

Challenges of private provision of potable water in Obio/Akpor Local Government Area and its Socio-economic implications

Abstract

Water is a basic and necessary requirement for the existence of animals and plants, yet it is limited in supply in several parts of the world. Surges in human population and demand for water for different purposes such as agricultural, domestic and industrial usages are the major factors leading to water scarcity. Nigeria and the study area are blessed with abundant water resources including surface and groundwater, yet there is a palpable lack of adequate and safe potable water. Consequently, the populace resorts to private sources of water supply which has its negative externalities even though the effort seems laudable. Based on the above, the study examined the proliferation of private water supply, its challenges and socio-economic implications in Obio /Akpor local government area. The study adopted a cross-sectional survey, and data were collected with the use of both closed and open-ended questionnaire. It also involved the collection of the private borehole points with the use of a handheld global positioning system (GPS). Data were analyzed using the descriptive method of analysis and data presented in charts and tables. The result of the study showed that there were no specific distances maintained between borehole points, a good number of borehole locations were clustered in some parts of the study area. Also, distances between soakaway pits and borehole points were inadequate in some communities. Based on the prevalent minimum wage in the study area, both households that operate boreholes and those that buy water spent more. Some of the socio-economic implications of private provision of water supply include too much spending on water, creation of livelihoods for water vendors and vulnerability to waterborne disease such as typhoid since there is no minimum standard for borehole drilling and distance in the study area. The study recommended that the government should develop a private borehole drilling standard that would include the minimum distance that must be maintained between two boreholes on vertical and horizontal lines. Also, the activities of the private water vendors should be regulated, and operating license obtained before operating commercial boreholes. The study concluded thus, there should be a synergy between the private and public sector to ensure safe and affordable water supply since their activities cannot be undermined.

Keywords: challenges, private, provision, water supply, socio-economic implications

Volume 4 Issue 5 - 2020

Wocha Chikagbum,¹ Ibama Brown,² Innocent I Weje³

¹Department of Urban and Regional Planning, Ken Saro Wiwa Polytechnic, Nigeria

²Department of Urban and Regional Planning, Rivers State University, Port Harcourt, Nigeria

³Department of Urban and Regional Planning, Rivers State University, Nigeria

Correspondence: Ibama Brown, Department of Urban and Regional Planning, Rivers State University, Port Harcourt, Nigeria, Email brown.ibma@ust.edu.ng

Received: August 16, 2020 | **Published:** September 07, 2020

Introduction

Water is a basic requirement for the existence and sustenance of life (plants and animal). Researchers have over the years debated extensively regarding the relative significance, adequacy of measure, sanitation and hygiene and water quality for the protection and improvement of human health.¹⁻³ Water is a universally available resource due to its naturally free occurrence that is being abused and taken for granted in most developing countries as there is no tangible information regarding its availability, cleanliness and quality. Potable water as it were, represents one of the rarest naturally occurring elements globally.⁴ Water has become incrementally scarce in several parts of the world due to surges in population, physical development and climatic change related consequence.⁵ According to the United Nations Environmental Programme,⁵ by the year 2025, 1.8 billion people of the global population will be residing in regions with acute water scarcity. Also, most of the developing countries will be faced with water scarcity challenges that will be more than half of the population of these countries.⁵ There is a significant and increasing challenge in developing countries where access to potable water in

most urban areas is becoming an illusion (World Health Organization (WHO)).⁶ The Organisation further reported that about 780 million people globally do not have access to safe water which has caused about 2.5million persons to die of diarrheal related diseases yearly. This development has made access to safe water very important in developing countries that indicates a wide gap between existing infrastructure, population and city expansion. Urban development and planning in these countries have divergent curves because most urban dwellers provide safe water for themselves as prevalent in most slums and suburbs.⁶

Countries with abundant fresh water resources are also faced with water shortage as a result of continuous water droughts attributed to climate change-related challenges which are gradually drying-up several surface water resources and further reducing the level of water in the aquifers reaching critical levels.⁷ Water, as it is, is finite, but it is an essential requirement for human usage especially residential, agricultural and industrial uses. Agriculture uses about 70% of freshwater for food production and irrigation.⁸ In some residential neighbourhoods, when buildings are connected to pipe-borne water,

the usage increases from 60 to 100 litres per person per day depending on the climatic conditions and food requirements. For instance, when people travel a long distance to get water for use, the quantity drops to 5 to 10 litres per day per person and affect the quality of the water.⁸ Provision of potable water supply is important for socio-economic development of any country and it represents one of the main indicators of the development.⁹

Access to potable water globally revolves around having too little water to satisfy the water needs of the surging population since the wealth of every nation is dependent on the health status of its citizenry, and access to potable water is very elusive. One major challenge in the water sector is managing water so that billions of humans, animals and plants within the environment do not suffer from the lack of access to potable water. However, Nigeria and the study area are blessed with abundant water resources including surface and groundwater, but these resources are not properly harnessed such that the challenge of access to the potable water supply would have been reduced to the barest minimum. In Nigeria, the Federal Ministry of Water Resources (FMWR) Roadmap for Nigeria Water Sector 2011 estimates the water resources potential of the country as 267 and 92 billion m³ of surface and groundwater and swelling population and climatic variation has led to the scarcity of water.¹⁰

Statement of the problem

The issue of private provision of potable water supply in Nigeria is increasing without concomitant control measures put in place by the government to check the activities of private water vendors. In recent times, the issue of the public water supply has remained silent in the governance lexicon in the study area even with four substations located within the proximity of the study area at Rumuola, Rumukwurushi, Diobu and Eagle Island. Historically, in the early 1990s, there was epileptic public water supply from the mains in some parts of the study area, but from the mid-90s till date the study area has witnessed palpable lack of public water supply. This non-availability of potable water supply necessitated the citizenry to resort to private water vendors not minding its imminent danger. Every sector whether private or public face challenges at some point, just like the public water sector in the study area. Part of the challenge includes broken-down facilities such as water pumps, rusted water pipes that were not promptly maintained. Others are obsolete facilities that were constructed and put into use for many decades, increasing population and spatial growth (controlled and uncontrolled) that had extended to the fringes that are outside of the coverage area of the existing water scheme.

There is no way the existing public water supply scheme could satisfy the water needs of the ever-surging population of the study area, hence the emergence of private provision of water. With the increase in population, there emerged a corresponding increase in the demand for basic goods and services with potable water inclusive. According to the 1991 population census figures, the study area had a total population of twenty thousand and fifty-three persons (20,053). Projecting this to 2019 (18 years interval) using a growth rate of 6.5%, the population grew to one million, five hundred and sixty-five thousand, seven hundred and sixteen (1,565,716). With an average of 5 persons per household, this means that the study area has a total of three-hundred and thirteen thousand, one hundred and forty-three (313,143) households.

The United Nations and World Health Organization standard for average litres of water consumed by an individual is about fifty to hundred (50-100) litres. Using an average of hundred (100L) for this study, it means that an average household requires about five hundred (500L) litres of water daily, hence, the entire study area requires a total of one hundred and fifty-six million, five hundred and seventy-one thousand, five hundred (156,571,500L) litres daily.¹¹ The epileptic water supply from the mains could not meet the water demand of the small population in the 1980s and 1990s, with the tremendous increase in demand occasioned by increased population and failure of the government in its civic responsibility to provide safe water especially in Obio/Akpor local government area has resulted to the failure of public water scheme.

Eyenghe et al.,¹² identified that Obio/Akpor has suffered deprivation concerning public water supply and other basic infrastructure, facilities and services, unfortunately, the situation has remained unchanged till date. Although the government of the day has been working assiduously to provide good roads and other facilities, and at the same time carried out several water reforms yet, access to public water supply remains a major concern. The question that is begging for an answer is how would the residents who lack access to potable water satisfy their water needs amid plenty of water? The simple answer is "private provision". This seems harmless and commendable, but the question of safety and quantity consumed with concerning available income becomes an issue that may not be ignored. However, safety in water consumption is predicated on the management beginning with the source of the water, treatment mechanism, storage and supply which can only be ensured and enforced by the government.

Consequently, the negative externalities of lack of public safe water supply and private provision are far-reaching extreme conditions since there is no control. Hence, this study intends to assess the social and economic implications of private provision of water in Obio /Akpor local government area.

This study aims to examine the private water supply, its challenges and socio-economic implications in Obio /Akpor local government area.

The objectives of this study are to:

- Identify the various sources of water supply in the study area
- Examine the quantity of water consumed concerning the water requirement of residents in the study area
- Ascertain how much income is spent monthly on water supply
- Identify some of the impediments to public water supply and distribution in the study area and
- Ascertain the socio-economic implications of private provision of water in the study area.

Presentation of the study area

Obio/Akpor local government area is the largest in Rivers State and the second centre of business activities in the state. It is one of the core areas and is located on the Eastern part of the State and lies approximately between 4° 48' and 6° 57'. It is bounded by Ikwerre and Etche local government areas in the North, Oyigbo and Eleme local government areas in the East, Port Harcourt in the South and Emohua

at the West. Its topography is relatively flat with about 3.3m above sea level, with a landmass of about 260km².¹³ The study area has abundant surface and groundwater supplies such that the water aquifer is high and accessible. The geological and topographic condition of the study area has a principle of restraint to development which is barred with the Bonny River and the vast deltaic swamp around the study area. Its urban form is governed by natural land constraints which also has a strong bearing on the directions of future development and cost of communication, though technology has overcome this constraint.¹⁴

The study area, Obio/Akpor local government area experiences heavy rainfall for eight to nine months of the year between April to November since it is located within the subequatorial south region of South-South. The highest rainfalls are July and September with the average mean yearly as 2,300mm. The highest temperature is normally between the months of January to May each year while the lowest in the year is between June and July. The variation in

temperature begins in January which is about 32°C (90°F) and the lowest is about 26°C (78.8°F) in July but the average mean yearly is 30°C (86°F). The relative humidity is comparatively uniform over the entire state because of the proximity to the Atlantic Ocean and is between 80% - 100%. This has influenced moderate climate and humid air over the entire delta region. There are two wind conditions in the state namely; southwest Monsoon Wind (Atlantic Ocean) and Northeast Trade Wind (Sahara Desert) winds, as both winds bring precipitation (rainy season) and harmattan (dry-hot season). The sea level altitude of the coastal plain, climate and soil composition have determined the vegetation, as there is a clear distinction between saltwater and freshwater swamps and high tropical rain forest with a soil that consists mainly of silt and sand that makes the area suitable for physical development and agriculture.¹⁴ In Obio/Akpor generally, land use pattern has mixed characteristics that encompass all land-uses such as residential, industrial, commercial, administrative, education and recreational land-uses (Figure 1).

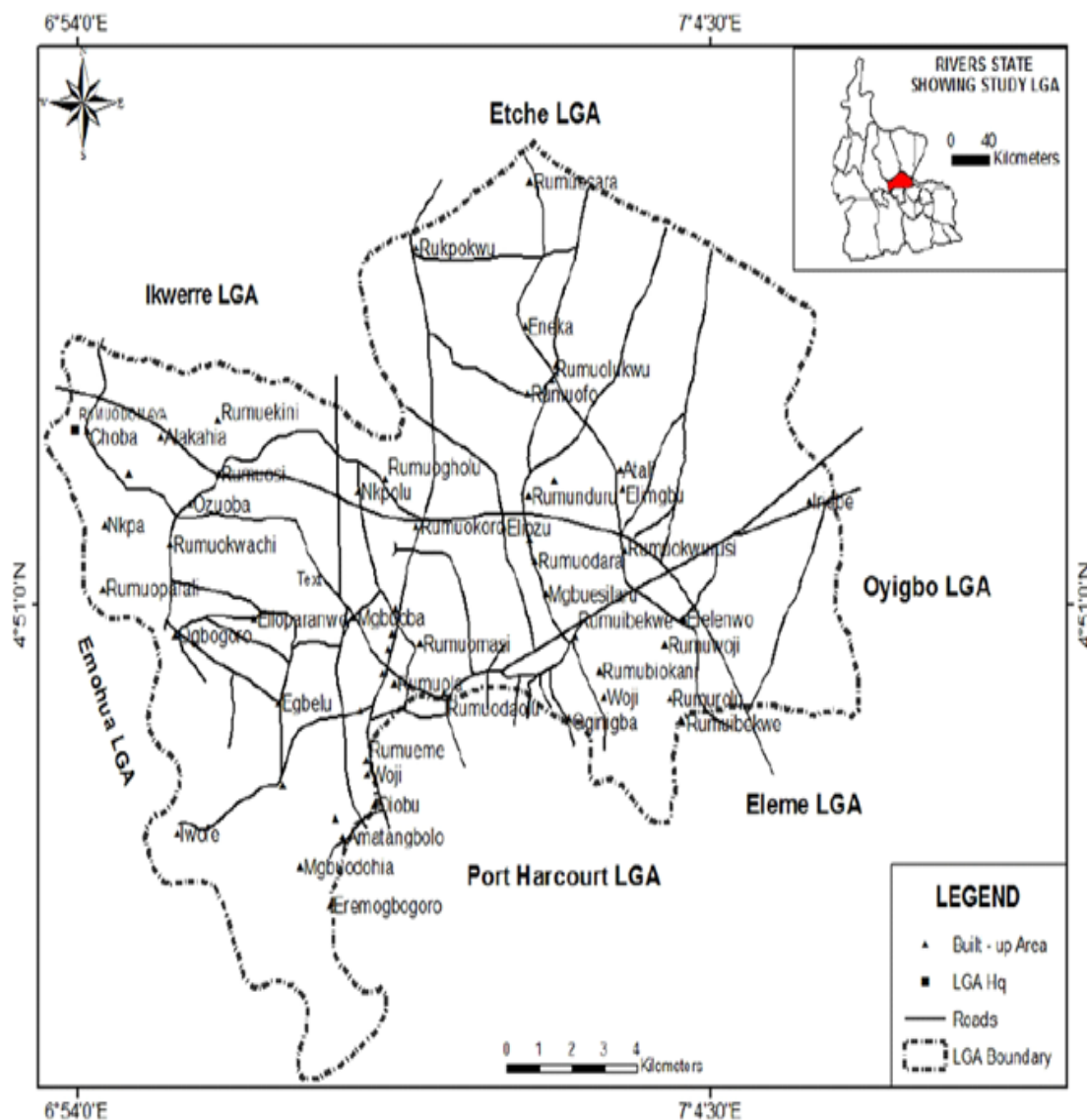


Figure 1 Map of Obio/Akpor showing the study area.

Source: etrex 10 GPS base map.

Emergence of private water vendors in Port Harcourt metropolis

According to the US Environmental Protection Agency (USEPA); the control of the quality of water supplied to the US public is through the Safe Drinking Water Act of 1974. It states that private water supply systems are those that serve no more than 25 people for at least 60 days of the year and have no more than 15 service connections (varies by state). Private water supplies are water supplies individuals privately provide for diverse uses. Although the quality of private water supplies varies, some have the requisite treatment as well as being managed effectively, but others undoubtedly present a health risk due to the quality of the water.¹⁵ In the recent past, the epileptic public water delivery services in Nigeria and the policy reforms of 1999/2000 engendered the emergence of public and private partnership in the water supply sector.¹⁶ Private water systems include private groundwater cisterns, residential wells and larger private water systems that serve more than one residence. Around the early 1980s, there was the public distribution of water from the mains covering major parts of the Port Harcourt Municipality and few areas in Obio/Akpor local government area. Gradually, around the mid-80s public water supplies dwindled and completely stopped in 90s in Obio/ Akpor. The residents were left with no other option than to provide water for themselves, hence, the use of private boreholes and other sources at their disposal.

Sources of water supply in urban areas

There are two main sources of water supply in an urban area namely; surface and ground sources. The surface water sources include lakes, rivers, streams, seas, impounding reservoirs and irrigation canals. The groundwater sources include springs, wells and infiltration wells.¹⁶ The source of water supply in any settlement depends on the availability of the source and the technology deployed on how to improve the quality of the available water source. The availability of any source of water mainly depends upon the quantity of the water required by the settlement for usage as these usages most times consider the requirements of other activities in addition to the needs of residential, industrial, and agricultural services. The requirement for the quantity of water required by a settlement considers some important criteria which include;

- a. Population and population growth to forecast for future demands;
- b. Types and variation in demand (the type of use; residential, industrial or agricultural and seasonal variations in these uses);
- c. Maximum demand (Per day/Per month – the peak hours of the day and the month depending on the usage and density type);
- d. Fire demand which must be about three times the residential demand of that settlement
- e. Appropriate and available technology to the settlement (experts and their technical knowhow);
- f. Quality of the available water sources (the level of purity).

Challenges of the provision of water supply in Nigeria

Researchers have identified some of the challenges and concerns relating to water supply and provision as socio-institutional.¹⁸ Respondents of this survey were drawn from utility workers, drinking water facilities consultants, water/wastewater facilities, manufactures

and government regulatory agencies. Other studies also revealed that there is an institutional inertia clogging the pace of change in the water sector with very limited understanding on how to resolve such challenges.^{19,20} Most of the water companies are losing money on their services to the public and this has made the public to take water service for granted. The high cost of infrastructure maintenance of water utilities thus making companies operate in a deficit. Climate change-related consequences have also contributed to water scarcity and drought in many places and require utility companies and managers alike to be proactive, not reactive as existing in most developing countries. Other challenges include the proper replacement of retiring and an ageing workforce in the utility companies, the status of wastewater and drinking water infrastructure, water supply and scarcity, lack of appreciation of water value. Inadequate funding for water infrastructure improvement projects and facilities; customer and community relations to communicate the challenges of water stewardship and develop for public support; poor emergency planning and response regarding water infrastructure, operational cost and energy usage of utility facilities and intentional contamination of water and inconsistent government policies and regulations.²¹

In the early 20th-century public water supply schemes started gradually in some strategic urban towns in Nigeria such as Kano, Lagos, Abeokuta, Calabar and Enugu with minimal administrative challenges. These schemes were sustained with the income from water sales as the government did not provide any subventions until the regionalization of Nigeria which witnessed a slow response to the management of water supply in these urban towns. As population surged in the cities, the water demand spiked as well but with a limited corresponding increase in capacity to satisfy the demand. This led to a myriad of impediments to water supply in Nigeria ranging from poor management of water supply facilities, inadequate financing and use of funds, inadequate data regarding the operation and maintenance, flawed system design, inadequate policies, overlapping responsibilities and legal frameworks, undue political interference. Other factors include the absence of distinct institutional objectives and outright corruption leading to the incapacitation of water supply agencies in Nigeria.^{22,23}

In the Nigerian context, UNICEF/WHO Joint Monitoring Programme (JMP) 2010 reported that Nigeria is unlikely to achieve the Millennium Development Goal (MDG) targets of access to water supply unless it takes drastic steps to improve current performance levels. Since the machinery to reform the sector has been agreed upon at the federal level, it is expected to be rolled out in all the states of Nigeria. These include sector policies and strategies, a review of legislation to conform with intentions regarding the roles of government and the private sector, and separation of policy formulation and regulation from service delivery. It was estimated that financial investment to meet MDG water requirement targets as of 2015 was US\$1.7 billion which is about NGN6.12 trillion for the entire nation and NGN17 billion for each state annually. Most states in Nigeria may not want to invest this huge amount on water, hence, residents and government alike resort to private sources of water supply. Ele²⁴ highlighted some of the challenges of potable water supply in Nigeria since 1999 and its consequences on economic development. They include surges in industrial and urban pollution, infrastructure decay, inadequate power supply, under-funding and demographic changes as some of the factors militating against the provision of potable water in Nigeria. Similarly, the Federal Ministry of Water Resources in a Draft National Water Policy identified poor community and other stakeholders' participation, poor management of the infrastructure as part of the challenges.

United Nations standard for water

The United Nations Committee on Economic, Social and Cultural Rights in 2002 laid emphasis on access to potable water as a substantial component to satisfactory right to an adequate standard of living. Presumably, the fundamental human rights to water enable everybody to enjoy access to acceptable, safe, enough, affordable and physically accessible potable water for domestic and industrial purposes. The importance of water, sanitation and hygiene for health and development has been reflected in the outcomes of a series of international policy forums such as the recent adoption of the 2015 Sustainable Development Goals that included water infrastructure to access safe drinking water.

Furthermore, the United Nations and World Health Organization posit that the minimum required amount of water per person per day is fifty to hundred (50-100L) litres. Cristina²⁵ contended that this requirement must be defined in clear terms since the basic need for potable water includes water used for personal hygiene that is often determined by availability and accessibility. The WHO adopts specific metrics to estimate water needs based on specific needs that are supposed to be met, such matrices include; the basic access that allows for hand washing, consumption and basic hygiene, but does not promise water for bathing and laundry. These limitations have significant impacts on the health of humans. Also, the transitional access allows individuals to access up to 50 litres of water daily at less than 100metres or 5minutes from the source to destination. This access could cater for laundry and bathing as well as basic access requirements for water. In this scenario, the impact on health is minimal as optimal access indicates the consumption of 100litres per person per day on average which is supplied continuously through multiple taps that meet all hygiene and consumption for persons who provide water for themselves and own boreholes.

Average cost of water in the UK and USA

Nation Wide²⁶ states that a typical family in the United States of America spends approximately \$2,060 on the average per year for home utility bills, and water accounts for an average of \$15-\$77 a month. In a similar report, Kim²⁷ asserts that an average American family pays up to \$70 a month for water. This amount is based on the presumption that each person uses between 80 and 100gallons of water per day. Families that consistently use less (around 50 gallons per person per day) spend around \$34per month. Also, Aimee²⁸ identified that water bill varies by region, Water UK estimates that the average water and sewerage bill is £415 a year or £34.58 a month. Also, inadequate financial resources, climate variability and climate change are other impediments to water supply in Nigeria. Furthermore, Chukwu²⁹ in another related study argued that poor state of infrastructure, corruption, and low rate of costs recovery hinder water supply and management in Nigeria.

Methods and procedures

The study adopted a cross-sectional survey with a multistage sampling method using both primary and secondary data. The study relied more on the primary data as it involved the identification of primary sampling units (seventeen political wards) and subsequent selection of secondary sampling units. The study applied stratified random sampling technique to identify heads of households that would be part of the study which determined the sample size as well as the number of questionnaires administered. Data were randomly collected from identified, listed heads of households with the use of a close and open-ended questionnaire. Handheld Global positioning

system (GPS) was used to identify and geolocate private borehole points within the study area. Data were analyzed using the descriptive method of data analysis and information presented in charts and tables.

Discussion of findings

Sources of water supply in the study area

Findings from the study indicate that the sources of water supply prevalent in the study area is the private source which involves the use of private boreholes for family use and commercial purposes. Commercial borehole operators sell water at different prices to individuals depending on the container used, water vendors carry water in carts and distribute same to homes and sell at prices that would enable them to maximize profit. The study further reveals that there are no regulations on what is being supplied to individuals regarding price and quality. Since the government has failed in discharging its role of providing water to the citizens, it has also become docile on the quality and price of water supplied to the people. Every government must ensure the effective regulation of every sector especially water supply and those related to the safety and health of the citizenry. Implicitly, it creates a situation whereby the poor and disadvantaged in the study area have unequal access to the essentials of life such as safe drinking water since they were unable to afford the outrageous cost charged by water vendors especially those that are presumed to be hygienically packaged (Figure 2).

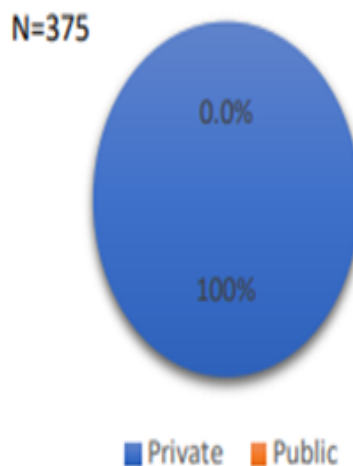


Figure 2 Sources of water study in the study area.

Source: Field Survey, 2019.

Quantity of water consumed concerning the water requirement of residents in the study area

According to the United Nations and World Health Organizations, every individual requires a minimum of 50-100 litres of water a day for optimal access per household. However, the study revealed that households that operate private borehole consume over 300l in a day, whereas households that do not operate private boreholes consume at least 100l in a day. The consumption rates for the two groups studied indicates that there is under consumption and limited access to water in the study area due to the high cost from borehole operators and water vendors. This follows the basic economic principle of demand and supply such that when the price is high, demand is low, and supply is reduced. However, most people believe that water is a social good that should attract no price for consumption, at the same time many find it difficult to spend their money buying water, even those that operate private boreholes tries to minimize operational cost by

reducing the amount of water being pumped when there is a power outage. Many households also try to avoid the use of power generators to pump water because of fuel and maintenance cost.

Quantity of water consumed by borehole operators

Table 1

Table 1 Borehole operators consumption rate

S/N	Number of litres/day	No	%
1	50- 100	27	7.2
2	101- 150	21	5.6
3	151-200	18	4.8
4	201- 250	95	25.3
5	251-300	13	3.5
6	300 litres above	201	53.6
Total		375	100

Source: Field Survey, 2019

Monthly income spent on water supply

The study revealed that borehole owners spend an average of NGN6000 per month for water while non-borehole owners spend an average of NGN2000 per month. The study further revealed that households with private boreholes spend more on the water than households without boreholes. Most borehole owners incur extra cost on maintenance with high propensity to use more water because water lines are connected into every functional water facility including outside tap that may be used for washing of cars. Also, there are incidences of leakages that increase the volume of water used. All of these automatically increases the total amount spent on water. Kim²⁷ asserts that an average household of 4 persons pays USD70 per month on the assumption that an individual use between 80-100L of water per day which is about NGN24, 500 equivalent in Nigeria. The implication is that households in the study area do not spend more than their counterparts in other countries especially, in the United States of America and the United Kingdom.

Average income spent by borehole owners per month

Table 2

Table 2 Average monthly spend by borehole operators

S/N	Cost of water (Naira)	No	%
1	N 500- N 2,000	38	10.1
2	N2,100- N4000	52	13.9
3	N4,100- N6,000	37	9.9
4	N 6,100- N8,000	85	22.7
5	N 8,100- N10,000	57	15.2
6	N10,100- N12,000	65	17.3
7	N12,100 above	41	10.9
Total		375	100

Source: Field Survey, 2019

Average income spent by non-borehole owners per month

Table 3

Table 3 Average monthly spend by non-borehole owners

S/N	Cost of water (Naira)	No	%
1	N 500- N 2,000	187	49.9
2	N2,100- N4000	75	20
3	N4,100- N6,000	60	16.0
4	N 6,100- N8,000	53	14.1
5	N 8,100- N10,000	0	0
6	N10,100- N12,000	0	0
7	N12,100 above	0	0
Total		375	100

Source: Field Survey, 2019

Challenges to public water supply and distribution in the study area

Several factors that have inherently affected the supply and distribution of public water over the years in the study area were identified. They include government insensitivity to the needs of the governed, corruption, and poor planning strategies, tax evasion, poor maintenance culture of existing water facilities and obsolete water facilities. It is important to assert that good governance requires selflessness and empathy towards the governed since these attributes engender goodwill without a feeling that the people are being done any favour by those in government. From Table 4, government insensitivity was the highest response received as it reflects how the governed are being treated with disdain. It is true that when people empathize with anyone, they tend to go the extra mile to ensure that such persons effectively manage the challenges that may be experienced. Corruption was another impediment to the public water supply. Based on the findings of this study, the government has over the years awarded contracts to rehabilitate water infrastructure in some parts of the site yet, no job was done, and nobody is questioned or held to account for such failure and brazen embezzlement. This is the height of corruption experienced where funds meant for the good of all is being embezzled by a single individual and or group of individuals. Poor planning was another palpable impediment identified in the study area since proper planning is pivotal to success and its absence often results in a colossal loss in both human and material resources on the side of the government and the governed. Lack of implementable blueprint for water distribution from the onset was also one of the identified impediments towards achieving effective supply and distribution. When there is a blueprint it often considers future growth and possible projections are made to handle such growth. Since there was no operational blueprint, the municipality is overwhelmed by the increasing population and physical development in the area without commensurate provision of potable water to the citizenry.³⁰⁻³²

Table 4 Impediments to public water supply

S/No.	Impediments to public water provision	No	%
1	Govt Insensitivity	101	26.9
2	Corruption	94	25.1
3	Poor Planning	82	21.9
4	Evasion of Tax	25	6.7
5	Poor Maintenance	24	6.4
6	Obsolete Facilities	25	6.7
7	Over Population	22	5.9
8	Leadership Inadequacies	2	.5
	Total	375	100.0

Source: Field Survey, 2019

Impediments to public water supply

Socio-economic implications of private provision of water

The study identified some of the social and economic effects of private sector provision of water supply. Some of these effects identified include too much spending on the water by individuals as this expenditure depletes the disposable income and purchasing power of the members of households. On the flip side, there is also the creation of sources of livelihoods for the water vendors and borehole operators alike. Other economic effects include loss of revenue by the government in the form of tax invasion while residents become vulnerable to any water-related disease. The issue of what is spent is relative when compared to what is spent on water tariff in other countries. However, given the disheartening status of poverty among income groups in addition to other competing needs for the available financial resources such as health, education, food, shelter it is imperative to assert that the average Nigerian household spends so much to access potable water. Most households in the study area with a monthly income of ₦20,000 spend about ₦2,000 monthly on getting access to potable water. This expenditure represents 10% of household monthly income only for water is outrageous because the household income is barely enough to sustain the household. On the contrary, those involved in water vending have successfully created for themselves sources of livelihood, thereby reducing the rate of unemployment. Another important implication is the vulnerability to water-related diseases because the sources of water may not be good enough for consumption since the activities of private water suppliers and the quality of water they supply is not verified by any known agency of government.

Conclusions

This study assessed and identified the inherent factors impeding the supply and distribution of public water supply and the socio-economic implications of private provision of potable water in Obio/Akpor Local Government Area. Indications from the study identified severable impediments such as government insensitivity, corruption and lack of maintenance of broken-down water facilities that distorts the supply and distributions of public water supply. Some of the socio-economic implications associated with private provision of water in the study area involve residents' vulnerability to water-borne diseases, too much expenditure on the water which negatively affects

the household income and limits the provision of other basics at home. The key economic benefit of private provision of water includes the creation of jobs for water vendors and borehole operators which has reduced the level of unemployment.

Based on the findings of the research, some of the recommendations include; existing developments that require private boreholes should obtain approval from the relevant agencies and the new developments should indicate positions of borehole points and soak away pits building plans seeking for approval at the local government offices and Ministry of Urban and Physical Development to ensure that adequate setbacks are maintained. Finally, the database of existing boreholes and their location should be created and properly managed. The study concluded that government should synergize with the private sector to ensure safe and affordable water supply since their activities cannot be underpinned.

Recommendations

Considering the research findings, the following recommendations are made to enhance water supply in the study area and ensure safety in water consumption

- A. Since private water supply has taken over public water supply, the government should enact a policy that would allow drilling of boreholes to be approved by relevant agencies for existing developments and new developments should indicate the positions of the boreholes and soak away pits on the proposed plans that would be approved at the Ministry of Urban and Physical Development. This is to ensure that adequate setback is maintained, and safety is ensured in the quality of water being consumed. A database of all existing private and public boreholes should be created and properly managed. This will serve as a reference point for locating new boreholes.
- B. Government should revamp dilapidated water facilities to ensure operations and complement the private sources to increase the daily water consumption of non-borehole owners since their daily consumption is below the United Nations standard.
- C. At the local government level, public enlightenment campaign should be organised to enlighten the public about the dangers inherent in consuming non-treated water and demonstrate the best affordable measures of treating water at homes. Also, the Obio/Akpor municipality should come out with a blueprint for public provision and distribution.
- D. The activities of the private water vendors should be regulated and operate under license obtained by anyone who wants to operate commercial boreholes.
- E. Corrupt contractors should be identified, investigated and prosecuted.
- F. The government should develop a private borehole drilling standard that would include the minimum distance that must be maintained between two boreholes on vertical and horizontal lines.

Acknowledgments

None.

Conflicts of interest

Authors declare no conflict of interest exists.

Funding

None.

References

1. Esrey SA, Feachem RG, Hughes JM. Interventions for the control of diarrhoeal diseases among young children: improving water supplies and excreta disposal facilities. *Bulletin of the World Health Organization*. 1985;63(4):757.
2. Esrey SA, Potash JB, Roberts L, et al. Effects of improved water supply and sanitation on ascariasis, diarrhoea, dracunculiasis, hookworm infection, schistosomiasis, and trachoma. *Bulletin of the World Health Organization*. 1991;69(5):609–621.
3. Cairncross S. *Water Supply and the Urban Poor*. In: Hardoy JE, Cairncross S, Satterth D, Editors. *The Poor Die Young: Housing and Health in Third World Cities*. 1st Edn, Earthscan Publications, London. 1990;109–126.
4. Omole DO, Longe EO. An Assessment of the Impact of Abattoir Effluents on River Illo, Ota, Nigeria. *Journal of Environmental Science and Technology*. 2008;1(2):56–54.
5. USEPA. National Primary Drinking Water Regulations. Drinking Water Contaminants. 2012.
6. World Health Organization (WHO). *Progress on Drinking Water and Sanitation*. Geneva, Switzerland. 2012.
7. Lazarova BL, Sack J, Cirelli G, et al. Role of Water Reuse for Enhancing Integrated Water Management in Mediterranean Countries. *Water Science and Technology*. 2001;43(10):25–33.
8. Gleick PH. Basic water requirements for human activities: meeting basic needs. *Water international*. 1996;21(2):83–92.
9. Abeygunawardane AWGN, Dayawansa NDK, Pathmarajha S. Socioeconomic Implications of Water Pollution in an Urban Environment A Case Study in Meda Ela Catchment, Kandy, Sri Lanka. *Tropical Agricultural Research*. 2011;22(4):374–383.
10. Federal Ministry of Water Resources. Draft National Water Policy. 2016.
11. McGarvey ST, Buszin J, Reed H, et al. Community and household determinants of water quality in coastal Ghana. *Journal of water and health*. 2008;6(3):339–349.
12. Eyenghe T, Brown I, Chikagbum W. Assessment of The Location and Availability of Public Facilities and Services in Port Harcourt Metropolis in Rivers State, Nigeria. *International Journal of Scientific & Technology Research*. 2015;4(6):126–135.
13. <https://en.wikipedia.org/wiki/Obio-Akpor>
14. Port Harcourt Master Plan Rivers State of Nigeria: Volume 2b, Dar al-Handasah Consultants, Shair and Partners – Lebanon; (1972–2003).
15. Craun GF, Brunkard JM, Yoder JS, et al. Causes of outbreaks associated with drinking water in the United States from 1971 to 2006. *Clinical Microbiological Review*. 2010;23:507–528.
16. Adewumi JR, Babatola JO. A Case Study on the Status of Water Supply for Domestic Purposes in Akure, Ondo State. *Botswana Journal of Technology*. 2009;18(1):38–47.
17. Civil Engineering. *Source of Water, Common Sources of Water, Main Sources and Water Distribution*. 2014.
18. Brown RR, Sharp L, Ashley RM. Implementation impediments to institutionalising the practice of sustainable urban water management. *Water Science and Technology*. 2006a;54(6–7):415–422.
19. Brown RR, Farrelly MA. Delivering sustainable urban water management: a review of the hurdles we face. *Water Science and Technology*. 2009;59(5):839–846.
20. Imperial MT. Institutional analysis and ecosystem-based management: the institutional analysis and development framework. *Environmental management*. 1999;24(4):449–465.
21. Westerling K. *The 13 Biggest Challenges Facing the Water Industry*. 2013.
22. Yakubu N. *Water supply services. Kaduna State Nigeria*. water engineering and development centre (WEDC), Loughborough University of technology, UK. Unpublished M.Sc thesis. 1995.
23. Falana EO. Industrial development. Case study of water corporations of Oyo State, Nigeria. Water engineering and development centre (WEDC). Loughborough University of technology, UK. Unpublished M.Sc. thesis. 1991.
24. Ele Samson. Challenges of Water Supply in Nigeria Since 1999 and its Consequences on Economic Development. *International Journal of Economic Development Research and Investment*. 2013;4(3).
25. Cristina M. *How Many Litres of Water Does a Person Need Per Day*. 2015.
26. Nation Wide. *How Much is the Average Household Utility Bill?* 2019.
27. Kim P. Average Utility Bill will Shock You. 2018.
28. Aimee D. *Average water Bill a Month*. 2019.
29. Chukwu KE. Water Supply Management Policy in Nigeria. Challenges in the Wetland. 2015.
30. Kevin Ejike Chukwu. Water supply management policy in Nigeria: challenges in the wetland area of Niger delta. *European Scientific Journal*. 2015;11(26).
31. United Nations Environmental Programme (UNEP). *Global Environment Outlook 2002*. United Nations Environment Programme. 2002.
32. World Bank. *Infrastructure for Development at Target*. 1994.