SOURCES AND DETERMINANTS OF URBAN WATER SUPPLY IN IBADAN NORTH LOCAL GOVERNMENT AREA OF OYO STATE, NIGERIA

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ABSTRACT
Increasing human population, climate change, reduction in water resources and inadequate investment in water project has led to inadequate supply of water within the household and community at large. Despite the communal demand, considerable amounts of the total water consumption for household are difficult to come by. The study examined the sources and determinant of household water supply in Ibadan North Local Government Area of Ibadan. This study employed survey research design while a purposive sampling technique was utilized. Both primary and secondary data collected were used. Using questionnaire, a total of 142 questionnaires were administered to selected household in various wards of Ibadan North Local Government Area. The study revealed that the major source of water to Ibadan North Local Government is mainly water from government borehole and well water while other sources such as rain water; water vendors are just supplement during water shortages. Efforts were made to identify problems which concerns the distance covered by the resident and the amount of water they use for domestic purposes. It was realized that the distance covered did not determine the amount of water used due to the fact. The study recommended an alternative source of power supply for instance a continuous source of diesel and petrol for the powering of the water work's generating set and that more boreholes and motor tankers should be brought with the cooperation of both the local government and the community.
Keywords: Household; Utility; Demand; Supply; Liveability; Water.

INTRODUCTION / STATEMENT OF PROBLEMS

Water, shelter, and food are three important elements that define human liveability and settlement sustainability. Apart from air, water is the most important resource to man. Water is a precious natural resource, which is vital for life, development and of the environment. It can be a matter of life and death, depending on how it is managed. Excess or shortage of it can lead to destruction, misery or death depending on how it occurs and how it is managed. Irrespective of how it occurs, if properly managed can turn out to be an instrument for economic survival and growth. It can be an instrument for poverty alleviation lifting people out of the degradation of having to live without access to safe water and sanitation, while at the same time bringing prosperity to all (Oyekale and Ogunsanya, 2012). Gbadegesin and Olorunfemi (2003) and Ajayi and Ugwu (2008) opined that an essential to most human activity is water, which can be a means to prosperity, poverty alleviation and economic value and development. However, when it is inadequate in either quantity or quality, it can be a limiting factor in poverty alleviation and economic recovery, resulting in poor health and low productivity, food insecurity and constrained economic development (Gbadegesin and Olorunfemi, 2003).

A considerable amount of the total water consumption is for household use. There are different sources of water among which are lakes, rivers, wells, springs and rain water. Oluwande *et al.* (2008) asserted that the sources of water in Nigeria including schools are rain water, well water, borehole, surface water and pipe-borne water. Although domestic water consumption accounts for only 7% of the total water use in Africa (Hinrichsen *et al*., 1997), the benefits related to an improved water supply, such as effects on health, time savings and high productivity, are quite immense (Sharma *et al*., 1996; HDR, 2006). Studies by Esrey *et al*. (1991), Roseqrant *et al.* (2002), Parsons and Jefferson (2006) established the positive relationship that exist between household health condition, communal sanitation, school facility condition, hygiene and water accessibility and supply. Aminou and Dabbert (2009) opined that for a household to fully benefit from an improved water supply, it must have indoor access to safe and reliable water sources. They further argued that developing countries are left out in the reality of indoor water access and for the expansion of access to safe and reliable water sources, especially in Africa and Asia; the Millennium Development Goals was introduced.

There are many factors that contribute to the total water consumed at household level. Arbues (2003) analysed several tariffs and their objectives and identified water prices, income or household composition as crucial determinant of residential water consumption. With the increasing human population and urban growth, settlements and households are being characterised by increasing water demand exerting pressure on available water sources and on the public sector to provide water for the citizenry. Odigie and Fajemirokun (2005) observed that the provision of household water supply and services in Nigeria has been traditionally regarded as a social responsibility of the Government.

Consequently, the costs of water infrastructure have been met from budgetary allocations and donor contributions rather than from water tariffs and charges. This has created the public perception of water as a free good. The sector therefore finds it very difficult to lay new pipeline and majority of the populace are without network coverage. Modern water resources managers according to Skaggs *et al*. (2004), are constantly required to balance multiple, conflicting, incommensurate objectives in an environment characterized by high levels of uncertainty, varying data quality and availability, and competing models and approaches. As thus, household water level can be affected by access to other alternative water source which are reliable than the public water utility system (Littlefair, 1998). There should be a close social distance between the planners and the beneficiaries because water has been identified as an economic good (Altaf and Hughes, 1994, Rogerson, 1996). Moreover, Littlefair (1998) further opined that improving the reliability of water supply to household will enhance water supply by the stakeholders.

Hence, the need to study and appreciate this problem is the basis for undertaking this study with the hope that the outcome will assist decision makers on household water supply improvement strategies. This study aims to examine the sources and determinants of household water supply in Ibadan North Local Government Area, with a view of determining the relationship between sources of water supply and the socio-economic characteristics of respondents.

The Study Area

Ibadan North Local Government is located within Log 3°59' E and Lat 7°20' N. Ibadan North Local Government is one of the 11 local governments in Ibadan with its headquarter is in Agodi. The local government has an area of 27km^2 with a total population of 414,508 according to the (National Population, 2006). Ibadan North Local Government is sub-divided into12 political wards. The local government is bounded in the North by Akinyele Local Government, in the East by Lagelu Local Government, and in the West by Ido Local Government.

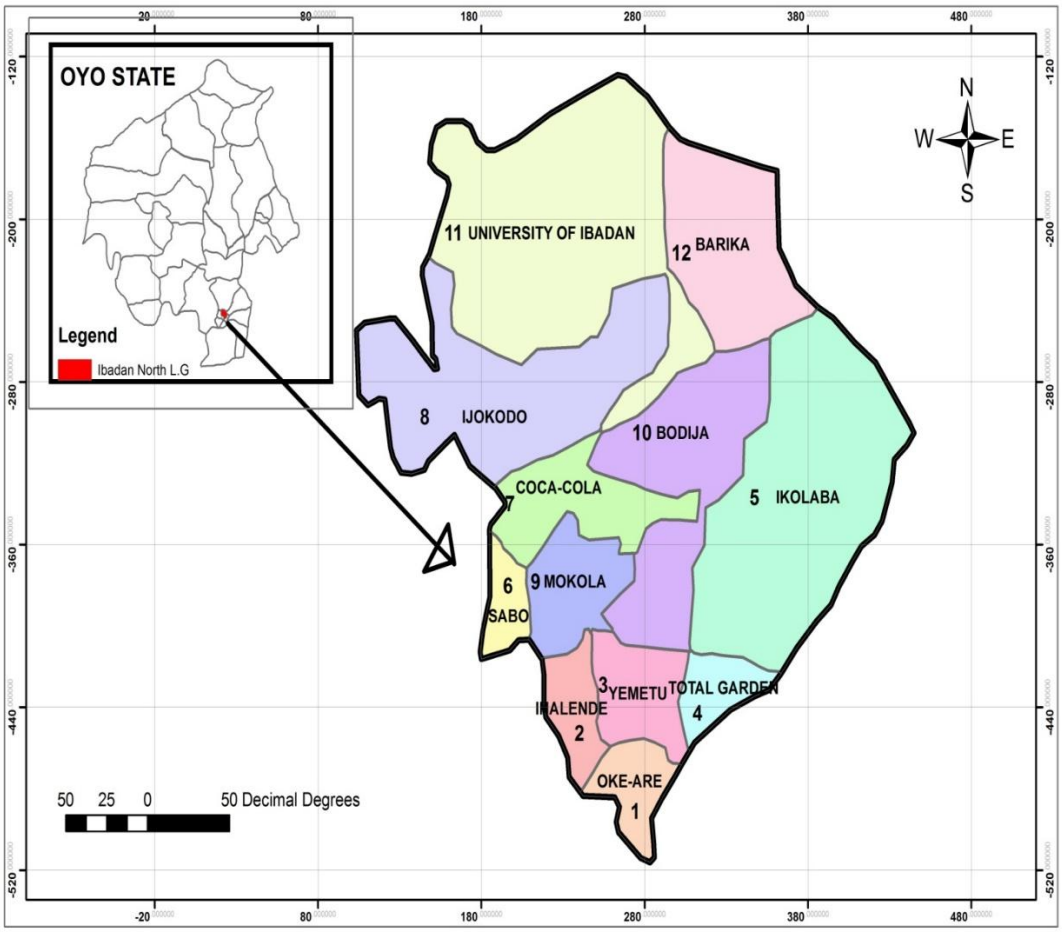


Fig.1: Oyo state showing Ibadan North Local Government
Source: Department of Geography University of Ibadan.

THEORETICAL ANCHOR AND LITERATURE REVIEW

Water Demand Theory

This study is anchored on the theory of water demand. It is premised on the dominance of residential (urban) over that of rural water demand studies. Single and system of demand equations with different functional forms have been employed to estimate elasticity of water demand with respect to price, income, household characteristics and composition, among others. These studies utilize time series, cross-sectional data or panel data.

In the developing country context, water demand management in general has traditionally focused on supply-side policies (Arbués *et al*., 2003) that aim at improved water supply coverage for the entire population at low tariffs (Atlaf, 1994). This strategy has been shown to produce low service levels especially in rural areas, and therefore unsustainable in that rural area water supply schemes have been approached as welfare activities without financial viability considerations. Willingness to pay (WTP) studies through contingent valuation approach has been used to investigate the potential value to consumers of an improvement in water supply. Studies have shown that households are willing to pay between 0.5% and 10% of their income for improved water services. Although household income is an important determinant of demand, other factors are found to be more paramount in the demand for improved water services in rural areas of developing countries. The decision by households to use improved water sources among other alternatives has received attention and has been modelled through a discrete choice approach.

Mu *et al*. (1990) approached this choice problem by assuming that the decision to opt for improved water resources is independent of the quality of water consumed thereof. Merret (2002) criticizes this approach as it ignores the fact that households use multiple water sources for multiple purposes. Asante *et al*. (2002) find that educational level and household income are important in determining the likelihood of households using improved water sources in the Volta basin of Ghana. However, their regression analysis does not include the price of improved water, an important decision variable often used as tool in water demand management strategies. Employing OLS estimation procedure, Iskandarani (2002) finds that per capita household income and water storage facilities are significant determinants of water demand in Jordan whilst the level of education of household head and price of water charged by private water vendors are not significant in explaining total water demand. Income elasticity of 0.30 and 0.29 is observed for Amman (urban) and rural areas respectively. Very few studies employ this theoretically consistent methodology in water demand studies.

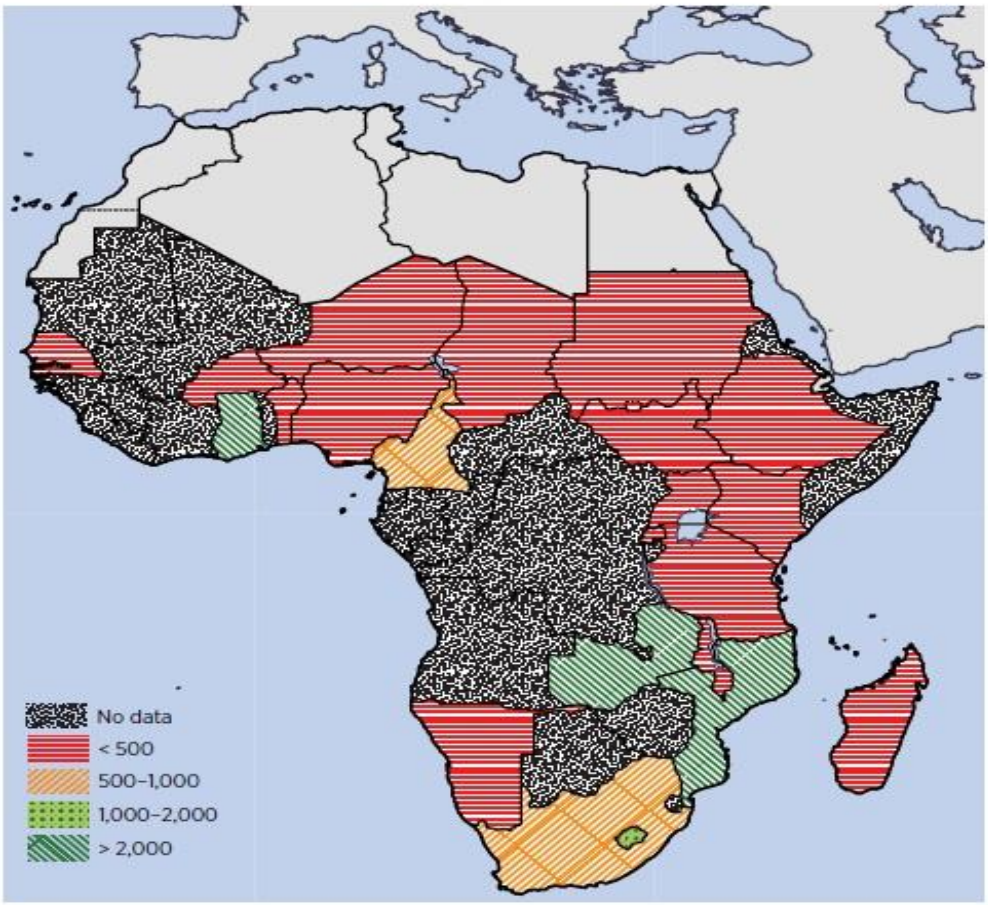
A notable one is by Pashardes *et al*. (2001) who applied the Quadratic Almost Ideal Demand System (QAIDS) model to estimate residential water demand in Cyprus and to derive welfare implications for changes in the water pricing system. Their results point to water as a necessity with an average income elasticity 0.32, ranging from 0.25 (lowest income group) to 0.48 (highest income group), indicating that water is more of a necessity to power household's system of consumer demand equations have been mostly applied in the area of food, meat and. And also, those affluent households use more water and thus pay more under the prevailing increasing block tariff system, while poorer households are more responsive or sensitive to water price changes.

LITERATURE REVIEW

Water demand and supply

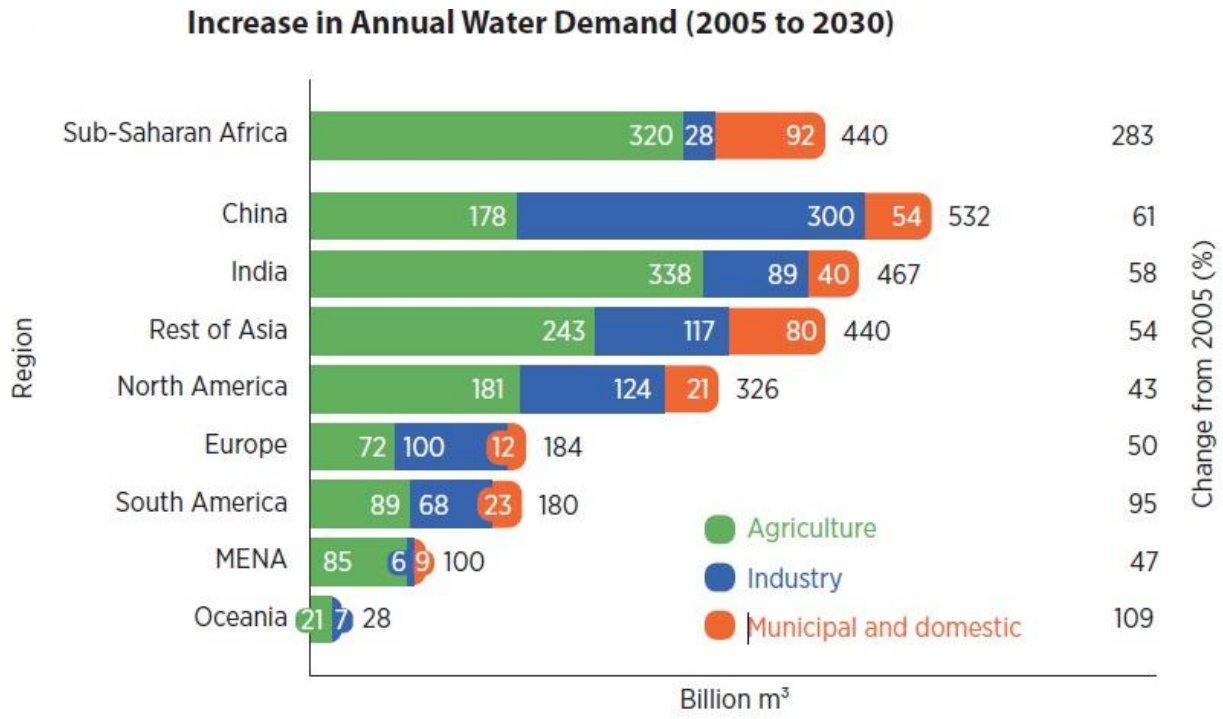
Africa's rapid urbanization will result in new water management challenges for cities. In 2010, only 61 percent of Africans had access to clean water and 31 percent to adequate sanitation (see fig 1) (WHO/UNICEF, 2012). More than 40 percent of Africans live in arid, semiarid, and dry sub-humid areas. The amount of water available per person in Africa is far below the global average and is declining with annual per capita availability of 4,000 cubic meters compared to a global average of 6,500 cubic meters (UNEP, 2010). A major study, the Comprehensive Assessment of Water Management in Agriculture, reveals that one in three people today face water shortages (CA, 2007). United Nations (2007) observed that around 1.2 billion people, or almost one-fifth of the world's population, live in areas of physical scarcity, and 500 million people are approaching this situation, another 1.6 billion people, or almost one quarter of the world's population, face economic water shortage (where countries lack the necessary infrastructure to take water from rivers and aquifers).

Figure 1. Water Storage in Africa (m^3 per Capita)



Source: Map produced by Africa Spatial Services Helpdesk, based on World Bank, 2011a.
Note: m^3 = cubic meters.

About two-thirds of Africa's urban population is served by water utilities (AICD, 2011). With more than 40 percent of Africans living in arid, semiarid, and dry sub-humid areas, and water infrastructures and utility remain derelicts, water demand grows (see figure 2), and water resources are becoming scarcer ((WHO/UNICEF, 2012).



Source: World Bank, based on 2030 Water Resources Group, 2009.
Note: MENA: Middle East and North Africa. m^3 = cubic meters.

The amount of water available per person in Africa is far below the global average and is declining with annual per capita availability of 4,000 cubic meters compared to a global average of 6,500 cubic meters (UNEP, 2010). Africa has about 9 percent of the globe's fresh-water resources, but utilization is low in many basins. For example, less than 2 percent of the Congo River's tremendous water resources are used. Most water use in the continent is for agriculture, although domestic and industrial uses of water are growing near urban areas (UNEP, 2008). In Nigeria, the water needs are met by surface and groundwater resources, which are 226 billion m3 and 40 billion m3, respectively (NUWSRP, 2004).

Human settlements and community liveability is highly dependent on the daily provision of adequate quality and quantity supply of portable water for his people. Scarcity of clean, fresh water is one of the world's most pressing environmental problems (Arms, 2008). According to UNECA (1999), the provision of water supply in human settlements involves tapping the most suitable source of water, ensuring that the water is fit for domestic consumption and supplying it in adequate quantities.

Bustanmante *et al.* (2004) defined domestic water as commonly understood to include the water needs of families for drinking, cooking, washing and sanitation. Household water supply consists of fetching of water through taps, storage and subsequent use of piped water, either as the principal or supplementary source of water. It is applicable both for potable and non-potable purposes (Fewkes, 2006). Some systems can provide water for domestic, institutional, commercial and industrial purposes, as well as agriculture, livestock, ground-water recharge, flood control processes and as an emergency supply for fire fighting (Gould and Nissen, 1999; Konig, 2001; Datar, 2006). Household water supply is a simple and modern concept, which varies from small and basic systems of fetching and collection of water through pipes, to large complex systems of collecting water from many hectares to serve many people (Leggett *et al.*, 2001).

In Nigeria, Idiata (2013) stated that urban water supply coverage has actually decreased in parts of developing world, an indication of urban growth but also of deterioration of existing

systems. Oguntoyinbo *et al*. (1983) recognized that it is now basically accepted that an adequate supply of water for drinking, personal hygiene and other domestic purpose is essential to public health and wellbeing. In Nigeria, studies have shown that the need for an adequate supply in terms of quality and quantity is ever growing. Ayoade and Oyebande (1978) have observed that the demand for food, housing and human needs have increased daily especially with increased standard of living and purchasing power, so that the increase in productivity activities generated by such demands have had a tremendous impact of water, this is due to the rapidly growing and expanding population. Sequel to this, Olokesusi (1990) stated that household water supply situation in Economic Community of West African States (ECOWAS) is far from satisfactory.

It is a paradox that the situation has not changed up till now in the Nigeria. The situation of urban household water supply in Oyo State especially in Ibadan North Local Government Area of Ibadan tends to be worse because of the large expanse of the area. According to Olokesusi (1987), when women walk up a valuable distance to get minimal water supplies, water becomes too valuable for washing and an important defence against infection is lost. The challenge of ensuring timely and spatially accessibility to portable water has become an important issue as the quality and quantity required for human health and leisure depends on several factors, especially when we try to determine the quantity of water that may be demanded at any point in time at household level (Onda *et al.,* 2012).

According to Ayanshola *et al*. (2010), accurate estimation of water demand should put into consideration variables such as income, population and sex, while Al-Amin *et al*. (2011) listed cultural habit, settlement pattern, type of supply and water source as water use determinants in homes. Ifabiyi *et al*. (2012) found in Sokoto, Nigeria that level of education, income levels and marital status correlated positively with total household water while time cost and the distance to water points correlated negatively. Lack of data has been considered as the principal factor hampering proper and adequate water demand estimation especially in the developing nations (Ayanshola *et al*., 2010).

In 2007, only 47% of the total population had access to water from improved sources (Aladenola and Adeboye, 2010). In Nigeria, a larger percentage of the revenue has been directed towards providing portable water. Helen, (2011) argued that the local and state governments, whose primary responsibility is to provide water, are spending millions of Naira purchasing chemicals for water that is unavailable. Okeke, (2009) suggested that water supply problem in Nigeria is enormous and can only be solved through a properly coordinated approach.

RESEARCH METHODOLOGY

This study employed survey research design; in which both primary and secondary data were collected. A multistage sampling technique was used to select 142 households proportionally across the twelve wards that make up the Ibadan North Local Government Area of Oyo state. The wards were subsequently classified into streets after which questionnaires were administered to the enumerated buildings systematically chosen along the streets in each ward. Credence was given to every 10^{th} building in each street. The instrument of investigation included questionnaire, in-depth interview and personal observation. Table 1 shows the selected areas in each ward, their population size and the number of questionnaires administered in each of the wards. Both descriptive and inferential statistics (chi square analysis, Pearson correlation and multiple linear regression) were used to analyse the data at $p < \text{or} = 0.5$ level of significance.

Table 1: Wards and population size of Ibadan North Local Government

Wards	Selected Areas	Population (Sample Frame)	Sample Size (Questionnaire Allocation)
1	Oke-Are	32,012	11
2	Oniyanrin	33,663	10
3	Yemetu	35,149	11
4	Agodi	46,159	13
5	Bashorun	36,273	14
6	Sabo	23,536	7
7	Oke Itunnu	30,747	12
8	Sango	36,747	14
9	Agotapa	17,947	9
10	Bodija	36,337	14
11	Samonda	45,242	14
12	Agbowo	40,657	13
	Total	**414,508**	**142**

Source: Author's fieldwork (2015)

FINDINGS AND DISCUSSION

The socio-economic characteristics of an individual tend to affect the quality of water used by each household and an individual. The study revealed that 23.4% of the sampled respondents are within age range of 11-20years, 42% of the respondents fall into age class of 21-30years, 17.7% of the sample respondents fall between the ages of 31 and 40 years, while the remaining 17% are above the ages of 41 years. Analysis shows that 35.9% of the respondents had attended tertiary institutions like the college of education, polytechnics and universities while 4.9% of the respondents were illiterates. 4.9% of primary school leavers, and secondary school education occupying 42.3%. It can be inferred that just 46.27% are the high-income earners (i.e. earns above ₦32,000 monthly) while 28.36% are the average income earners (i.e. earns between ₦18,000 and ₦32,000 monthly); and, 25.37% are the low-income earners (earns below ₦18,000 monthly). Despite the income structure of the respondents, analysis revealed that over half (50.91%) of the sampled respondents have an average household size of between 4-6 members, 17.27% claim to have house sizes of between 1- 3 and 7- 9 inhabitant, while the remaining 14.55% of the sampled respondents have house size of between 10 and above.

Household Water Source, Characteristics and Consumption Pattern

In Nigeria, more than 90% of rural areas and 60% of urban areas face water related problems (Anyadike, 2009). The daily per capita consumption of water in Nigeria varies between 10-27 litres, with an average of 46 litres, which is far below the internationally recommended minimum requirement of 115 litres per person per day (Utsev and Aho, 2012). This shortfall in water requirement is due to differences in availability and supply (Ayoade and Oyebande, 1978 and UNICEF, 2009). There are various sources of water supply in the study area. These include well water, borehole, and tap water.

A sizeable proportion of respondents have dug well in their homes to serve as an alternative source of water supply since there is no connection to public supply. According to the information gathered on field, rain water is one of the least used by people mainly because it is seasonal in nature, however in the rainy season the rainwater is largely drained and used by household for domestic uses. Borehole is also becoming popular, but for its cost of installation which most people cannot afford except for government intervention. Field observation revealed that household with borehole cannot be said to be high income earners alone, but one determining

factor is the terrain of the place and if there is ready availability of water in there well across all seasons. Findings revealed that source of water supply differs significantly among respondents of different levels of income ($p<0.05$). This implies that income has something to do with the sources of water (see Table 2). Although the water is still mainly for domestic purposes which ranges from household chores, cooking, bathing and other family businesses.

Table 2: Source of water by income

	Tap	Well	Borehole	Rain	Total
<₦18,000	4(33.3%)	6(20.7%)	7(29.2%)	0(0%)	17(25.8%)
₦18,001- ₦32,000	2(16.7%)	9(31.0%)	7(29.2%)	1(100%)	19(28.9%)
₦32,000	6(50%)	14(48.3%)	10(41.7%)	0(0%)	30(45.5%)
Total	12(100%)	29(100%)	24(100%)	1(100)	66(100%)
Pearson Chi-Square = 3.888; df = 6; p = 0.002					

Source: Author's analysis, 2015.

Findings revealed that a household chore was a major determining factor in the daily water consumption. About 70% of the respondents demanded for water for domestic chores while 0.7% of the respondents argued that the number of bathing times which depend largely on weather condition was major factor. Less than one quarter (21.17%) of the respondents argued that cottage industries such as pepper grinding, baking industry, catering activities, ice-cream industry and ice-block making industry were major determinants of water consumption in the study area. Water vendor constituted 8.83% of the respondents. Such households depend mainly on borehole as their source of water. Situation whereby there is an increase in human population without a corresponding expansion and investment in water supply infrastructures can lead to increase in water deficit. Vairavamoorthy *et al*, (2007) identified the role of the government in water supply mechanism. They argue that providing adequate water supply to the rapidly growing urban population is a challenging task for governments throughout the world.

Sources and distance of water supply in the study area

Investigation on the sources of water revealed that 51.4% of the respondents have their water sourced within their compound, 35.5% have their water sourced from the neighbourhood while 6.5% got their water form the next compound with respect to the distance covered to get water for consumption, the study revealed that while 3.7% of the respondents have their water sourced 500 metres away from their houses, 1.9% have their water source 1 kilometre away from their houses. Only 1.0% claimed to have water sources whose distance cannot be specifically stated (Figure 2).

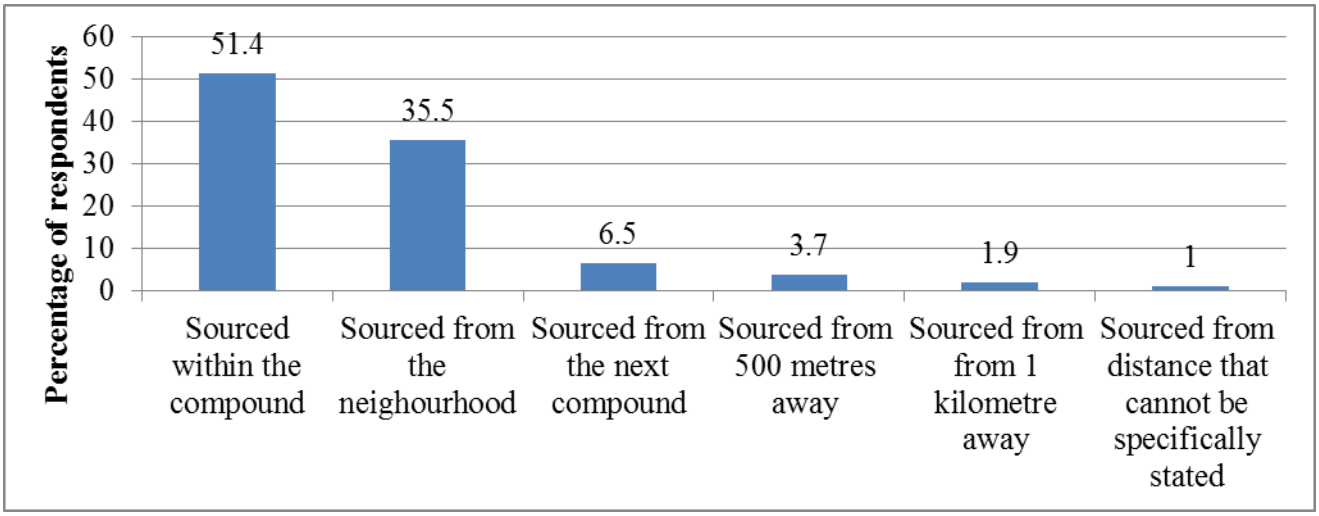


Figure 2: **Sources and distance of water supply**
Source: Author's analysis, 2015.

Relationship between volumes of daily water consumption, distance to source of water and household size

Finding revealed that there is a significant relationship between daily water consumption level (litres) and household size ($r = 0.606$; $p<0.05$). The positive and the significant relationship between the variables implies that as house hold size increases, the daily water consumption level (litres) increases as well and vice versa. They both move in the same direction. However, a negative and significant relationship was observed between daily water consumption level (litres) and the distance travelled to get the water ($r = 0.541$; $p<0.05$). The positive relationship between them implies that as the distance travelled to get the water increases, the daily water consumption level (litres) deceases and vice versa. They move in the opposite directions. The statistically significant value implies that distance has something to do with the amount of water consume in a day (see Table 3).

Table 3: Relationship between volumes of daily water consumption, household size and distance to source of water

		Daily Consumption level litres	Household size	Distance to source of water
Daily consumption level in litres	Pearson Correlation	1	0.606**	-0.541**
	Sig. (2-tailed)		0.000	0.000
	N	142	142	142
Household size	Pearson Correlation	0.606**	1	0.037
	Sig. (2-tailed)	0.000		0.310
	N	142	142	142
Distance to source of water	Pearson Correlation	-0.541**	0.037	1
	Sig. (2-tailed)	0.000	0.310	
	N	142	142	142
**. Correlation is significant at the 0.01 level (2-tailed).				

Source: Author's analysis, 2015.

Influence of household size and distance to source of water on volumes of daily water consumption

A strong relationship was observed between the volumes of daily water consumption, household size and distance to source of water (R = 0.791). R square is simply the square of R. It indicates the proportion of variance in the volumes of daily water consumption that can be explained by the two predictors (household size and distance to source of water). R-square of 0.626 shows that 62.6% of the variation in the volumes of daily water consumption can be explained by variability in household size and distance to source of water. Thus, the remaining 37.4% can be explained by other factors not considered in this model. The high R^2 indicates that a model containing a combination of household size and distance to source of water is likely to be a good predictor of the volumes of daily water consumption in the study area (see Table 4).

The linear relationship among the variables in the regression can be determined by examining the Analysis of Variance (ANOVA). Note the value of the F statistic and its significance level (denoted by the value of "Sig."). If the value of F is statistically significant at a level of 0.05 or less, this suggests a linear relationship among the variables. As indicated in (see Table 4. The statistical significance at a 0.05 level means there is a 95 per cent chance that the relationship among the variables is not due to chance. In this case, there is a joint prediction of volumes of daily water consumption ($p<0.05$).

The coefficients table determine the value of the constant. This table summarizes the results of the regression equation. Column B in the table gives the values of the regression coefficients and the constant, which is the expected value of the dependent variable. The values in column B represent the extent to which the values of independent variables contribute to the value of the dependent variable. That is, the B coefficients tell us how many units of volumes of daily water consumption increases for a single unit increase in each predictor. The findings revealed that, a unit increases in household size corresponds to 62.1 points increase in the

volumes of daily water consumption and a point increases in distance to source corresponds to 30.1 points increase the volumes of daily water consumption (see Table 4).

The t-values in the coefficients table indicate the variable's statistical significance. In general, a t-value of 2 or higher indicates statistical significance. The column “Sig.” holds the p-values for our predictors. As a rule of thumb, we say that a b coefficient is statistically significant if its p-value is equal to or *smaller than 0.05.* In this case, household size and distance to source of water (B coefficients) are statistically significant ($p<0.05$). That is both household size and distance to source of water significantly influenced volumes of daily water consumption in the study area (see Table 4).

The equation can be written as

$Y = a+b1x_1+b_2x_2+e$

$Y = 10.700 + (0.621X_1) + (0.301X_2) + 8.7$

Where; y = Volumes of daily water consumption, X_1 = household and X_2 = distance to source of water.

This model predicts the volumes of daily water consumption.

Table 4: Influence of household size and distance to source of water on volumes of daily water consumption

Coefficients				
	Unstandardized Coefficients		T	Sig.
	B	Std. Error		
(Constant)	10.700	0.676	15.826	0.000
Household size	0.621	0.067	9.210	0.000
Distance to source of water	0.301	0.061	4.893	0.000
R = 0.791 R Square = 0.626 Adjusted R Square = 0.590 Std. Error of the Estimate = 8.68881 F = 52.806 Sig = 0.000				

Source: Author’s analysis, 2015.

Household water challenges and solutions

The perceived problems identified by respondents includes “poor management” of the few water amenities/infrastructures that are available accounting for 76.8%, the proportion of the respondent whose distance from the source of water supply were a major challenge constituted 8.5% while 7.4% were faced with the challenges of the high cost of accessing water; and people who did not face any form of challenge accounted for 7.3% (see Figurer 3). The result implied that majority of the households were faced with different kind of problems. The findings corroborate the work of Mohammed and Sahabo (2015), that the successful management of any resources requires accurate knowledge of the resource available, the uses to which it may be put, the competing demands for the resource, measures and processes to evaluate the significance and worth of competing demands and mechanisms to translate policy decisions into actions on the ground.

Urban sustainability and liability will be a mirage if there is no ready accessibility to and steady supply of portable water within the cities. Settlement and people demand on water for consumption and other eco-industrial activities. Joseph (2012) stated that addressing water scarcity requires an inter-sectoral and multidisciplinary approach to managing water resources in order to maximize economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems, such that the integration within sectors will take into account development, supply, use and demand, and to place the emphasis on people, their livelihood and the ecosystems that sustain them. On demand side, enhancing water productivity (the volume of production per unit of water) in all sectors is paramount to successful programmes of water scarcity alleviation (FAO, 2007).

Just as the population of the world is growing, the demand for water and water resources has experienced an increase even twice higher than the average household population. Despite less visible effects of water shortage and scarcity across the global, an increasing number of regions are chronically short of water (UNDESA, 2011), countries such as Sudan, India, Niger, Ethiopia and regions in the Northern, Southern region and Benue in Nigeria. Reasons for water scarcity in these areas include environmental pollution, location, climate change and inadequate water facility management. Residents of Ibadan North LGA face the problem of household water supply.

Further study inquiry into the possible solutions to problems of water supply revealed that 65.59% of the respondents were of the opinion that more boreholes should be provided to solve the problems; 9.68% were of the opinion that house owners should dig their own wells to enhance for better supply of water; 7.53% were of the opinion that there should be constant power supply for pumping to solve their problem of water supply; another 7.53% responded that government should intervene in solving the problem; 4.30% responded that more taps for water should be provided to improve supply, 1.08% were of the opinion that government should repair damaged pipelines to improve supply of water; meanwhile, 4.3% suggested proper communal investment in water projects and improved behaviour to facilities. Some of the findings corroborates with that of Amole (2009); Waheed *et al*., 2008 and Fatoye and Odusami (2009), which provided an explanation between utilities provisions and household and community residents satisfaction.

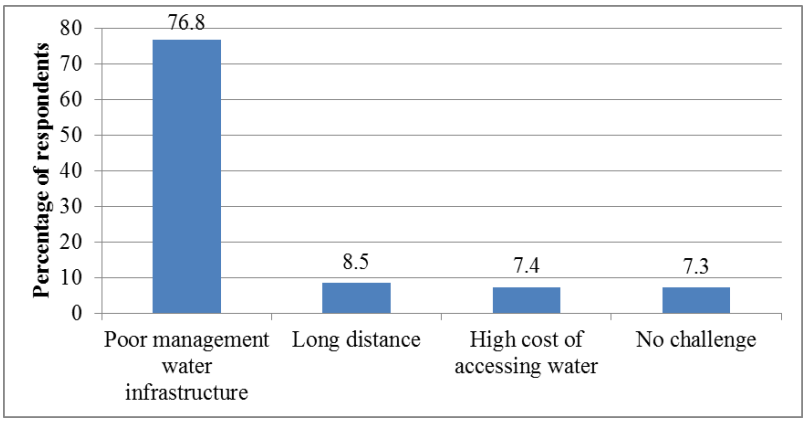


Figure 3: Sources and distance of water supply
Source: Author's analysis, 2015.

Conclusion and recommendation

Livability is impossible with the inadequate water supply; and one of the most important significant activities in the effort of demand management of residential water demand is trying to understand the factors that affect residential water demand. Based on the findings of this study and review of relevant literature it is concluded that demographic and socio-economic factors

were found to be a significant determining factor in both residential water demand and households water source choice; household income generating activities such as catering, grinding pepper etc. demand more water. Thus planners should give due emphasis in the type of employment of the residents so that these households would be served more cheaper and reliable services as water is not only a consumable good but also means of earning livelihood and there should be an extensive and detailed study done by the Ministry of water resources development and the respective regional bureaus to have a clear picture of the factors that affect consumer's decisions of water source choice and residential water uses. Based on foregone, the study proffers the following recommendations based on the problem identified;

- An alternative source of power supply for instance a continuous source of diesel and petrol for the powering of the water work's generating set.
- More boreholes and motor tankers should be brought with the cooperation of both the local government and the community.
- Residents of Ibadan North Local Government Area need to be educated to some extent in other to influence the perception of water quality.
- In areas where people have access to pipe borne water, improve the lid pipes should be constructed and distributed evenly to minimize the congestion of taps.

If all these steps are taken, then the problem of water supply and distribution in the study area would actually be minimized and this may in turn have a great influence on the socio-economic status and therefore the living standards of people living in the local government area.

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