

ANALYSIS OF DOMESTIC WATER SUPPLY AND SANITATION IN ONDO, NIGERIA

Adewale O. YOADE¹, Babawale A. ADEYEMI² and Olabisi O. ADEYEMI³

¹Department of Urban and Regional Planning, Wesley University Ondo, Nigeria

²Department of Geography, Adeyemi College of Education, Ondo, Nigeria

³Department of Urban and Regional Planning, Federal Polytechnic, Ado-Ekiti, Nigeria

Corresponding Author's email: yoadewale@yahoo.com



DOI: 10.29816/sjss.8.3.2

ABSTRACT

This study examines the availability of domestic water supply and sanitation practices in different residential zones of Ondo, Nigeria. Data were collected having stratified the study area into the high, medium and low densities. Three political wards were randomly selected from each zone. There are 2,222 buildings in the selected wards with 879 in the high; 725 in the medium and 618 in the low. Systematic sampling was used to select 10% of the buildings. A total of 222 copies of questionnaires were administered on household heads out of which 187 copies were retrieved and analyzed. Findings showed that majority (66.8%) of respondents were owners of the buildings while 33.2% were tenants. Findings revealed that 12.4% of the residents in the high density area considered the water available to them as good quality, 28.6% rated their water quality as fair, while 59.0% declared that the quality was bad. The major sources of water in the study area were well, borehole, stream and rain. For borehole (which was mechanized and considered a better source compared with well), it was found that 5.7% of the residents had access in the high density area, 67.3% in the medium density area and 80.0% in the low density area. The study recommended that water supply planners, decision makers, donor agencies and external support organizations to take their share of the responsibility and support communities in their efforts to maintain the system that have been handed over to them

Keywords: Water supply; Sanitation; Environment; Resident; Nigeria

Introduction

Water is very critical to human life and it constitutes about 80% of animal cells. The human body by weight consists of about 70% water and several body functions depend on water (human DEVELOPMENT REPORT 2006). According to the Millennium Development Goals (MDGs) Report 2012, 783 million people, or 11% of the global population, remain without access to an improved source

of drinking water. Such sources include household connections, public standpipes, boreholes, protected dug wells, protected springs and rainwater collections. The importance of the water supply and sanitation system has been a subject of serious attention reflected in the measurement of human development. This priority treatment follows official reports estimating about one billion

people in the world living without access to improved drinking water supplies while 2.6 billion people live without adequate sanitation (see Lane, 2012; WHO, 2010; WHO/UNICEF, 2010; UNICEF and WHO, 2004 and UN-Habitat, 2003). Nearly 80% of the people using water from unimproved sources are reportedly concentrated in three regions namely, sub-Saharan Africa, Eastern and Southern Asia. For sanitation, overall levels of use of improved facilities are noted to be far lower than for drinking water (WHO and UNICEF, 2006). These represent serious global health burdens especially when viewed in terms of the consequences associated with a lack of access to drinking water, inadequate sanitation and poor hygiene. Although some countries, especially in the less developed realm, are making significant progress in addressing the challenges of water supply and sanitation, reports on sub-Saharan Africa is particularly not encouraging as only 36% of the population was officially estimated to have access to basic sanitation (UNICEF and WHO, 2004) while 37% of the population still relies on unimproved sources of water (Onabolu et al, 2011).

The United Nations has long been addressing the global crisis caused by insufficient water supply to satisfy basic human needs and growing demands on the world's water resources to meet human, commercial and agricultural needs. The United Nations Water Conference (1977), the International Drinking Water Supply and Sanitation Decade (1981-1990), the International Conference on Water and the Environment (1992) and the Earth Summit (1992) – all focused on this vital resource. The Decade, in particular, helped some 1.3 billion people in developing countries gain access to safe drinking water.

In Africa, 2% of the total population have access to improved water supply and 60% have access to improved sanitation, but the

situation in the rural area is worse with only 47% of their population having access to improved supply and 45% having access to improved sanitation (WHO/UNICEF, 2000). According to the report by UNICEF/WHO (2012), coverage rate in 2010 was lower than the rate in 1990 and below 10% of the 2010 rate required to meet the target in the sub-Saharan Africa. In 2010, an estimate of 66 million Nigerians were without access to an improved drinking water source. This makes Nigeria one of the ten countries in the world with the largest population without access to an improved drinking water source. This is as a result of increase in population which is not directly proportional to the facilities provided for water supply and sanitation compared to those in India and China.

Nigeria is one of the countries in sub-Saharan Africa whose records on general access to water supply and sanitation facilities by the citizens remain very poor. The Nigerian cities in particular are fraught with inexorable rise of squatter settlements, overcrowding dwellings, breakdown of waste disposal arrangements, air and water pollution and inadequate water and sanitation services. Many problems of mortality, morbidity and poverty have been reported in the literature as consequences of a lack of safe drinking water supplies as well as poor sanitation coverage (Nwankwoala, 2011; WHO, 2010; Nyong and Kanaroglou, 1999; Sodeinde et al, 1997). Given these poor pictures, the question arises of what, probably, could be the main problem of the lack of access³ to safe drinking water and basic sanitation for the population. Many studies seem to agree to the fact that a lack of political will to tackle the problem is one of the most responsible factors (see Mara, 2012; Lane, 2012; Moe and Rheingans, 2006). The sanitation sector has not been doing well also, because the number of people with access to improved sanitation services in urban areas in 1990 was 6 million out of 26

million people in urban areas. In 2006, 24 million out of 69 million people residing in urban areas had access to improved sanitation services (Sari and Ari, 2006; WSMP NIGERIA, 2008). Sanitation in Nigeria is also following a negative trend, which has led to slow progress in the aspect of proper sanitation.

However, deposition of faecal matter near homes, contamination of sources of drinking water (sometimes caused by poorly designed or maintained sewage system), dumping of refuse and sweeping into the gutters, defecating and disposing of feces by the street corners and waterways and selling of food stuffs and cooked food by the road side are all unwholesome practices that pose potential risk to the development of diseases. Water quantity is as important as water quality. Poor housing also contributes to poor environment health and its consequent input in the health of the urban dwellers. Measures for the prevention of cholera mostly consist of providing clean water and proper sanitation to populations who do not yet have access to basic services. Health education and good food hygiene are equally important.

The environmental sanitation-related diseases exacerbate poverty by diminishing productivity and household income. In addition, the national cost of lost productivity, reduced educational potential and huge curative health costs constitute a major drain on the local and national economy. Besides, a dirty environment with its attendant health consequences, prevailing in most of our cities, can discourage tourists/investors and undermine the economic benefit of tourism to the country. As knowledge of the relationship between water and sanitation as well as how it should be managed has dramatically expanded over the past several decades through the various global knowledge channels (Akpabio, 2012). Consequently, wide-ranging actions are required to solve environmental sanitation problems in order to

reduce and avert their adverse health, economic and developmental effects. Therefore, this study examined water supply and sanitation facilities and services available in the residential areas of Ondo, with a view to assessment of water supply and sanitation at the household level across the different residential areas of Ondo, Nigeria. The objectives of the study are therefore, to determine socio-economic characteristics of the residents in the study area. The study also investigated the level of access to water supply and sanitation in the study area.

Literature review

Access to water is measured by the number of people who have reasonable means of getting an adequate amount of water that is safe for drinking, washing and essential household activities expressed as a percentage of the total population. Also, the provision of potable water supply and good sanitation services at a reasonable and affordable cost is the first step in eliminating poverty. These have been established to improve health, boost socio-cultural development, and promote economic balance (Okun, 1988; Bendahmane 1993; Olukanni, 2013; Olukanni et al., 2014a). More so, it is known to be the basic primary drivers of public health, personal hygiene and human dignity (WHO/UNICEF, 2000).

A household is considered to have access to improved water source if it gets drinking water primarily from a pipe borne water supply system, a public standpipe, borehole and dug well with pump, a protected spring, a well-developed rain water harvesting system, a reliable water vendor or water tank truck. Sources such as direct from surface waters – i.e. rivers, lakes, ponds, etc. and unprotected wells and springs are regarded as unimproved water sources. (UNICEF and WHO, 2008) Worldwide, the percentage of people without access to improved water and sanitation has been virtually constant at about 17%, despite

the increase of infrastructure during the 1990's (UNFPA, 2003). According to International Water Association (IWA, 2004), "access to good, safe and reliable drinking water is one of the most basic needs of human society and as such requires integrated approach, close cooperation and partnership between all stake holders". Again, research has shown that access to good, reliable and sufficient water supply increases the health status of people. However, many people in the world today lack this basic need. In 2000 Global Water Partnership observed that most countries give first priority to satisfaction of basic needs for water, one fifth of the world's population is without access to safe drinking water and the service deficiencies primarily affect the poorest segments of the population in developing countries. As the amount of water accessed every day is largely determined by the distance to the water source and the collection time, a reasonable distance is one that allows everyone to collect sufficient water to cover personal domestic uses. According to WHO (2005), in order to have a basic access to 20liters per day, the water source has to be within 1,000 metres of the home and collection time should not exceed 30 minutes. When water is piped into the home, access is optimal and at least 100 litres per person per day is likely to be

ensured. In this respect, UNDP confirms in its human development report 2006 that having a regular supply of clean water piped to the household is the optimal type of provision for human development. Access to a regular supply of water within the home also eliminates the need for women and children to spend time and physically exert themselves to collect water from distant sources.

The concept of improved drinking water and sanitation as essential to health is not a novel idea. The traditional environmental health already focused on sanitation issues including clean water, sewage and waste management (Dannenberg, Frumkin & Jackson, 2011). The Joint Monitoring Programme (UNICEF/WHO) (JMP) has defined "improved water "sources as facilities that are protected from environmental contamination, especially faecal contamination such as piped water into a dwelling, plot or yard, protected well or spring and rainwater collection. An "improved sanitation" facility has been defined by the JMP as a facility that separates and removes human excreta from potential human contact. It has specifically been defined that sharing facilities of any type are categorized as unimproved sanitation. The JMP's classification for both improved and unimproved source of drinking water and sanitation facility is presented in Table below.

Table 1: Improved and unimproved drinking water sources and sanitation facility categories as defined by the JMP

Improved drinking water source	Unimproved drinking water source
Piped water into dwelling, yard or plot Public tap or standpipe Tube well or borehole Protected dug well Protected spring Rainwater collection	Unprotected dug well Unprotected spring Cart with small tank or drum Tanker truck Surface water (river, dam, lake, pond, stream, canal, irrigation channel) Bottled water
Improved sanitation facility	Unimproved sanitation facility
Flush or pour-flush to: • Piped sewer system	Flush or pour-flush to elsewhere (that is, not to piped sewer system, septic tank or pit

• Septic tank • Pit latrine	latrine)
Ventilated improved pit (VIP) latrine	Pit latrine without slab/open pit
Pit latrine with slab Composting toilet	Bucket
	Hanging toilet or hanging latrine
	Shared facilities of any type
	No facilities, bush or field

Source: WHO/UNICEF, 2014

Study area

Ondo is one of the major urban centres in Ondo state. The town is located on latitude $7^{\circ}6'0.0180''N$ and longitude $4^{\circ}50'30.0984''E$. The town is bounded to the north by Oluji/Okeigbo local government, to the east by Idanre local government, to the west and south by Odigbo local government. The

population projection of the town stood at 389,900 during the 2006 population census. Ondo falls within the tropical wet and dry climate with a relatively small dry season. Consequently, rainfall in Ondo is seasonal in character with well-marked wet and dry seasons (Yoade, Adeyemi and Onifade, 2018).

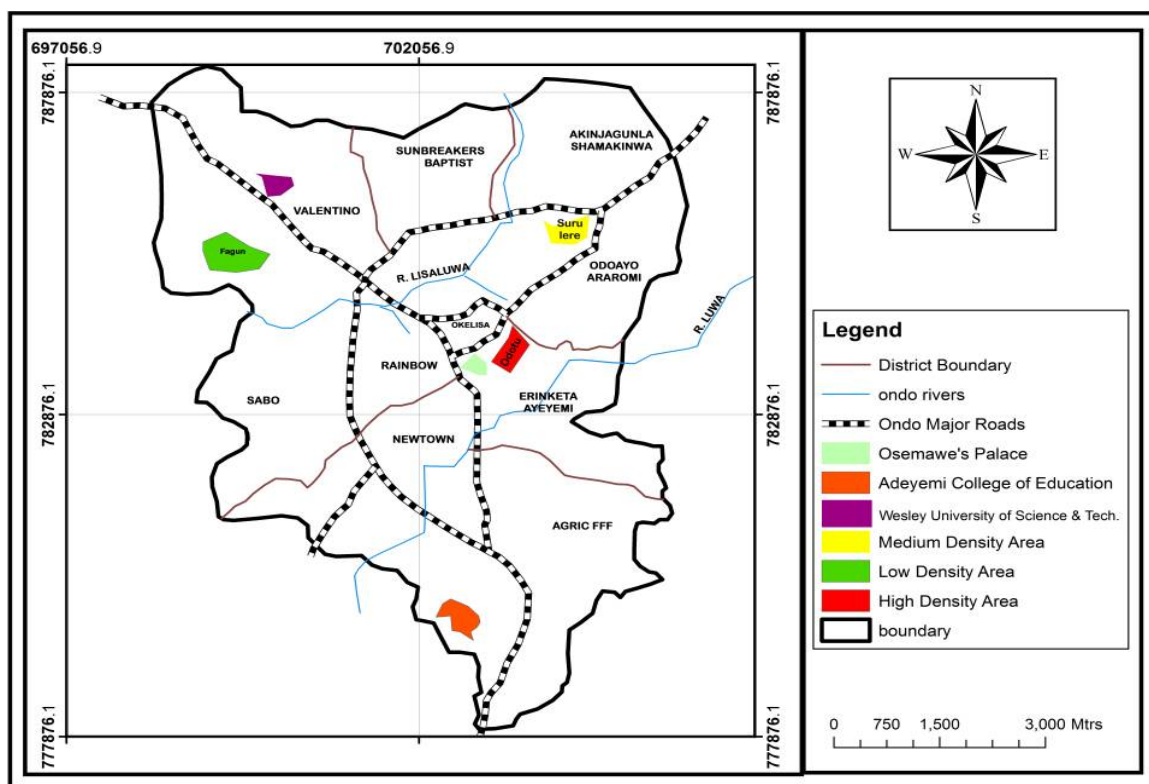


Figure 1: Map of Ondo City showing the Study Area

Source: Adapted from Google map, 2017

The dry period comes between November and February, while the wet season lasts for 8 months; from March to October; the mean

annual rainfall is about 1561mm. the annual mean temperature is $27^{\circ}C$, with a maximum of $30^{\circ}C$. Ondo landscape is made up of generally

undulating hills of granite outcrop of igneous origin, and is marked by few dome-shaped hills. These hills are found to be developed over the basement complex of metamorphic rocks with their summits ranging between 250 and 500 meters above sea level (Akintola 1982). The town has no major river; rather it is drained by several streams with fairly wide flood plains. The most important of these streams are Luwa, Lisaluwa, and Mode. The town falls within the moist/wet lowland forest, i.e. it has thick forested vegetation, but due to human activities, most of these original forests have been replaced with secondary re-growth such as post extraction secondary forests and post-abandonment secondary forests.

Methodology

Data for this study were from both primary and secondary sources. The primary data were collected through field observation and administration of questionnaire. The questionnaire administered on the residents addressed issues on residents' socioeconomic characteristics, sources of water supply, water storage methods and quantity and quality of water available for the residents.

However, the twelve political wards in Ondo were divided according to the stratified residential areas into five (5) political wards in high density area, four (4) in medium density area and three (3) political wards in the low density area. In the administration of questionnaire, one ward was selected from each residential zone. Systematic sampling technique was used in selecting residents to be sampled. The first building at the street entrance was selected, then subsequent unit of investigation was every 10th residential building in the area, representing 20% of all residential buildings in the selected wards of the study area. Based on the pilot study, there are 2,222 residential buildings in the sampled wards of the selected areas. These comprised of 879 in Odotu (High); 725 in Surelere

(Medium); and 618 in Fagun (Low). The study administered structured questionnaire on the oldest resident in each of the sampled buildings.

The target person for the survey was the household head. This is because household head was able to provide information on urban renewal projects implementation in the study area. Using this procedure, a total of 222 copies of questionnaires were administered out of which 187 copies were retrieved for the study. Secondary data collected include map of Nigeria, Ondo State, Ondo town gotten from Ministry of Works and Urban Development, Ministry of Natural Resources, Ministry of Environment, and number of residential buildings from National Population Commission (NPC). Data collected were analyzed using both the descriptive and inferential statistics based on the set objectives.

Findings and discussion

This section presents the results obtained through administration of questionnaire to sampled respondents. Section A will present the socio-economic characteristics of the respondents in the study area.

a. Socio-economic and demographic characteristics of the respondents

The socio-economic characteristics of respondents' discussed in this section include the gender of residents', their age, marital status, educational attainment and religious affiliation, among others. The gender distribution of the respondents across the selected cities is as contained in Table 2. The finding revealed that both genders were well represented across the study area as, 51.9% of the residents were males while 48.1% were females. This proportional representation of the two genders may influence the residents' response in the evaluation of environmental sanitation practices in the study area. Also, the

study established that since the P value is greater than 0.05, therefore it can be deduced that the gender distribution of respondents in each density in the study area is insignificant that is, their gender does not affect where they live.

The summary of data collected and analyzed on marital status of the residents is as presented in Table 2. Marital status was categorized into five: single, married, divorced, widowed and separated. It is revealed that most (35.3%) of the residents were single, (47.6%) of the respondents' are married, (10.7%) were divorced, (3.2%) were both widowed and separated.

It was deduced from the study that P value is also greater than 0.05, hence it can therefore be deduced that the marital status of respondents spread across the three residential densities is insignificant, that is, their marital status does not affect the residential density. Analysis of data collected on the educational attainment of residents as presented in Table 2 revealed that (24.6%) of the residents have acquired primary education, (35.8%) have secondary education and (39.6%) are having tertiary education. This proportional representation of respondents' with tertiary education may influence the residents' response in the evaluation of the sanitation practices in the study area. This is because education tends to create awareness. There is every tendency to believe that a well-educated person may perceive his immediate environment differently and this is reflected in the result of the analysis.

The study revealed that 15% of the respondents' are civil servants, 24% are business men and women, 35.0% are artisans, 13% are professionals and 12.3% are farmers in the study area. The P value is exactly 0.05, therefore it can be deduced that the occupation of respondents is directly proportional to their residential densities, that is, high density residential for low income

earners, medium density residential for medium income earners and low density residential for high income earners, hence it is significant. The tenure of the respondents defines the type of house occupancy as presented in table 4.6 below. The sturdy reveals that 66.8%, have ownership, while 33.2% are tenants. Just as mentioned above, based on the P value as 0.626, it can therefore be deduced from the table above that the type of occupancy does not affect the residential density for the respondents, hence it is insignificant.

The summary of the type of houses occupied by the residents across the residential zones as presented in Table 2. Findings revealed that 19.8% of the residents live in bungalow buildings, 30.5% live in storey buildings, 20.3% live in flats, 10.2% live in storey flat, 15.0% live in duplexes and 4.3% live in traditional houses. All these indicate that there is variation in the type of houses the residents occupy across the selected cities of the study area. The Chi-square tests results ($\chi^2 = 70.348$ and $p < 0.001$) established that there was a significant association between the residential zones and the type of houses occupied by the residents in the study area.

Data on residents' age distribution were grouped into five. It is revealed in Table 3 that (13%) of the respondents were from ages 20 to 30, (21.9%) were from ages 31 to 40, (24.6%) were from ages 41 to 50, (28.3%) were from ages 51 to 60 and (11.8%) were from ages 61 to 70. This proportional representation of the older residents' may influence the residents' response in the evaluation of the environmental sanitation practices because of their past experiences and their level of exposure in the study area. For the ease of analysis, residents were grouped into three based on the length of stay. These are residents with short (< 5 years), average (6 to 10 years), long (> 10 years) stay. The study reveals that 26.7% of

the respondents have the short stay, 31.1% have the average stay and 42.2% have the long stay.

For the purpose of this study, three household groups were determined. These are household with 6 members and below, household that contains 7 to 10 members and household with more than 10 members. These

were respectively regarded as the small, medium and large size household group. Income was grouped into low, medium and high income group. The numerical monthly income of the groups was less than ₦60000, ₦61000 to ₦150000 and above ₦150000 respectively. For low, the respondents were 33.2%, 44.9% for medium, and 21.9% for high.

Table 1: Socio-economic background of the respondents

Variable	High Density	Medium Density	Low Density	Total
Gender				
Male	56 (53.3)	26 (50.0)	15 (50.0)	97 (51.9)
Female	49 (47.7)	26(50.0)	15 (50.0)	98 (48.1)
Total	105 (56.2)	52 (27.8)	30 (16.0)	187 (100.0)
Marital status				
Single	38 (36.2)	16 (30.8)	12 (40.0)	66 (35.3)
Married	50 (47.6)	26 (50.0)	13(43.3)	89 (47.6)
Divorced	11 (10.5)	6 (11.5)	3 (10.0)	20 (10.7)
Widow	3 (2.9)	2 (3.8)	1 (3.3)	6 (3.2)
Separated	3 (2.9)	2 (3.8)	1 (3.3)	6 (3.2)
Total	105 (56.2)	52 (27.8)	30 (16.0)	187 (100.0)
Education qualification of Respondents				
Primary	30 (28.6)	12 (23.1)	4 (13.3)	46 (24.6)
Secondary	38 (36.2)	19 (36.5)	10 (33.3)	67 (35.8)
Tertiary	37 (35.2)	21 (40.4)	16 (53.3)	74 (39.6)
Total	105 (56.2)	52 (27.8)	30 (16.0)	187 (100.0)
Income distribution of respondents				
Low	56 (53.3)	3 (5.8)	3 (10.0)	62 (33.2)
Medium	43 (41.0)	29 (55.8)	12 (40.0)	84 (44.9)
High	6 (5.7)	20 (38.5)	15 (50.0)	41 (21.9)
Total	105 (56.2)	52 (27.8)	30 (16.0)	187 (100.0)
Respondents' Age distribution				
20-30	14 (13.3)	7 (13.5)	4 (13.3)	25 (13.4)
31-40	23 (21.9)	11 (21.2)	7 (23.3)	41 (21.9)
41-50	26 (24.8)	12 (23.1)	8 (26.7)	46 (24.6)
51-60	30 (28.6)	15 (28.8)	8 (26.7)	53 (28.3)
61-70	12 (11.4)	7 (13.5)	3 (10.0)	22 (11.8)
Total	105 (56.2)	52 (27.8)	30 (16.0)	187 (100.0)
Occupation distribution of respondents				
Civil Servant	7 (6.7)	13 (25.0)	8 (26.7)	28 (15.0)
Business & trading	22 (21.0)	14 (26.9)	9 (30.0)	45 (24.1)
Artisans	46 (43.8)	15 (28.8)	5 (16.7)	66 (35.5)

Professionals	13 (12.4)	6 (11.5)	6 (20.0)	25 (13.4)
Farming	17 (16.2)	4 (7.7)	2 (6.7)	23 (12.3)
Total	105 (56.2)	52 (27.8)	30 (16.0)	187 (100.0)
Type of House				
Bungalow	10 (9.5)	16 (30.8)	11 (36.7)	37 (19.8)
Storey Bungalow	47 (44.8)	6 (11.5)	4 (13.3)	57 (30.5)
Flat	12 (11.4)	18 (34.6)	8 (26.7)	38 (20.8)
Storey Flat	3 (2.9)	10 (19.2)	6 (20.0)	19 (10.2)
Duplex	25 (23.8)	2 (3.8)	1 (3.3)	28 (15.0)
Traditional	8 (7.6)	0 (0)	0 (0)	8 (4.3)
Total	105 (56.2)	52 (27.8)	30 (16.0)	187 (100.0)
Length of Stay				
Short Stay	6 (5.7)	29 (55.8)	15 (50.0)	50 (26.7)
Average Stay	43 (41.0)	3 (5.8)	12 (40.0)	58 (31.1)
Long Stay	56 (53.3)	20 (38.5)	3 (10.0)	79 (42.2)
Total	105 (56.2)	52 (27.8)	30 (16.0)	187 (100.0)
Household Size				
Small	56 (53.3)	29 (55.8)	15 (50.0)	100 (53.5)
Medium	6 (5.7)	20 (38.5)	12 (40.0)	38 (20.3)
Large	43 (41.0)	3 (5.8)	3 (10.0)	49 (26.2)
Total	105 (56.2)	52 (27.8)	30 (16.0)	187 (100.0)
Type of Occupancy				
Ownership	72 (68.6)	32 (61.5)	21 (70.0)	125 (66.8)
Tenancy	33 (31.4)	20 (38.5)	9 (30.0)	62 (33.2)
Total	105 (56.2)	52 (27.8)	30 (16.0)	187 (100.0)

Source: Field Survey, 2017

b. Access to water and sanitation

Residents were asked to rate the quality of water as good, fair and bad. The good water was considered as one that is suitable for drinking without further treatment. The rain water is the one that requires further treatment before drinking while the bad is water not suitable for drinking but being managed to be used by the residents for bathing and washing of clothes. Findings revealed that 12.4% of the residents in the high density area considered the water available to them as good quality, 28.6% rated their water quality as fair, while 59.0% declared that the quality was bad. In the medium density area, 11.5% of the residents had good quality water, 67.3% perceived the quality to be fair, while 21.2% said their water

was bad. In the low density area, 26.7% of the residents were of the opinion that they had good water, 53.3% had fair quality water, while 20.0% had bad water.

Findings on the daily average volume of water household water consumption revealed that the overall volume of water consumed per household in the area was 234.56 litres. However, in the high density area, the average household water consumption was 185.18 litres, while it was 225.36 litres and 305.29 litres in medium and low density areas respectively. It was found that the overall average per capita water consumption was 51.2 litres. Across the residential areas, the per capita consumption was 25.8litres in the high density area, 48.8 litres in the medium density and 71.1 litres in the low density area.

These results reveal that the basic requirement of 50 litres per capita per day recommended by Gleick (1996) was surpassed in the low and medium density areas but relatively low in the high density area.

Findings on water sources in the study area revealed that pipe borne water is supplied to only to a few residents (2.9%) in the high density area. The major sources of water in the study area were well, borehole, stream and rain. For borehole (which was mechanized and considered a better source compared with well), it was found that 5.7% of the residents had access in the high density area, 67.3% in the medium density area and 80.0% in the low density area. Also, in the high density area, 26.7% of the residents had access to well water, while it was 26.9% and 20.0% in the medium and low density area respectively. It was revealed from the result of the analysis that it was only in high density area that stream (36.2%) and rain water (28.6%) dominated. These findings indicated that sources of water varied with residential area in the study area.

Findings revealed that there are three type of toilet were found available in the study area. These were flush toilet, ventilated improved pit (VIP) latrine and open pit latrine. Findings on these toilets revealed that while those toilets considered adequate (flush and VIP latrine) are commonly used in the study area, the use of open pit latrine is still prevalent in the high density area with 21.0% of residents having access to open pit latrine.

Related to this is the location of the toilet. It was found that 54.3% of the residents in the high density area had their toilets (regardless of the type) detached from the main house. This indicated that these toilets were not likely to be provided with hand-washing facilities for effective hygiene practices in the area. Also, there was a sharp difference in the location of the toilets in the medium and low density residential areas. And it can be said that the location of the toilets inside the house might give room for better hygiene practices among the residents of medium and low residential areas.

Also, investigation was made into the quality of toilet available for the residents. The rating was in three levels; 'good', 'fair' and 'bad'. The 'good' toilet was the flush toilet with hand-washing facilities. The 'fair' toilet was the flush toilet with no hand-washing facilities and VIP toilet (which are usually with no hand-washing facilities) while the 'bad' was the pit latrine that has been declared unhygienic for human use. Based on these definitions, in the high density area, 42.8% of the residents had 'good' toilets, 30.5% had 'fair' ones while 26.7% had bad toilets. The situation was different in the medium and low density areas. Findings revealed that 63.5% and 76.7% of the residents had 'good' toilets, while 36.5% and 30.0% had 'fair' toilets in medium and low density areas respectively. Residents in these areas claimed they had no 'bad' toilets (Table 2).

Table 2: Access to domestic water supply and sanitation

Variable	High Density	Medium Density	Low Density	Total
Quality of water				
Good	13 (12.4)	6 (11.5)	8 (26.7)	27 (14.4)
Fair	30 (28.6)	35 (67.3)	16 (53.3)	81 (43.3)
Bad	62 (59.0)	11 (21.2)	6 (20.0)	79 (42.3)
Total	105 (56.2)	52 (27.8)	30 (16.0)	187 (100.0)
Average daily household water consumption (in liters)				

Less than 100	8 (8.7)	7 (13.5)	0 (0.0)	15 (8.0)
100-199	75 (71.4)	23 (44.2)	7 (23.3)	105 (56.1)
200-299	22 (21.0)	18 (34.6)	18 (16.0)	58 (31.0)
300 and above	0 (0.0)	4 (7.7)	5 (16.7)	9 (4.8)
Total	105 (56.2)	52 (27.8)	30 (16.0)	187 (100.0)
Household water sources				
Rain	30 (28.6)	2 (3.8)	0 (0.0)	32 (17.1)
Well	28 (26.7)	14 (26.9)	6 (20.0)	48 (25.7)
Stream	38 (36.2)	0 (0.0)	0 (0.0)	38 (20.3)
Bore hole	6 (5.7)	35 (67.3)	24 (80.0)	65 (34.8)
Pipe borne	3 (2.9)	1 (1.9)	0 (0)	4 (2.1)
Total	105 (56.2)	52 (27.8)	30 (16.0)	187 (100.0)
Location of household toilet				
Inside	48 (45.7)	45 (86.5)	19 (63.3)	112 (59.9)
Outside	57 (54.3)	7 (13.5)	11 (36.7)	75 (40.1)
Total	105 (56.2)	52 (27.8)	30 (16.0)	187 (100.0)
Quality of toilet				
Good	56 (53.3)	33 (63.5)	21 (70.0)	99 (52.9)
Fair	6 (5.7)	19 (36.5)	9 (30.0)	60 (32.1)
Bad	43 (41.0)	0 (0.0)	0 (0.0)	28 (15.0)
Total	105 (56.2)	52 (27.8)	30 (16.0)	187 (100.0)
Type of Toilet				
Water system	45 (42.9)	34 (65.5)	23 (76.7)	102 (54.5)
Open pit latrine	22 (21.0)	11 (21.1)	7 (23.3)	40 (21.4)
VIP Latrine	38 (36.1)	7 (13.5)	0 (0.0)	45 (24.1)
Total	105 (56.2)	52 (27.8)	30 (16.0)	187 (100.0)

Source: Field Survey, 2017

Spearman correlation analysis was applied to analyses the relationship between variables on socio-economic characteristics and access to water supply and sanitation. Findings revealed that there was a positive significant correlation between income and type of toilet used (.339**), average water consumed (.209**), quality of water (.011**) but not with quality of toilet used (.023). This implies that income determined the kind of toilet used, quality and quantity of water consumed by the residents, but it did not influence the quality of toilet they used in the study area. This indicates that as income of the residents increased, the type of toilet changed and the volume of water increased as well. On the

contrary, reverse was the case for quality of toilet used by the residents in the study area.

Also, the household size was negatively and significantly correlated with quality of water consumed (-.685**), type of toilet used (-.031**) and quality of toilet (-.248**) but not with average volume water consumed (.318). This implies that the household size of the residents had something to do with their quality of water and toilets, and type of toilet they used. However, the results revealed that an increase in the household size leads to a corresponding decrease in the quality of water consumed, the kind and quality of toilet used by the residents in the study area (Table 3).

Table 3: Correlation analysis among different variables

		Income	Household size	Average water consumed	Quality of water	Type of toilet used	Quality of toilet
Income	r_s p	1.00					
Household size	r_s p	-.063** .075	1.00				
Average water consumed	r_s p	.209** .707	.318 .772	1.00			
Quality of water	r_s p	.011** .000	-.658** .000	.146** .000	1.00		
Type of toilet used	r_s p	.339** .000	-.031** .001	.521* .000	.645** .000	1.00	
Quality of toilet	r_s p	.023 .209	-.248** .000	.461 .000	.659** .0321	.537* .000	1.00

**Correlation is significant at the 0.01 level

*Correlation is significant at the 0.05 level

5. Conclusion and Recommendations

The study found out that public water services declined in coverage and regularity of supply. This means that settlements in low quality residential and socio-economic areas are hardly served with public drinking water services, not even to mention public sanitation infrastructures. Given that most households in Nigeria live below poverty line (Okosun, I., C. Siwar., A. S. Hadi and A. R. M. Nor, 2012), the choice between the options of improving household water or sanitation access will certainly be sacrificed only on attaining basic water needs for drinking, cooking and occasional personal laundry activities while attention to sanitation matters will be seen as luxury and secondary. Also, most policy tools do not take into consideration the local peculiarities of resource availability and diversities in socio-economic contexts of the Nigerian population. The study therefore concluded that residents' level of access to water supply and sanitation is low particularly in high density area.

Therefore the following recommendations are made:

1. Developing effective capacity at various scales of policy and implementation practices, through massive manpower training, is important in guaranteeing adaptive utilization, translation and implementation of relevant international water and sanitation policies at the local and national levels.
2. Government as a driver of change should strengthen the State and Local Government councils so that they can fulfill their mandate in the water and sanitation sector.
3. There is urgent need for manpower training and organizational learning.
4. There is also the need for community sensitization and mobilization on hygiene and sanitation practices, so as to reduce exposing water sources to variety of hazardous events with potential impact on public health.
5. Adequate provision should be made for waste bins in the environment so as to allow people dispose their waste materials properly.
6. Drain covers should be provided so as to prevent blockage and breeding of mosquitoes in the environment.

References

- Acey (2004). The Peripheralization of the Urban Poor in the Local Manifestations of the Global Economy; UCLA.
- Adeagbo, D. (2001). Security of Lives and Property in the Peri-Urban: An Assessment of the Efforts of Landlords/Tenants Associations; Physical Development Department, NISER; OOlbadan.
- Adedibu and Okekunle (1989). Environmental Sanitation in Lagos Mainland: Problems and Possible Solutions, In: International Journal of Environmental Studies; Vol. 33, Pages 99-109
- Afon, A. O. (2004). "Residents' Satisfaction Index in Selective Rehabilitation of An Urban Core Residential Area in Ogbomoso, Oyo State". Journal of Nigerian Institute of Town Planners Vol. xvii, pp.45 – 58.
- Afon A. O. (2006). Informal Sector Initiative in the Primary Sub-system of Urban Solid Waste Management: The Third World Experience; Obafemi Awolowo University, Ile Ife.
- Ajanlekoko (2001): Sustainable Housing Development in Nigeria- The Financial and Infrastructural Implication; Nigeria.
- Akande R. O. (1987). Problems of Uncontrolled Development in Ibadan Fringe: A Case Study of Ogbere, Ibadan; (Unpublished) B. SC Thesis, Department of Urban and Regional Planning, Obafemi Awolowo University, Ile Ife.
- Akpabio, E. M. (2012). Water meanings, sanitation practices and hygiene behaviours in the cultural mirror: a perspective from Nigeria. Journal of Water, Sanitation and Hygiene for Development. 02 (3): 168-181.
- Akpabio, E. M (2007). Nigeria's Water Law: how is it translated in the Cross River Basin? International Journal of Regulation and Governance 7 (2): 157-184.
- Akpabio, E. M., Watson, N. M., Ite, U. E. and Ukpong, I. E. (2007). Integrated water resources management in the Cross River Basin, Nigeria. International Journal of Water Resources Development 23 (4): 691-708.
- ADB (2007). Nigeria: Rural water supply and sanitation sub-programmes in Yobe and Osun States, appraisal report. Water and Sanitation Department (OWAS). May 2007
- Adekunle, L. V., Sridhar, M., Ajayi, A. A., Oluwade, P. A. and Olawuyi, J. F. (2004). An Assessment of the health and social economic implications of satchet water in Ibadan Nigeria: a Public health challenge. African Journal of Biomedical Research, 7: 5-8.
- Ademiluyi, I. A. and Odugbesan, J. A. (2008). Sustainability and impact of community water supply and sanitation programmes in Nigeria: an overview. African Journal of Agricultural Research 3 (12): 811-817.
- Aluko, S. (2006). Abacha's vision 2010 Blueprint reviewed. Naira land Forum. Tuesday May 09, 2006.
- Amakom, U. (2009). Sanitation sector status and gap analysis: Nigeria, a report. September, 2009.
- Ayedun, C. A., O. D. Durodola and O. A. Akinjare (2011). Towards ensuring sustainable urban growth and development in Nigeria: Challenges and Strategies. Business Management Dynamics, vol 1, No.2: 99-104.
- Bello, A. H (2007). Evaluation of Solid Waste Scavenging Activities in Ikeja, Lagos State; (Unpublished) Independent Project on Nigeria, Department of Urban and Regional Planning, Obafemi Awolowo University, Ile Ife.
- Bendahmane, D.B. (1993) Lessons Learned in Water, Sanitation and Health: Thirteen Years of Experience in Developing Countries. Arlington, Virginia: Water and Sanitation for Health (WASH) Project.
- Bindeshwar P. (1999). 'Sanitation is the Key to Healthy Cities: A Profile of Sulabh International', in: Environment and Urbanization; Vol. 11, No. 1, April 1999.
- Black, M. and Talbot (2005). Water, a Matter of Life and Health-Water Supply and Sanitation in Village India. UNICEF. Oxford University Press. Pp 93-129.
- Bradley, D. (1977). Health Aspects of Water Supplies in Tropical Countries. In: Water, Wastes and Health in Hot Climates, Feachem, R., McGarry, M. and Mara, D. (eds). Chichester: John Wiley, PP.
- Blakely, T., Hales, S., Kieft, C., Wilson, N. and Woodward, A. (2005). The global distribution

- of risk factors by poverty level. Bull World Health Organization. Organ 83 (2), 118-126.
- Cairncross, S. & Kolsky, P. (2003). WELL Advocacy Document - Environmental Health and the Poor: our shared responsibility, Water and Environmental Health at London and Loughborough (WELL), UK.
- Castro, J. E. (2008). Neoliberal water and sanitation policies as a failed development strategy: lessons from developing countries. Progress in Development Studies 8 (1): 63-83.
- CBN (2005). Microfinance policy, regulatory and supervisory framework for Nigeria, Abuja, Nigeria.
- DFID (2005). Factsheet: environmental sustainability. Department for International Development. www.dfid.gov.uk/mdg
- Dunggwom, J. Y. (2004). Characteristics and Physical Planning Implications for Slums in Jos. Journal of Environmental Sciences 8 (2). University of Jos, Nigeria
- Egunjobi Layi (1988). Perception of Urban Environmental Problem: A pilot Study of the City of Ibadan, Ibadan. Nigeria
- Egunjobi L. (2002). 'Planning the Nigerian Cities for Better Quality of Life' In: S. O.
- Elledge, M. F. (2003). Sanitation Policies: Thematic Overview Paper, IRC International Water and Sanitation Centre.
- FGN (2000). National Water Supply and Sanitation Policy. Department of Water Supply and Quality Control, Federal Ministry of Water Resources. Federal Republic of Nigeria.
- FOS (1994). Social Statistics in Nigeria, Federal Office of Statistics; Abuja
- FOS (1997). Social Statistics in Nigeria, Federal Office of Statistics; Abuja
- FRN (2000). Water Supply and Sanitation Interim Strategy Note; November, 2000; Federal Republic of Nigeria.
- Gabriel, F. and T. Abraham (2009). Urbanization, Housing and Infrastructural Facilities in Lagos, Nigeria. Journal of Architecture and Built Environment 37 (1): 9-14.
- Goodchild, B. (1974). Class Differences in Environmental Perception; Urban Studies II, pp. 157 – 355.
- Hardoy J. E and Satterthwaite D. (1989). Squatter Citizen: Life in Urban Third World, Earthscan, London.
- Ishaku, H.T.,Majid, M.R., Ajayi, A.P and Haruna, A. (2011). Water Supply Dilemma in Nigerian Rural Communities: Looking towards the Sky for an Answer; *Journal of Water Resource and Protection*, 2011, 3, 598-606, doi:10.4236/jwarp.2011.38069 Published Online August 2011 (<http://www.SciRP.org/journal/jwarp>)
- Jenkins, M. W. and V. Curtis (2005). Achieving the good life: why some people want latrines in rural Benin. Social Science and Medicine 61, 11: 2446-2459.
- Keeble, L. (1960): Principles and Practice of Town and Country Planning; The Estate Gazette.
- Lane, J. (2012). Barriers and opportunities for sanitation and water for all, as envisaged by the New Delhi statement. IDS Bulletin volume 43 Number 2, March. Institute of Development Studies, Oxford, UK.
- Mara, D. (2012). Sanitation: what's the real problem? IDS Bulletin volume 43 Number 2, March.
- Institute of Development Studies, Oxford, UK.
- Marcellus, I. O. (2009). Development planning in Nigeria: reflections on the National Economic Empowerment and Development Strategy (NEEDS), 2003-2007. J. Social Science, 20 (3): 197-210.
- Moe, C. L. and R. D. Rheingans (2006). Global challenges in water, sanitation and health. Journal of Water and Health 04. Suppl. 41. IWA Publishing.
- Microsoft Encarta (2008): Microsoft Students Encarta- A Software Encyclopedia, Microsoft Incorporated.
- Mooijman, A. M., (2003). WELL Factsheet: Evaluation of Hygiene Promotion [Online], Water and Environmental Health at London and Loughborough (WELL), Available: <http://www.lboro.ac.uk/well/resources/fact-sheets/fact-sheets-htm/ehp.htm> [June 2006].
- Musleh Uddin and Sudhir (2000). Environmental Sanitation Promotion: A Social, Institutional and Legal Challenge for the Rural Poor; ADB; Asia.
- Mukhtarov, F. (2009). The Hegemony of integrated water resources management: a study of policy translation in England, Turkey and Kazakhstan. Thesis submitted to the Department of Environmental and Policy of

- Central European University in Part fulfillment of the degree of doctor of philosophy. Budapest.
- National Bureau of Statistics (NBS) (2007). The multiple indicator cluster survey 2007. National Bureau of Statistics, Abuja, Nigeria.
- NPC (2006). Census. National Population Commission, Nigeria.
- Nwaka, G. I. (1990). Urban planning and environmental protection in Nigeria. Proceedings of ISOCARP International Congress, Warsaw, Vol 1, No. 8, pp. 1-9 (also in Urbanistics PVS, Rome, No. 2, 1991, pp.6-8).
- Nwaka G. (2005). The Urban Sector in Nigeria: Towards Economic Development, Environmental and Social Harmony, In Global Urban Development, Vol 1, Issue 1, May, 2005
- Nwankwoala, H. O. (2011). Localizing the strategy for achieving rural water supply and sanitation in Nigeria. *African Journal of Environmental Science and Technology* 5 (13): 1170-1176
- Nyong, A. O. and P. S. Kanaroglou (1999). Domestic Water Use in Rural Semi-Arid Africa: A Case Study of Katarko Village in Northeastern Nigeria. *Human Ecology* 27, 4: 537- 555.
- Okosun, I., C. Siwar., A. S. Hadi and A. R. M. Nor (2012). Urban poverty in Nigeria and approaches to poverty alleviation: a review. *African Journal of Political Science and International Relations* vol. 6 (1): 8-14.
- Olukanni, D.O. (2013). Assessment of WASH Program in Public Secondary Schools in South-Western Nigeria. *ARPN Journal of Engineering and Applied Sciences* Vol. 8 (3).
- Olukanni, D.O., Ajetomobi, M.O., Tebowei, S.O., Ologun, O.O. and Kayode, O.M (2014). Water Supply and Sanitation Challenges in an Urban Setting: A Case Study *International Journal of Engineering and Applied Sciences (IJEAS)* ISSN: 2394-3661, Volume-1, Issue-3, December 2014
- Onabolu, B., O. D. Jimoh, S. B. Igboro, M. K. C. Sridhar, G. Onyilo, A. Gege and R. Ilya (2011). Source to point of use drinking water changes and knowledge, attitude and practices in Katsina State, northern Nigeria. *Physics and Chemistry of the Earth* 36: 1189-1196.
- Osagie, E. (2007). The New Nigerian Economy: from poverty to prosperity. Benin City: AFBSN Publications.
- Olayiwola L.M and Omisore, E. O. (2001). 'Local Government and Urban Planning Administration in Nigeria: Problems and Challenges' In: *Ife Planning Journal*, ICOMDEST, OAU, Ile Ife; Osun State.
- Onibokun, A. G. (1987). 'The Policy Implication of Emerging Metropolises in Nigeria', In: *Urban and Regional Planning Policy Formulation in Developing Countries* (ed.) by Faniran, et al; pg 91-104; Ibadan University of Ibadan Press.
- Porters, J.D. (1976). *Environment and Behaviour: Planning and Everyday Urban Life*. New York, Victoria Press.
- POSTnote (2002). Access to Sanitation in Developing Countries, December, 2002, Number 190.
- Rochester R. C. (2005). Towards effective Environmental and Town Planning Policies for Delta State, Nigeria.
- Roland et al (2004). An Integrated Approach to Environmental Sanitation and Urban Agricultural, Cumberland Strasse; 133; ch-8600, Duebendourf
- Sada, P. O. (1970). 'The Rural-Urban Fringe of Lagos, Population and Land Use' In: *Nigerian Journal of Economic and Social Studies*, Vol. 12, No. 2, pp 225-241.
- Sanusi, Y. A. (2010). Water, Sanitation and Human Development in Urban Fringe Settlements in Nigeria. *Theoretical and Empirical Researches in Urban Management*, 8, 17: 14-29.
- Sari, H. and Ari, I. (2006). A guide to sanitation and hygiene for those working in developing countries. Visited October 2013.
- Sodeinde, O., Adeyemo, A. A., Gbadegesin, A. R. & Ademowo, G. O. (1997) Persistent diarrhoea in Nigerian children aged less than five years: A hospital-based study. http://www.icddrb.org/images/jddr153_persistent_diarrhoea.pdf, accessed 16th June 2007.
- Stoveland, S. and B. U. Bassey (2000). Status of Water Supply and Sanitation in 37 Small Towns in Nigeria. Presented at the Donor Conference in Abuja. 2-4 February.
- Udom, E. S. (2011). Accessibility to potable water supply in Akwa Ibom State. Unpublished PhD thesis. Department of Geography and Regional Planning, University of Uyo, Nigeria.

- UN-Habitat (2003). Water and sanitation in the world's cities: local action for global goals, London. Earthscan.
- UNICEF (2010). At a glance: Nigeria. http://www.unicef.org/infobycountry/nigeria_statistics.html
- UNICEF and WHO (2004). Meeting the MDG Drinking Water and Sanitation Target: a Mid-Term Assessment of Progress. UNICEF/WHO, Geneva, Switzerland.
- WHO/UNICEF (2000). Global water supply and sanitation Assessment 2000 report. Available at: http://www.who.int/docstore/water_sanitation_health/Globassessment/GlobalTOC.htm
- UNICEF and WHO (2010). Joint Monitoring Programme for Water Supply and Sanitation. 2010. Progress on sanitation and drinking water. JMP estimates are based on a linear regression of nationally representative household surveys.
- Walling, E. et al (2005). Waste Management in Developing Countries: A Case Study of Waste Dumpsite in Aba, Nigeria. Whitefield, D. K. and Kanaan, G. E. (1972): 'Zoning Parking and Traffic Connection' Eno Foundation for Transport.
- WHO and UNICEF (2000). Global Water Supply and Sanitation Assessment 2000 Report .Geneva.
- WHO/UNICEF (2006). 'Meeting the MDG Drinking Water and Sanitation Target: The Urban and Rural Challenge of the Decade', WHO and UNICEF, pp. 41.
- White, G., Bradley, D. and White, A. (1972). Drawers of Water. Chicago: Chicago University Press, pp.162-176.
- WHO (2010). UN-water global annual assessment of sanitation and drinking-water (GLAAS) 2010: targeting resources for better results, Geneva: World Health Organization.
- WHO/UNICEF (2010). Joint monitoring programme for water supply and sanitation. Meeting the MDG drinking water and sanitation target: mid-term assessment of progress. WHO; Geneva: UNICEF, New York.
- WHO and UNICEF (2006). Meeting the MDG water and sanitation target: the urban and rural challenge of the decade, WHO, Geneva and UNICEF; New York.
- WHO (2007). Combating water-borne disease at household level. The international network to promote household water treatment and storage. WHO Geneva. www.who.int/water_sanitation_health/mdg1/en/print.html
- Zuleeg, S. (2006). Trends in Central Europe (Germany/Switzerland)'TECHNEAU, pp.83.
- Yoade, A., Adeyemi, S. Onifade, V. (2018): Perception of Environmental Quality of Inner-City of Ondo, Nigeria; Journal of Environmental Design, University of Uyo, Akwa-Ibom State, Nigeria; Vol. 13, No 1; ISBN:1995-9229-15.