Assessment of accessibility of safe drinking water: A case study of the Goreangab informal settlement, Windhoek, Namibia

Earl Wesley Lewis*, Nguza Siyambango and Selma Lendelvo

Multidisciplinary Research Centre, Life Science Division, Private Bag 13301, Pioneers Park, Windhoek, Namibia

*Corresponding author. E-mail: elewis@unam.na

Abstract

Water accessibility in informal settlements remains a challenge in sub-Saharan Africa. In this study water accessibility in the Goreangab informal settlement, Windhoek, Namibia was analyzed. Semi-structured (n = 105) and key informant interviews (n = 3) were conducted. Long distances and financial constraints are the main reasons for poor water accessibility. Only 11% of residents live within 1 km of a safe drinking water source, the recommended safe distance by the World Health Organization on minimum water access standards. Considering local factors, incorporating an integrated water resource management framework and a public–private partnership is suggested to improve the settlement's water supply management.

Key words: informal settlement, Namibia, water access, water management, water supply, Windhoek

INTRODUCTION

In Namibia, water is generally scarce, because of low, sparse and variable rainfall, coupled with high evaporation rates. Worse still, water scarcity has been exacerbated by the large number of people who reside far from major sources of water. Water is a critical necessity for human life and supply remains a serious problem throughout Namibia, as the country is one of the most arid in sub-Saharan Africa (Ruppel 2013). The need for potable water and basic sanitation services was identified at Namibia's Independence as a critical concern, especially for people living in communal areas (Mutanga 2017).

Due to rapid rural–urban migration, associated with poor living conditions in rural areas and assumed urban possibilities, Namibia is changing swiftly from a rural-based society to one based largely in urban areas. The transition is made most visible by the informal settlements burgeoning on the edges of towns. Around 2015, Namibia's urban areas incorporated approximately 140,000 informal houses, and this is likely to double by about 2025, if the trend is not addressed urgently (Weber 2017).

Urban growth is particularly acute in Namibia's capital city, Windhoek. According to the World Health Organisation (WHO 2013) and the National Planning Commission (2013), the city is growing at approximately 4.4% per annum, whereas the informal settlement population is growing at 9.5%. Therefore, the city is challenged with providing its population with potable water.

Windhoek's water management system is divided into formal and informal sectors, but access to safe drinking water in Namibia is spatially skewed in favor of formal urban areas. In the formal areas, controlling demand remains a key concern, while in the informal areas, improved accessibility to water is crucial (Magnusson 2005).

In Namibia, the Ministry of Agriculture, Water and Forestry (MAWF) has custodial responsibility in managing and regulating water resources. MAWF's main objective is ensuring that the integrity of water resources is properly investigated and maintained through sustainable use, to cater for people's
needs and sustain their environment (Enkono & Mosimane 2016). Local authorities and regional councils are responsible for implementing water supply and sanitation in rural and urban settlements.

In 2002, the Namibian Cabinet approved the National Water Policy White Paper that formed the basis for the Water Resource Management Act (2004). The policy provides a framework for equitable, efficient and sustainable water resource management, and clearly elucidates that water is an essential resource for life and that an adequate supply of safe drinking water is a basic human need (Ruppel 2013). The 2004 Act expresses the need to form institutions to manage water and other resources. However, despite these efforts, water supply remains a major challenge, especially in communal areas (Republic of Namibia 2008).

Although the City of Windhoek has had considerable success in providing water to its residents, its unprecedented population growth since about 2010 has strained the city’s resources to meet increased demands for jobs, shelter and services. Unplanned settlements pose further challenges to the municipal authority to supply services and adequate shelter (Pendleton 1994). Whilst planned residential areas have fully-serviced plots with water and sewerage connections, only an emergency provision of water through stand pipes is supplied to informal settlements, with very limited sewerage facilities, or sometimes none at all (City of Windhoek 2002).

Undoubtedly, as in many other countries, Namibia’s informal settlements are faced with water access and availability challenges. The increasing population in Windhoek arising from rural migration has resulted in increased pressure on availability and access to essential services such as housing (informal settlements) and safe water. Consequently, informal settlements have mushroomed in and around the Goreangab Dam, with adverse effects on the integrity and safety of its water (Benova et al. 2014). This has led to residents living in the Goreangab informal settlement facing challenges with respect to access to clean and safe water for household use. Most residents have no access to basic needs like sanitation, water or electricity. There are shared public water access points (WAPs) and toilet facilities in some areas, but they cannot cater for all households, as they are too distant for some people to reach (Nangombe 2015).

Accessibility is defined as water being within reasonable distance, affordable, and accessible in law and in fact, and with information on water issues being provided (Gedo & Morshed 2013). According to WHO (2008) reasonable access means the availability of at least 20 l/c/d within 1 km of the user’s dwelling.

Accessibility of water in Goreangab informal settlement has continued to decrease monthly because new migrants settle in the area, leading to the expansion of its boundaries so that residents are located further from the fixed communal taps. No new WAPs are being provided to cater for those living far from available potable water taps, which in turn exerts more pressure on the available infrastructure. This leads to adverse effects where demand is continually increasing and a growing backlog exists. It is against this background that we decided to evaluate accessibility to water in the Goreangab informal settlement.

**STUDY AREA**

Goreangab is a peripheral township in the northwestern part of Windhoek, in Samora Machel constituency. The 2011 housing and population census (Namibia Statistics Agency 2013) shows that Samora Machel is the second most highly populated constituency in Khomas region, with 50,110 inhabitants. (Windhoek West has 53,438 inhabitants.) According to the Namibia Statistics Agency (2013), the number of households in Samora Machel increased from 6,598 in 2001 to 13,250 in 2011.

A substantial part of the settlements is very close to the Goreangab Dam shore – one of Windhoek’s water sources – often only a few hundred meters from the dam, despite a prescribed 1 km green belt in every direction from the dam (Holms & Stalas 1996).
The area is characterized by one-room, tin or corrugated iron shacks that accommodate about five people on average (Kastner et al. 2005). The informal settlement has more than 2,000 residents (Informante 2015). A survey of a section of the settlements surrounding the Goreangab Dam area indicated that most residents are young adults (20 to 40 years) and that 80% had migrated from elsewhere in Namibia. About 72% came to Windhoek in search of employment (Zimmermann 1999).

MATERIALS AND METHODS

A questionnaire was used to interview residents of Goreangab community in April 2017. In total, 105 questionnaires and three key informant interviews were conducted with local leaders staying in the settlement. Stratified sampling was used to select different settlement sections, while convenience sampling of households was used – i.e., households were chosen solely on the basis of availability in the selected area. Respondents preferred to be interviewed in their respective native languages rather than English and so, prior to the interviews, the research team spent a significant amount of time going through the questionnaire with the interviewers. The data were analyzed using SPSS.

RESULTS

Water supply system

Currently there are two water metering schemes in the informal settlements: post- and pre-paid. In Goreangab the water supply system is pre-paid. Kastner et al. (2005) observed that, with pre-paid metering, each proclaimed household receives a pre-paid card that must be inserted into the meter for it to dispense water. Users can add credit to cards at one of two points of sale in the settlements. The cards contain computer chips and cost about US$7 (N$100) to buy. The card can be recharged repeatedly for smaller amounts. At the taps people pay 8 to 9 N$/m³ (Uhlendahl et al. 2010). Although this system ensures that each household only pays for the water it consumes, it has its own associated problems. Of particular concern is that a resident who runs out of credit on the card will be unable to obtain water from the standpipe. Another concern mentioned is that residents sometimes run out of credit when the point of sale office is closed and then cannot recharge the card.

At the time of this study – i.e., in 2017 – only two standpipes were available for use. All respondents claimed that the water supply was insufficient and long queues at the standpipes demonstrate slow release of water. On average people waited about one hour, with the longer queues in the mornings and evenings.

Water accessibility

Water is a basic commodity and access to potable tap water for human consumption has been shown to be problematic in this community. Due to poor access, water is used sparingly in the community, with some people collecting water only three times (29%), twice (24%) or once (19%) a week, mainly using from one to five containers of 25 L capacity. Those who collect water daily do so because they have no vehicle to transport multiple water containers at once, but carry 20/25 L bottles by hand. Others use wheelbarrows and can transport five or six 20 L bottles per trip. Those who collect water weekly are able to do so because they have many water containers (up to 16 bottles of 25 L capacity) and their own transport.
Most people (78%) indicated that they had access to a potable tap water but at different distances. Those who indicated the need to travel long distances and also reliance on others to access the water for them, live in settlements not proclaimed by Windhoek municipality. The remaining respondents (22%) had no access to tap water at all, for various reasons – e.g., long distances to travel; financial constraints; no pre-paid card because their home is not proclaimed as an official building, etc. Although WAPs exist in other informal settlements, respondents who indicated lack of access to tap water lived furthest from a WAP (Figure 1).

The distance to the taps ranges from 1 to 10 km. Only 11% of households are within 1 km of a tap, which is the recommended distance by WHO (2008). Figure 1 shows that 67% of residents live between 1 and 5 km from a WAP. The remaining 22% live between 6 and 10 km from a WAP.

**Figure 1** | Distances from households to potable water taps.

**Alternative water sources**

The new part of Goreangab informal settlement is adjacent to Goreangab Dam, from which untreated seepage flows into the river bed and runs along the settlement. Claassen et al. (2015), showed that the water is highly contaminated with organic substances and thus unfit for human consumption.

Most residents indicated that they do not collect water from the river (89%). Those who do (11%) collect it daily. Some respondents use the river water for drinking (11%). The majority, however, use it for household activities such as cooking, bathing and washing dishes (65%). Others use it for business activities such as construction (8%), fishing (5%) or gardening (11%).

Those living closest to the river indicated that they use the water for domestic purposes, as it is close and free, making it more accessible than the WAPs. The majority of respondents using water from the stream indicated that their households are closer to the stream than the water taps, and 77% indicated that they were aware that the water is polluted and would like assistance in treating it so that they can use it without fear of falling sick.

The information from the surveys and observations shows that those who built their houses near the river did so to gain easier access to it. Wealthier households used municipal taps while poorer ones relied heavily on the river to meet some of their needs.
DISCUSSION

Water supply

Water supply to informal settlements is a major challenge globally. Water supply has grown inadequately with regard to meeting user needs and expectations (Ahmed & Sohail 2003). The findings in this research indicate a serious water supply problem in the new part of Goreangab informal settlement. There is a lack of water supply services and the water collection points are not distributed evenly. These issues could be considered inherent to the nature of informal settlements, given the social and economic circumstances under which they develop.

Magnusson (2005) states that these inherent problems faced by informal settlers are being prioritized in most water-related policy documents, and emphasized as one of the major challenges in improving socioeconomic development and reducing poverty in developing countries.

The Government of Namibia’s position statement is that water supply in urban areas (all non-farming areas), where people reside permanently, should be approached in the same way as that in the formal municipal areas (Republic of Namibia 2008). However, according to Pan et al. (2015), planning and implementation is a major challenge, due to the dynamic nature of informal settlements and demands that extend beyond a single department’s control, whether they originate from other municipal departments or spheres of government, or politicians or residents.

In order to find long-term solutions to water supply challenges in informal settlements, Lundqvist (2002) proposes that they must be reasonable and affordable, as well as socially accepted by the existing populations.

Therefore, to tackle water supply problems within the informal settlement, social- and site-specific water management strategies are required. For such an approach to yield satisfactory results, the challenges of water supply in places like Goreangab informal settlement, need a holistic, bottom-up approach, prioritizing the water supply demands and living conditions of informal settlers.

Water accessibility

As indicated in Figure 1, access to water is a major challenge for most residents in the area. Despite the water collection points in the community, 89% many people live far from the WAPs. There is a notable difference in water consumption between households. This is due mainly to the distance that must be walked to reach WAPs. Residents closer to a WAP are able to collect more water for consumption than those that live further away.

The implications of inadequate access to water in terms of distance were determined by Howard & Bartram (2003), who showed that the further the WAP, the less water people tended to collect and the more they cut down on basic hygiene requirements, such as bathing and washing dishes. They were also more prone to diseases. WHO (2008) explains that, if people can reach a source of water in communal areas and return within 30 minutes (within 1 km), they can collect enough drinking water to satisfy their basic needs in terms of direct ingestion, cooking and hygiene. When the round trip takes more than 30 minutes, people generally collect less water than needed to meet basic requirements. This supports findings conducted in Windhoek’s informal settlements by Uhrendahl et al. (2010), who found that, depending on the level of access available, informal settlers would reduce laundry or things having a major influence on their health, like body hygiene, cooking and house cleaning. A study by Enkonzo & Mosimane (2016) conducted in Kuvukiland, an informal settlement in northern Namibia, revealed that all-female households collected less water than those where there were males to carry it. This resulted in all-female households using less water for body hygiene purposes. Our results show that 89% of residents live more than 1 km from WAP, which is a far cry from the WHO (2008) recommended accessible distance to safe drinking water.
Although distance plays a major role in water accessibility, financial constraints are another reason why access to water is a challenge. Drinking water affordability is a complex challenge and is closely linked with accessibility. In Uhldahl et al.’s survey (2010), the authors found that 37% of Windhoek’s population live in informal settlements, with less than 1 USD/c/d (approximately 13 N$). Many residents with pre-paid cards stated that they don’t always have enough money to buy clean water to cater for their domestic requirements.

Alternative water sources

Although Windhoek has made provision for clean drinking water via the pre-paid water system in the area, some of the poorest residents cannot always afford to recharge their cards. Therefore, they use water seepage from the dam that flows alongside the settlement. This water is highly polluted and unfit for human consumption (Claassen et al. 2015).

The river is widely used in the community, especially by those living near it and who cannot afford to pay for treated water from the municipality, mainly for washing clothes and bathing. The water that some residents can afford from the WAPs is reserved for critical things like cooking and drinking. Some residents said that, due to financial constraints, they have no option other than to use the water for drinking and cooking.

Future water supply

In Windhoek, areas like Goreangab informal settlement reflect the major challenges of future water supply. Two major issues discussed so far are the insufficient water coverage in the area and the inability of poorer residents to pay for water. Because of the unplanned design of informal settlements, multiple challenges arise, which, if not addressed timely and appropriately, lead to water provision becoming unreliable, inconvenient and unsustainable. In informal settlements in developing countries, water cannot be treated as a homogeneous good. It must rather be treated as a heterogeneous good, with each source providing water of different quality, reliability and convenience (Adekalu et al. 2002). Apart from the post- and pre-paid systems currently used in Windhoek’s informal settlements, there are a variety of service options for consumers. These include public standpipes, wells and boreholes, rain water harvesting and water hawkers. It seems reasonable to assume that, in most instances, a well or tap should be provided to serve a maximum of 200 people (Howard & Bartram 2003).

For water provision to become sustainable, Wats (2003) opts for the adoption of proper service planning strategies and approaches. These should take into account a broad range of factors influencing the efficacy of water provision in settlements. Goldberg et al. (2009) (as cited in Muzondi 2014), believes that strategizing water provision entails consideration of demographic and service information, including: the current population, number of households, number of residential consumer units and the incomes related to them, current levels of water service, current and expected consumption, demand for services in terms of willingness to pay, population and economic growth, growth in number of consumer units, level of service provided to residential consumer units, and fluctuations in residential consumer income levels.

The aforementioned factors define the level of success in terms of water provision and a holistic water provision planning approach/strategy could perhaps consider them. Rheingans & Moe (2006) suggest that a range of service strategies is available for improving water provision. These include public proprietorship and management, whereby ownership of the water provision infrastructure lies entirely with a public entity. In this case the central, regional and/or local government is responsible for service system operation. Public–private partnerships (PPPs) are collaborative and can be realized through leases and concessions, whereby the municipality has the authority to delegate the operation of infrastructure facilities and the responsibility of new investment within the water provision sector, including passing the commercial risks to the private sector. Private
ownership and operation give the private sector full ownership of the system’s infrastructure and operation.

These three strategies have their own advantages and disadvantages. According to Kujinga et al. (2013), the public proprietorship and management approach seems more appealing to poor communities, because the public sector is not profit orientated and has citizens’ interests at heart. At the same time, public services are thought to be inefficient and overly bureaucratic, and thus slow to implement decisions and requiring a strong economic base to sustain services. With private ownership, results will be visible in the shorter-term, but would inevitably lead to higher costs for consumers. Therefore, in Muzondi (2014) opinion, the PPP is the most practical option for informal settlements. A PPP would strike a balance between public and private interests, thereby producing better results, wherein the quality and efficacy of the facility provided is satisfactorily in equilibrium with the economic sustainability of the service rendered.

Another strategy to improve water sustainability, which has been approved by several authors (Butterworth et al. 2010; Muzondi 2014; Enkono & Mosimane 2016), is integrated water resources management (IWRM). The Global Water Partnership (2009), defines this as ‘a process that promotes the coordinated development and management of water, land, and related resources, in order to maximize the resultant economic and social welfare in an equitable manner, without compromising the sustainability of vital ecosystems’. In other words, IWRM seeks an equilibrium between economic and social values, where water equity can be achieved through fair allocation, distribution and pricing policies. For example, in order to maintain water equity, most African countries (including Namibia) use the increasing block tariff system (Hirotsugu & Umenai 2002), where the rate per unit of water increases as volumetric consumption increases. Thus, large volume consumers pay at higher rates and low volume consumers pay affordable rates. Ideally, IWRM can be effective, with respect to water provision in informal settlements, because it exploits the dualistic scenario. It can accommodate poorer informal settlers, enabling fair access to water services that they can afford. Perhaps, in order to solve disparities in urban water provision, IWRM provides a realistic approach for enhancing service provision in informal settlements, without compromising delivery to wealthier areas (Muzondi 2014). For reasonable progress, therefore, it is proposed that PPP and IWRM should be explored in combination to ensure improvement in water accessibility.

**CONCLUSION**

It is concluded that the main water accessibility challenges faced by Goreangab informal settlement’s inhabitants are poor water accessibility, mainly due to long distances, and water affordability. The difficulties associated with access to potable water could also explain people’s high reliance on the contaminated water seepage from Goreangab Dam. Use of the latter, especially for cooking and drinking, poses serious health risks to the community, and requires immediate action from Windhoek municipality and the relevant stakeholders, to provide short- and long-term solutions. The unreliable access to water supply also indicates the inability of the municipality to meet the demands of migrants flocking there in search for better opportunities. Therefore, it is recommended that the government explore alternative options such as PPP and a well-recognized framework for planning such as IWRM for guidance on water supply in informal settlements.

**REFERENCES**


Zimmermann, I. 1999 A brief socio-economic survey of the area of Greenwell Matongo closest to Goreangab.