



# The role of informal small-scale water supply system in resolving drinking water shortages in peri-urban Dar Es Salaam, Tanzania

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## ABSTRACT

Developing countries are facing unprecedented urbanization coupled with informal peri-urban growth, characterized by inadequate basic infrastructure provision. A large proportion of peri-urban populations particularly in the Sub-Saharan African region faces limited access to drinking water. Informal water suppliers of varying size and scale have become predominant and fill drinking water supply gap left by public utilities. This paper draws on qualitative and quantitative research approach to examine the state, role and inherent practices of informal water supply system in addressing peri-urban drinking water shortages along with consumers and stakeholders' attitudes towards the system. Open-ended and semi-structured questionnaires were used to interview private water providers, public officials, households and other stakeholders to document informal water supply practices. The results indicate that informal small-scale providers account for 100% of drinking water in peri-urban settlements, but water infrastructures are in the dire state as its investment is carried out without adequate professional guidance. Furthermore over 64.1% of the communities acknowledged the importance of informal water providers in increasing water access. However, their recognition contravened with public institutions' position where 60% maintained that public water provision remains a viable option for peri-urban water access. Nevertheless, overall condition depicts that informal small-scale water supply systems remain pertinent and leading drinking water access options for many households in peri-urban settlements. Acknowledging its contribution along with integration into public regulatory mechanism can greatly contribute towards the improvement of water supply services to the majority of informal urban and peri-urban populations.

## 1. Introduction

Water is an essential resource for life, whose uses have no alternative rivals (UNICEF/WHO, 2012). Access to safe and clean water is a human right and cannot be over-emphasized. In the recognition of this need both the United Nation (UN) Millennium Development Goals (MDG; 2000) and the Sustainable Development Goals (SDG; 2015) have specific goals and targets on increasing water access.<sup>1</sup> The MDG's target was met in 2010, where over 89% of the global population, had access to improved water sources (WHO, 2015). However, these outstanding achievements largely indicate global average while 40 countries including Tanzania did not achieve the MDG targets in 2015 (Kombe, Ndezi, & Hofmann, 2015; Liddle, Mager, & Nel, 2016). Over 800 million people worldwide still lack access to potable water, 43% of whom reside in Sub-Saharan Africa (Adams & Zulu, 2015; WHO, 2015).

The underlying factors for poor water supply and access are many (Kjellén & McGranahan, 2006). They stem from colonial policies, and in the post-independence era, with limited public investment and expansion of the already declining colonial water system, exacerbated the challenge (Liddle et al., 2016), as the centralized piped water network was unable to cope with rapid population growth and cities spatial expansion (Andreasen & Møller-Jensen, 2016; Sima & Elimelech, 2011). Privatization of urban water supply services in the late 1980s and 1990s with substantial support from the World Bank and other international organizations (Bakker, 2003; Kjellén, 2006; Schwartz & Sanga, 2010), was envisaged to provide practical solution to chronic urban water supply in developing countries (Liddle et al., 2016; Njiru & Albu, 2004; Smiley, 2013). However, it faded in early 2000 (Ahlers, Schwartz, & Guida, 2013), leading to subsequent shift of urban water supply services into the public domain, through the adoption of semi-public

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<sup>1</sup> There is a wide discussion about the meaning of water access, however there is no consensus on a universal definition (Dagdeviren & Robertson, 2011). In this study, we adopted the definition by Kristof (2005) who says that good access to water implies "a reliable source of water which supplies adequate quantity and quality of water in a convenient way".

utilities with full government regulatory control (Bakker, Kooy, Shofiani, & Martijn, 2008; Dagdeviren & Robertson, 2011). Nevertheless, formal urban water supply network in developing countries continues to be inadequate, with the informal urban and peri-urban settlements being the most deprived (Andreasen & Møller-Jensen, 2016; Smiley, 2013). Consequently, informal water provisioning has become dominant in many cities of developing countries (Misra, 2014; Sima & Elimelech, 2011), where communities get access to water through numerous forms and scales of informal provision (Kombe et al., 2015; Nganyanyuka et al., 2013).

Recent studies show that the informal suppliers provide drinking water to more than 50% of urban population in Sub-Saharan Africa (Dagdeviren & Robertson, 2011; Sima & Elimelech, 2011). In Tanzania, urban water provision is still a critical challenge (Allen, Dávila, & Hofmann, 2006). While only 23% of the population in 20 cities with informal settlements in Tanzania has access to potable water from public utilities, 68% is covered by the informal water providers and 9% get water from ponds, streams, and rivers (Pauschert, Gronemeier, & Jebens, 2012). Dar es Salaam, which is the largest city in Tanzania, and among the rapidly urbanizing cities in Sub-Saharan Africa with a population of more than 4.4 million (URT, 2013), has over 80% of its residents living in informal settlements (Kombe et al., 2015), where access to formal piped water is a major problem. The colonial policies and global reforms have had a significant contribution to the city's unreliable and uneven water infrastructure landscape (Smiley, 2016). Colonial piped water system was primarily constructed to benefit Europeans, while African neighborhoods were served by public water kiosks. Privatization of the water supply services in Dar es Salaam began with a 10-year lease contract with city water Company in 2003 (Dill, 2010). Despite the water firm's ambitious goal of supplying piped water to over 80% of city's residents within a short period of time, it didn't address the crisis as was expected (Bayliss & Tukai, 2011; Smiley, 2013). The sustained inefficient bills management and tariffs collection; poor operation and maintenance, and lack of infrastructure investments seemed to intensify the water supply crisis than providing a solution. Consequently, the government terminated the contract, within two years of service with the city water Company as reported in the Tanzanian newspapers Nipashe 2005-05-14, The Guardian 2005-05-14 and The Guardian 2005-05-18 (Kjellén, 2006).

The Dar es Salaam Water and Sewerage Authority (DAWASA) and Dar es Salaam Water and Sewerage Corporation (DAWASCO), are two semi-autonomous public institutions with sole responsibility to supply potable water to the residents of Dar es Salaam, and other operational areas of Kibaha and Bagamoyo towns at present (Kombe & Lupala, 2005). While the city's population grows rapidly, this growth does not match with the corresponding expansion of piped water supply network (Smiley, 2016). These aspects are argued to increase a huge gap between demand and supply of water for the city residents with estimated demand at 533 million liters per day against the current total DAWASCO production capacity of only 273 million liters per day (Kombe et al., 2015; Nganyanyuka, Martinez, Wesselink, Lungo, & Georgiadou, 2014). Furthermore, Non-Revenue Water (NRW) caused by leakages and illegal connection further decrease expansion of piped networks due to water loss. The Energy and Water Utility Regulatory Authority (EWURA) a government agency with a mandate to monitor and regulate utility agencies, estimates that NRW for DAWASCO in 2014 was 57.7% against 20% limit set by EWURA (EWURA, 2014). Consequently, the NRW further reduces the amount of water reaching customers which primarily impedes the utility to extend water supply networks to the peri-urban settlements.

The government through DAWASCO has taken steady efforts to address water shortages and poor coverage including expansion of water production plants to increase the volume of water, however, still, piped-water distribution network covers only a fraction of the city (WaterAid, 2011). Considerable improvements have been directed to planned middle and high-income housing areas, institutional, industrial

and commercial hubs while leaving a large part of Dar es Salaam, particularly informal urban and peri-urban areas uncovered by officially supplied water (Smiley, 2016). Such inadequacy compels large proportion of city residents to access water through a myriad of a non-conventional informal system that includes unregulated private informal small-scale providers of varying size and scale (Kombe et al., 2015; Sima & Elimelech, 2011).

The informal urban water provision has been a contentious theme of discussion in the past two decades (Ahlers et al., 2013). More recently, a broad discussion on the emergence, growth and persistence of informal small-scale water providers and their significant contribution on increasing drinking water provision in poorly serviced informal settlements have ensued, along with the problems and benefits offered by the sector (Ahlers et al., 2013; Allen, Hofmann, Mukherjee, & Walnycki, 2017; Andreasen & Møller-Jensen, 2016; Bell, Allen, Hofmann, & Teh, 2016; Kombe et al., 2015; Kooy, 2014). For example, Kjellén and McGranahan (2006) highlight the operation of informal small-scale providers in developing countries and discuss the possibility to operate and extend water services on full cost recovery without government support. Some studies highlight the growing trend of informal service provision and analyze its potential role of filling the gaps left by public service providers (Dagdeviren & Robertson, 2009; Kariuki & Schwartz, 2005; Matsinhe, Juárez, Rietveld, & Persson, 2008). Others note the potentials of the informal sector in increasing water access in slum areas (Adams & Zulu, 2015; Kooy, 2014; Marston, 2014; Narayanan, Rajan, Jebaraj, & Elayaraja, 2017); while some studies emphasize the need to formalize the sector in order to improve urban service delivery, particularly areas inhabited by the urban poor (Adams & Zulu, 2015; Schwartz & Sanga, 2010).

However, these and previous studies examine informal water provision at a larger scale, while those which have examined Dar es Salaam, had a wider scope at district, municipal or citywide level. This makes it hard to understand their heterogeneity in operations, service delivery system, and specific roles in addressing the drinking water shortage, and how residents manage to access water, and how the sector is perceived. This paper, therefore, contributes to these perspectives and provide more insights through examining the system at much lower level (ward and sub-ward). This level provides a holistic understanding on how the informal small-scale water supply system actually works and contributes to addressing inadequate drinking water provision in peri-urban areas in Dar es Salaam, and by extension to Tanzania, along with its challenges and future prospects towards improved service delivery in the deprived peri-urban settlements.

## 2. Materials and methodology

### 2.1. The peri-urban

Peri-urban settlements refer to settlements located in areas of transition zones between the city and countryside (Allen et al., 2006); or rather between fully urbanized land in cities and in areas used predominantly for agriculture (Rakodi, 1997). In the Tanzanian context, peri-urban entails areas falling outside the consolidated urban and characterized by a mixture of land uses between the city's built-up areas and its hinterland. These areas have inadequate basic social services and infrastructures, exhibit rapid informal settlement growth, with mixed social classes and dominated by multiple land tenure regimes, including statutory right of occupancy, customary and quasi-customary tenures (Kombe & Lupala, 2005; Msangi, 2011). This study adopted this definition and examines three selected peri-urban settlements in Dar es Salaam City.

### 2.2. Case study areas

The study was conducted in three peri-urban wards, viz. Chamazi, Kinyerezi, and Goba in Dar es Salaam, Tanzania (Fig. 1). The wards

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