

Sustainable Water Supply: An Overview of Water Supply Systems in some Nigerian Peri-Urban Communities

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Abstract

The aim of this study was to identify various types of water supply systems in Nigerian peri-urban communities, to articulate reasons for their adoption and to assess their sustainability. The study involved intensive literature survey, site visits to water facilities in a number of Abuja, Ilorin and Lagos peri-urban municipalities, historical data collection, and field note from onsite observation and dialogue with the operators. It was discovered that approximately 70% of these water facilities are pumped shallow well water while the rest 30% are borehole water. Furthermore, the water rate charged varies from one facility to another. The water rate jumps up by 30% - 35% during the dry season. Moreover, clients of the water supply facilities spend 6% - 15% of their monthly family income on water. There is therefore a need for water rate standardization, monitoring and enforcement of policy guidelines of the private water supply facilities. Doing so would lead to improved quality of water supplied, improve public health and ensure sustainability of water supply in those municipalities.

Keywords: Community, peri-urban municipality, sustainability, water supply

1. Introduction

Water is life. It is an unavoidable commodity that is needed by most (if not all) living things and in various aspects of our economic activities (Russi et al, 2013). While there are abundant water resources in many places, it is scarce in some locations (Banerjee and Morella, 2011; Mapfumo and Wellington, 2014; World Bank, 2016). The method of exploitation of water resources in many places does not only make them unfit for consumption but also put the availability of water for a long term at jeopardy. There is therefore a need to evaluate the sustainability of various methods of water supply systems, factors affecting their sustainability and how the challenges could be overcome. To put this in a proper context, the following definitions of sustainable water, water supply system, sustainable water supply system, and peri-urban community were adopted.

1.1 Definitions

Sustainable water refers to water resources and water services that are able to satisfy the changing demand placed on them, now and into the future, without system degradation while water supply system refers to a system of engineered hydrologic and hydraulic components which provide water supply (Heikkila et al, 2012; Mejia et al, 2012; Nathanson, 2010). A sustainable water supply system could then be defined as an infrastructure that can continually supply sufficient clean water for human uses and for other purposes into the foreseeable future (Schnoor, 2010). In addition, the term "peri-urban communities" is used here to mean new municipalities springing up around a city or existing municipalities on the outskirts of a city that are experiencing changes due to the expansion of the city to their domain.

1.2 Necessity for sustainable water

Availability of potable water is one of the key factors to achieving improved public health, women empowerment and alleviation of poverty. The reason being that in a number of countries women and children trek several kilometers and spend hours to get water for their household. They spend the precious time that would be used for education in schools and for productive economic activities on getting water. Consequently this reduces their potentials and kept their household income at poverty level. The global community recognizing the overarching importance of water made it one of the millennium development goals. Many developing countries that were previously affected devoted significant resources to achieve the millennium development goal on water. At the end of 2015, which was the target date of the millennium development goals, a number of countries were able to meet the water supply goal while some others (including Nigeria) were unable to meet the goal. Consequently, access to safe and affordable water for all by 2030 was enlisted as the sixth of the global sustainable development goals, which was the successor to millennium development goals (Budds and McGranahan, 2003; Carter et al, 1999; Dunmade, 2015 and 2016; Gleich, 1998; Omar, 2013; USAID, 2010; Vörösmarty et al., 2000; WaterAid, 2015a and b; Word bank, 2016).

However, to attain this goal, a number of requirements has been articulated. These include investment in adequate infrastructure, protection and restoration of water-related ecosystems, cooperation between developed and developing countries to encourage water efficiency, and capacity building support for treatment technologies (UNDP, 2017).

1.3 Objectives of the study

The purpose of this study was to identify and assess the current approaches to water supply systems in some Nigerian peri-urban communities. The aim of the assessment is to determine the sustainability of the water supply systems as an index of Nigeria's progression towards the achievement of the sustainable development goal on water.

1.4 The Motivation

The motivation for this study stemmed from the concern for the hardship being encountered by citizens in those municipalities to get water. As a result, some children get late to school. Some women also could not engage in gainful economic activities that would improve their standard of living. Other motivation includes the failure of overwhelming governmental and non-governmental organizations' effort to meet the millennium development goal on water. Since water

supply systems and their associated infrastructure are among the main issues affecting the availability of potable water supply, it became necessary to examine the water supply systems in order to determine their sustainability and to identify what could be done to improve the systems.

1.5 The Study Area

Nigeria is a country with a land area of 923,770 km² and an estimated population of 189,559,501 people. Its population growth rate is about 2.76% per annum. An estimated 51.2% of the Nigerian population lives in the urban centres. More than 61% of the Nigerian urban dwellers live in the peri-urban municipalities (Olalekan, 2014). This study focuses on the peri-urban municipalities of Lagos, Ilorin, and Abuja. Lagos metropolitan area's population estimate is about 21 million people while that of Ilorin is about 881 thousand people. Abuja metropolitan area's population is estimated at 6 million people with an annual growth rate of about 35% (World population review, 2016; Andrew, 2016). Figure 1 shows the locations of the cities whose peri-urban communities' water facilities were studied.

2. Research Methodology

The research methodology involved literature survey on water supply systems in Nigeria and on Nigerian public-private partnership on water. It also involved visits to and conversation with officials of ministry of water resources at the federal and state levels. There were also field visits to 53 peri-urban water supply facilities in Lagos, Ilorin and Abuja. Water facilities visited include those located at Lagos megacity's peri-urban communities of Atan-Ota, Ado-Odo, Anisere, Ipamesan and Iganmode in Sango-Ota area. Water facilities located in Kangu and Idi-Ogede peri-urban communities of Ilorin as well as Tundun-Maje on the outskirts of Abuja were also visited. Activities at these facilities were observed and note taken during the visits. There were also conversations with people at the locations.

3. Results

3.1 Current Water Supply Situation in Nigeria

The study revealed that Nigeria is one of the ten countries that are home to about two-thirds of the global population without access to improved drinking water sources. Only 42% of households in Nigeria have access to safe water. The country failed to achieve its millennium development goal target of 75% of households having access to improved sources. Improved sources of drinking water referred to in this article include piped water supplies, boreholes fitted with pumps and protected wells (Water Aid, 2015a; Word Bank, 2016).



Figure 1 Peri-urban municipalities' water facilities under study

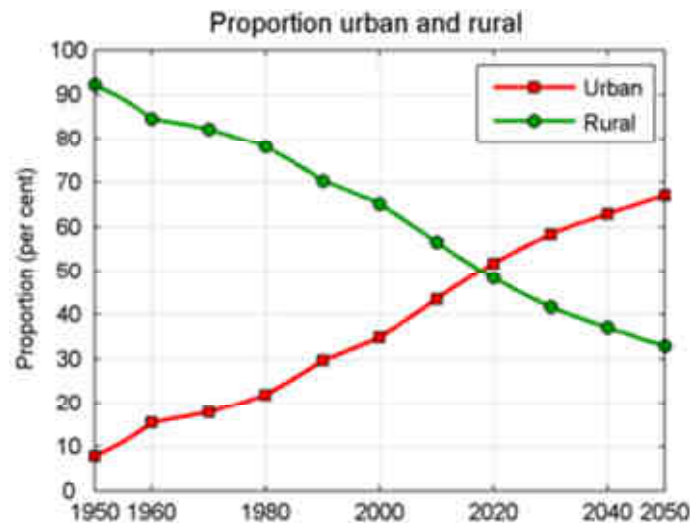


Figure 2. Proportions of urban and rural population in Nigeria in per cent of the total population, 1950 to 2050. (Source: <https://esa.un.org/unpd/wup/Country-Profiles/>)

3.2 Nigerian Peri-Urban Water Supply Systems

The study revealed three common types of water supply systems employed in most of the Nigerian peri-urban municipalities. The type of water supply system accessed by inhabitants of a specific municipality depends on available services and their income level. The following are the three common types of Nigerian peri-urban water supply systems:

3.2.1 Shallow well water supply system

This type of water supply facility is often individual house owned. They are often partially treated or untreated at all. Water from this facility are usually manually drawn, but there are some of them are covered and fitted with pumps (Figure 3a-c). This study found that many of the pump fitted wells are commercialized. Most of the commercialized pump fitted shallow well were found in Lagos and Abuja. It was also discovered that well-to-do individual homeowners with pump fitted shallow well in Ilorin peri-urban municipalities of Kangu and Idi-Ogede have water point outside their houses and they give their neighbours free access to the water.



(a)

(b)

Figure 3

a. An example of pump fitted shallow well in Idi-Ogede, Ilorin

b. An example of commercialized pump-fitted shallow well in Iganmode, Sango-Ota, Lagos



Figure 3c. An example of manually drawn protected shallow well

3.2.2 Borehole water supply system

The second most common water supply system in Nigerian peri-urban municipalities is deep well water facilities. They are usually called boreholes. They are owned individually, by communities or provided by government. It was also discovered that most of them are either not treated or partially treated. Majority of them are mechanically pumped but there are those that are manually pumped (Figure 4a and 4b). Most of the privately owned mechanically pumped deep well facilities in Lagos, Ilorin and Abuja peri-urban municipalities are commercialized. Some of the wealthy owners of this type of water supply facilities in Ilorin do have freely accessible water points for their less privileged neighbours.



(a)



(b)

Figure 4

- a. An example of commercialized borehole at Anisere, Sango-Ota,
- b. An example of manual borehole at Ago-Iwoye

3.2.3 Water Cart Vendor (also known as Mai Ruwa) System

This is a commercial water vending system involving individuals. These individuals are often seen transporting ten units of 20L kegs of water in hand-pushed carts (Figures 5a and 5b). They usually get the water either from free public water facilities or by buying the water at a cheap price from some covered private water facilities. They buy the ten jerry-cans of water for about fifty to sixty cents while they sell each of the ten 20L keg of water for between 20 - 25 cents depending on the season of the year. This method of water supply system can be found in poor neighbourhoods of Lagos (Amukoko) and Abuja (Lugbe) peri-urban municipalities (Njoku and Adelaja, 2012).



Figure 5a Water vendor sourcing water



Figure 5b. Water vendor marketing water

4. Main Findings

4.1 Factors responsible for the observed situation

Four factors were found to be responsible for water availability problems in Nigerian peri-urban municipalities. The four factors are massive rural-urban migration and high population growth rate that led to the springing up of new illegal settlements at the outskirts of many cities. Since the settlements were not planned it is difficult to extend pipe-borne water network to many of them. The rapid population growth is also responsible for the overstretch of existing water facilities. Other factors include abandonment of a number of urban and semi-urban water supply projects. Furthermore, the water problem was exacerbated by very poor maintenance culture that are responsible for the decay of existing water infrastructure. The implication of these findings is inevitable marketing of water as a business.

4.2 Characteristics of commercialized water facilities

It was discovered in the course of this study that about 70% of the commercialized private water facilities are pumped shallow wells while the rest 30% are boreholes (Figure 6). About 20% of the private water facilities' operators claimed that their water sources are treated quarterly for purity. However, it was observed that the treatment involve throwing unmeasured quantity of alum and common salt into the well. Moreover, it was observed that the prices charged per litre of water vary from one facility to another and there is indiscriminate hiking of water prices in the dry season when some shallow well dry up.

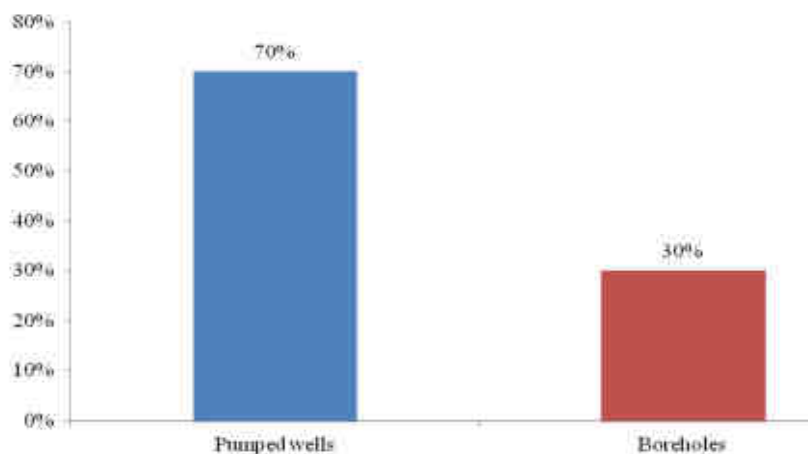


Figure 6. Types of commercialized private water facilities

4.3 Implications of the findings

Non-regulation of water prices and indiscriminate hiking of water prices at will by the vendors make water to constitute a significant cost item in the budget of low-income families. Water cost constitutes 6% to 15% of the monthly income of the low-income earning families. In addition, it led to inadequate quality of water being sold, thereby making the water unfit for human consumption. Furthermore, unregulated use of chemicals for water treatment poses risk to groundwater, human health and the ecosystem. All these issues make the water available to inhabitants of peri-urban municipalities to be economically, socially and environmentally unsustainable. Consequently, there is a need for improved water policies. There is also a need for consistent monitoring and enforcement of the policies to make the systems sustainable.

5. Conclusions

Existence of private water supply facilities in the Nigeria is inevitable. They are complements to public water facilities especially in Nigerian peri-urban municipalities. There is a need for water rate standardization and policy guidelines regarding the water supplied by the private water facilities. There is also a need for monitoring and enforcement of the policy to ensure adherence to quality requirements. Furthermore, there is also a need for more government support for small community managed rural water supply facilities. Moreover, there is also a need for education for improved maintenance culture and local fabrication of water systems' component parts. Taking these steps will enhance the availability of potable water in the peri-urban municipalities. It will also ensure continuous improvement of water supply services in those communities. This will consequently lead to improved public health, increased life expectancy and improved sustainability of water supply in those communities.

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