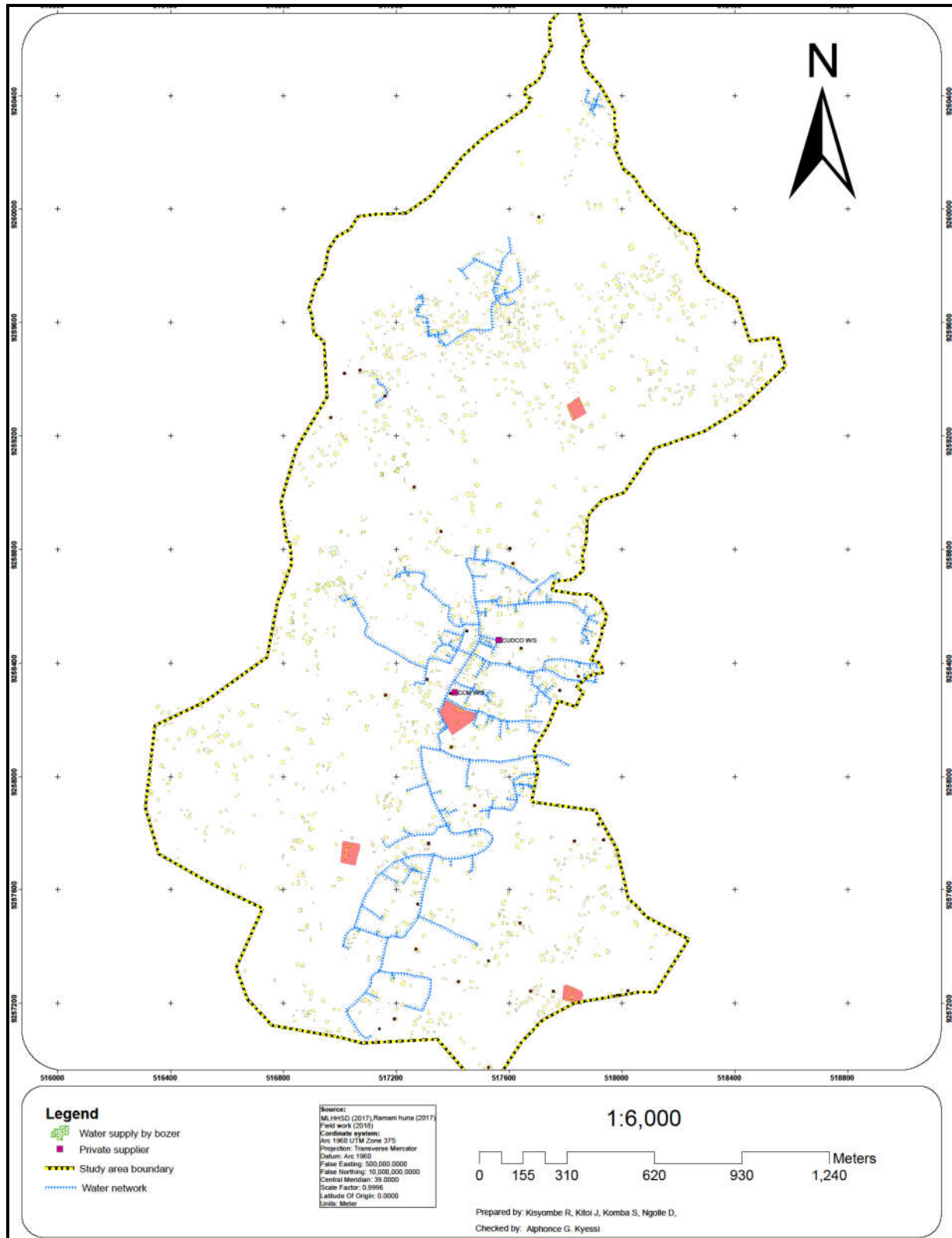
Actors and roles in water supply in the area

As highlighted under section 3.2, the public, the private and the community actors take part in water supply in the settlement. There exists no NGO working on water supply in the settlement.

Table 5. The roles of water supply actors at the Muungano settlement

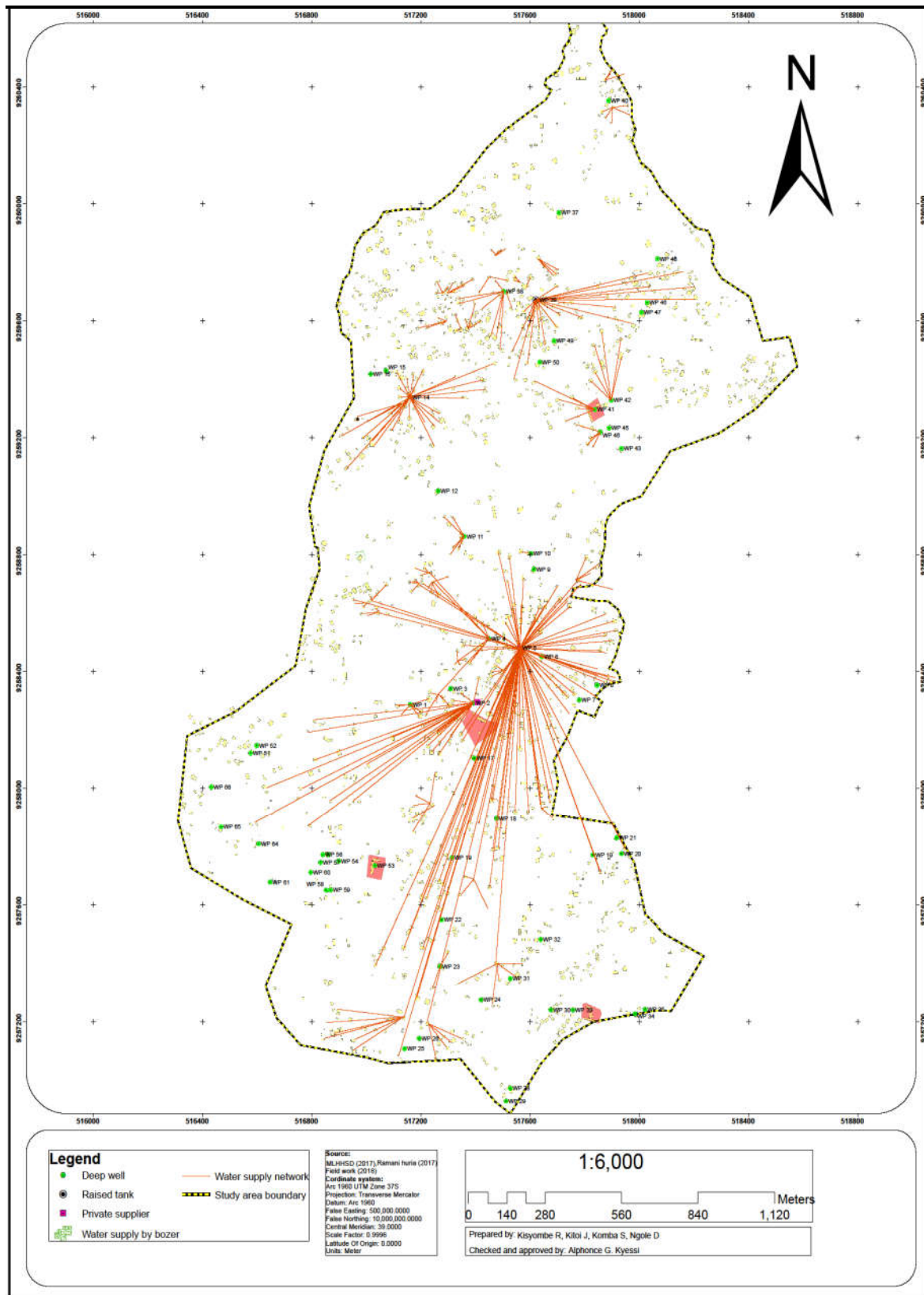
S/N	Actor	Function(s)/Role(s)	Remarks
1	Mtaa Committee	Oversees and monitors general services provision in the area	A government organ
2	Mtaa Water Committee	Manages water provision in the area, Runs community-based water projects Provides water supply services to the community	One of the local (Mtaa) government committees. Its roles are statutory. It is answerable to the Mtaa Development Committee.
3	Private service providers	Provide water supply services to the community	Not regulated or accountable to the mandated water supply authorities.

Source: Field Study, 2018.



Source: Field Study, 2018.

Figure 7. Potable water network in the Muungano settlement



Source: Field Study, 2018

Figure 7. Proximity to water supply in the Muungano settlement

The Mtaa Committee is known for its provision and management roles in water supply, and it set up a specialized water committee, that is under the Mtaa Committee. However, just like in many other settlements, the Water Committee is confining its role to managing water supply that is provided under the Mtaa Committee alone. Thus, the private water suppliers who serve the majority in the settlement are not in any way managed by the Mtaa Committee.

Table 5 summarizes on the actors and their roles in water supply at the Muungano settlement.

Challenges and innovations of extending public water networked system to peri-urban settlements

The challenges and innovations of extending public potable water supply to the peri-urban settlements are derived from the

analysis of the current situation of the service in the Muungano settlement, as well as the community's affordability and the willingness to pay.

Challenges

The challenges of water supply services in the Muungano settlement include insufficient water accessibility infrastructures; high dependency on the private water supply system operating by the market forces; long distance and more time spent in accessing water; inaccessibility to clean and safe water, and the unreliability of the public water supply. The challenge of insufficient water infrastructures occurs in terms of the limited water network coverage in the area. The current water supply network by the three different types of service providers covers only around 30% of the whole settlement. However, the challenge of the limited water network coverage is also an opportunity for extending the piped water system in the settlement. The limited coverage of water network in the settlement is accompanied with a high dependence on the private water supply system. This is a challenge since the service providers in the private water supply system operate by the market forces. For instance, the private service providers implement their own water tariffs, whereas in some years the price was raised to more than four times in comparison with the public system tariff. Without regulating private service provision, the community, especially the low income households, may fail to afford potable water and subsequently opt for unsafe sources.

The challenge of long distances and the time on fetching water is related to the reality that the existing water supply networks cover about 30% only. Hence, the population living in the other sections of the settlement have to travel and spend time to get water, whereas about 50% of the interviewed households spend 10 to 20 minutes for that purpose, and about 13% spend up to 30 minutes travelling and getting water. Water access situation in the settlement, in terms of the water quantity supplied and the availability convenience are among the components with which the Muungano community is overall dissatisfied. Slightly above one third (36%) of the interviewed households indicated that they usually get water supply always, while about half of the population expressed that they experienced high unreliability, because of intermittent supply. This situation has created an opportunity for private sector service to extend into this area.

Innovations

Two key innovations related to extending the water supply services were observed in the settlement, including private network of supply and multi-model system of the supply. The private network of water supply is an innovation through which, private suppliers became the main service providers of potable water, after the old public network could no longer serve the settlement adequately. Private networks of water supply are owned by individual service providers. Through these networks water is pumped from the privately owned bore holes in a system of pipes to individual houses, who pay on a monthly basis. The private networks currently account for about 69% of the water supply in the settlement. Just as the public water supply system is unable to meet water demand in the settlement, leading to the emergence of private water systems, the public and private systems could not suffice, hence more systems of water supply had to come in and serve

the community. While some households cannot afford the private water network tariff, they access water through the community-based water system, whose services are relatively cheaper. As such, the multi-model is an important approach for water supply services in the settlement, since none of the models can separately cover the water demand in the settlement.

Conclusion

Although the private small scale water suppliers are leading in the provision of potable water supply in the Muungano peri-urban area, the way the provision is managed presents a risk of denying access to a wider section of the population in such area. The private service providers are not regulated or monitored by any institution at the local or higher level. That is a weakness and a loophole for unaccountability and poor quality service delivery. It can also be a source of unfair prices charged, which make quality water unaffordable/inaccessible by poor households. Thus, it is recommended that, these private schemes be formalized for improved management. Although the local government system at Mtaa level has a specific committee responsible for water supply and sanitation issues in the area, the committee's scope excludes a control over the service providers. This is a weakness in managing service provision issues at Mtaa level. Institutional capacity building is therefore, recommended to support, monitor and regulate stakeholders (including private and public institutions) involved in water and sanitation services at the local level. In this research it has been observed that multi-model approach to services provision is important, as it enhances access and options of service provision. Thus the approach ought to be protected and supported. Water quality, however, is of high importance and has to be ensured in the operations of the multi-model water supply.

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