AN ANALYSIS OF THE DOMESTIC WATER DEMAND AND SUPPLY IN ILORIN METROPOLIS, KWARA STATE

BY

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P15SCGS8040

A DISSERTATION SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES AHMADU BELLO UNIVERSITY ZARIA

IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF MASTER OF SCIENCE DEGREE IN GEOGRAPHY

DEPARTMENT OF GEOGRAPHY
FACULTY OF SCIENCE
AHMADU BELLO UNIVERSITY
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MAY, 2016.

DECLARATION

I hereby declare that this dissertation was written by me and is a product of my research effort. It has not been presented in any previous application for any degree. All quotations are indicated and the sources of information are acknowledge by means of references.

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CERTIFICATION

This dissertation entitled "An Analysis of the Domestic Water Demand and Supply in Ilorin Metropolis in Kwara State by Mohammed, S. Surajudeen meets the requirement for the award of the degree of Master of Science (Geography) of Ahmadu Bello University, and is approved for its contribution to knowledge and literacy presentation.

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ACKNOWLEDGEMENTS

The completion of this research was possible due to active cooperation, contribution and support from many individuals all of who cannot be mentioned separately by name. I appreciate you all.

I am grateful to my supervisors, Prof. I. M. Jaro and Dr. J. O. Adefila who gave me the directions, advice and necessary encouragement, especially at such times when I found the research tough and felt discouraged. May God Almighty reward you all real good.

I express my deepest appreciation to my brother and colleague for their sacrifice, love and encouragement.

Most importantly, I am sincerely grateful to Almighty Allah for the strength, grace and the gift of life to undertake this research successfully. All praise, honour and glory be unto Allah.

DEDICATION

This research is dedicated to my parents Late Alhaji Muhammed Zakariya and Hajia Safiya Mohammed.

ABSTRACT

Water is one of the basic human need and imperative for sustaining quality of life on earth. However, its unbalance and unmanaged used make it scarce. This study analyzes the Domestic Water Demand and Supply in Ilorin metropolis, Kwara State. Focuses on the analysis of the sources of water resource in Ilorin, assessing factors affecting water demand and supply and their relationship. The methodology involve the use of questionnaires and interview method to gather necessary information from the state water Board and result gathered from the study area. The study was carried out through the use of structured questionnaire which was administered. Two hundred and fifty (250) questionnaires were filled correctly. On the part of water Board questionnaire were correctly filled and returned. Random sampling was employed. The questionnaires were used to solicit information from a sample of respondents. The analytic techniques involve both the descriptive and inferential statistics such as frequency distribution, sample percentage and correlation analysis. Therefore it was deduced from the analysis that consumption and supply are 124.0 liters and 190.2 liters respectively per person per day. The conclusion from the result of correlation coefficient (1.9996) that there exists very high positive linear relationship between the household water demand and water supplied by the kwara State Water Board. The women and children are particularly vulnerable when water is short supply. Bursting of pipe, poor management, topography of an area, water wastage coupled with bias in water supply have been some of the factors influencing water supply. The study recommends that there should be concerted effort by both water users 9demand) and supplier to control water wastage so as to achieve the goal.

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CHAPTER ONE
INTRODUCTION

1.1 BACKGROUND TO THE STUDY

Water is essential to life and its supply, consumption and spatial distribution are closely associated with economic growth and the development of society. Apart from air, water is indispensable to life it is a foundation for human prosperity because adequate and high quality water supplies provide a basis for the growth and development of human social, economic and culture of people (Ward, 1975, Young, 2006). The importance of water to man cannot be overemphasized, it holds the most important benefit to man's sustenance beside shelter, food and clothing (Ajadi, 1996) According to Amin and Mahmud, (2011) it is recognized all over the world that water is a vital resource to human existence and that is a major factor in commanding the progress of civilization.

Water is essential in sustaining quality of life on earth, the sustainability of socially sensitive goods such as water depends on effective and efficient use of available water resources. Amin and Mahmud, (2011) also reported that the extensive use of water has increased globally and the efficacy of supply side measure is questionable owing to drastic increase in population, technological advancement and economic growth; the demand for water supplies is continuously increasing, numerous researchers have emphasized on water demand management rather than the supply side management. The water demand study in relation to water supply enables us to estimate how much the increase in demand for water supplies.

Water demand is the quantity that the treatment plant produce in order to meet all water needs in the community. Water demand includes water delivered to the system to meet the need of consumers, water supply for fire fighting and system flushing. On the other hand water supply refers to system for the collection, transmission, treatment, storage and distribution of water Admassu M. (1996).

The term "domestic water demand" according to Amin (2007), is usually taken to mean the amount of water required for various domestic uses. Domestic water use varies according to the

living standards of the consumers in urban and rural areas. The use of water for domestic purpose may be subsidized in drinking, food preparation and cooking washing cloths and utensils, house cleaning and polishing vegetable gardening, livestock watering and other uses.

According to Adedayo and Ifabiyi (1999), access to safe and adequate potable water supply is a basic human right. They reported that domestic water supply and demand is not uniform in different parts of Ilorin metropolis and varies significantly base on locations, climate change, house characteristics and socio-economic variables. Indeed, residential water demand is often found to be a positive function of the number of individuals in the family, the size of the house, the nature of water – using appliances and household income. Also they reported that domestic water demand is increasing rapidly while the options for new development of water resources are limited in Ilorin municipal, the infrastructure is in poor shape, underfunding by the government and low revenue collection over the decades has weakened the capacity of government to find, build and maintain infrastructure. According to WHO/UNICEF (2000) 1.1 billion people lack access to improved water supply. In the same vein, the data released by the Nigeria Bureau of Statistics in 2006 confirmed that only 51.4% of Nigerian have access to safe water with only 43.4% having access to all year round supply.

According to Fabiyi and Ahmed (2011), one of the most important problems of urbanization across the world is that of water supply, because of its role in natural health and economic development. They reported that an important aspect of urban water supply is the understanding of household water demand at the level of household is complex phenomenon which varies on the basis of socio-economic factors.

The study of water supply and demand in Nigeria becomes imperative in various respects. According to Fabiyi and Ahmed (2011), it was confirmed that in 1990, 71.1 million Nigerians lived in urban areas, in 1995 it increased to 96.1 million, by 2003 this percentage had gone to 136 million people, indicating a serious stress in water supply in Nigerian cities. Also, a report by Central Bank of Nigeria CBN (2004) showed that 41% and 51% of Nigerians population are children and female

respectively suggesting that relatively high percentage of Nigerians are vulnerable to water borne diseases. According to Adedayo and Ifabiyi (1999) Ilorin central is a typical traditional city with mixtures of traditional rural and industrial function where water supply is erratic, inefficient, rotational and unreliable, they reported that four additional public agencies are also into water supply in the state apart from Agba and Asa Dam. UNICEF having 73 boreholes in the area, EUMBP with 22 boreholes, KWAADP with 40 boreholes and DFFRI with about 404 shallow and deep wells in the traditional part of the city.

In addition, they reported that pipe borne water runs in few days of the week and many of the inhabitants have to walk great distances before they get to the nearest water points in Ilorin. According to Oyebode (1991), 75% of the respondents walked 400 – 800 meters from their residence to the nearest water points. Analysis of numbers of days with running taps revealed that 60.9% of the respondents have water twice a week, 11% three times a week, while only 0.9% have water on daily basis. As reported by Adedayo and Ifabiyi (1991), analysis of the amount of water supplied and amount demanded suggested that Ilorin experienced water deficit as much as over 1,000,000 liters per capital day per annum. According to Sule (2000) about half of the population of the Ilorin metropolis lack access to safe and portable water supply. On the contrary, water supply by delivery agent and its contamination level due to poor sanitation is always disastrous in terms of ill health, thereby undermining their productive time which in the long run could lead to reduction in income and increase in disease out break and increase in poverty.

According to Annad (2007), competition for water has resulted in the collapse of water base ecological systems hence decline river flows and large scale ground water depletion. This is leading to an increased potential for conflict within and between countries with the rural populations being the most affected. Also reported that even though the water crisis is observed as a general problem for the rural population, women bare the greatest burden because of their social gendered roles, which involve looking for and collecting water for households. Barkingham (2000), equally affirmed that water demand and allocation in the household has got a direct link with accessibility of the

water supply sources. This is determined by the distance travelled to collect water. According to the WHO (2003) standards areas with access to water of more than 1000m/more than 30min uses of the total collection time pose a great threat to human health (WHO, 2003) also reported that in Amona and Rakai district of Uganda, most of the people still do not have easy access to water. This has got a negative impact on the status of women and children who are responsible of collecting water. This is because they always have to travel a distance of more than 1km to collect water and to carry it on their heads.

The situation in some parts of the study area is also pathetic that both old and young men and women spend most of their time and resources in search for water. The extent to which this shortage undermine the productive time and income generating efforts of people in Ilorin metropolis demands for a scientific study, therefore this study seeks to analyze the demand and supply of domestic water in Ilorin metropolis, Kwara State.

1.2 STATEMENT OF THE RESEARCH PROBLEM

Inspite of the effort made by the government of Kwara State to expand dams in the state and additional boreholes by public agencies into the water supply there is still inadequate supply of water in Ilorin metropolis. This indicates that water issue in the metropolis deserves serious policy and research attentions.

A number of studies have been carried out on water supply, demand shortage and scarcity. Richard and Arthur (1984) used a multiple regression model to study the factors which influence water consumption in Oklahoma city and Tulsa. The result indicate that average price and per capita income were predictive variables for Oklahoma city's water demand, while only per capita income was found to be a predictor for consumption in Tulsa. Ajadi (1996) carried out a research on availability of water and consumption pattern in Ilorin metropolis with aid of questionnaire and interview method to find out that increased in urbanization, rapid growth of population coupled with ineffective management of water resources have been leading to water crisis. Mimi and Smith

(2000) and Khadam (1984) employed this approach in water demand studies for Ramallah and Khartoum respectively. Both studies also found price and size of household significant. Also a study of water consumption patterns in El paso as an economic development strategy for the sustainable use of water. It was reported that regional growth in the El paso / lascrues / juraes, now exceeding two million people and growing at an estimated 2.5% per year is highly dependent on an adequate supply of drinking water.

Adedayo and Ifabiyi (1999) examined the distribution of water and the role of public agencies in Ilorin, Kwara State. Using descriptive statistics, they found out that unevenness in the distribution of water is as a result of political interference in the activities of the agencies, the localities of highly placed government officer are favoured to the neglect of others.

Ijaya (2000) investigated the impact of water shortage and depletion on the productive time of women in Ilorin. The author made use of structured questionnaire, informal interview and participant observation. The result of the study revealed the shortages to inadequate supply of water is due to inefficiency by delivery agent and contamination of water due to poor sanitation. Nsofor (2000) examined the effect of attitude and social-economic characteristics on water based outdoor recreation participation in Benin City using descriptive statistic data. He found out that the use of water base recreation activities is significantly affected by attitude and socio-economic characteristic of users. Sule and Okeola (2002) assessed the performance of a regional water supply management in Ilorin, Kwara State. Using both the descriptive and inferential statistics such a single percentage and correlation analysis. The result of the study revealed that increasing urbanization population and ineffective management of water resources have lead to water crisis.

Kirby (2004), carried out analysis on water scarcity, he revealed that water scarcity is as a result of growth and simultaneous increase in urbanization of the global population threatens to exhaust existing fresh water and the increased in consumer's demand for amenities such as home dish water and swimming pools. It is a known fact therefore, that the study of demand and supply

for domestic water has turned into a global phenomenon and indeed a critical policy issue receiving some recognition not only from developed nation but by authorities of developing countries.

Fleming (2004) discussed various methods of projecting water demands using historical water demand data and population. Annual water demand and population data from 1996 through 2003 were obtained and reviewed. The demand analysis performed was used to determine a projected water demand for the years 2025 and 2055 based on the methods used by Vanasse Hangen Bruslin Inc. (VHB) in the 1997 demand analysis. The methodology utilized by VHB included four district approaches. The first approach looks at historic trends in raw water volumes and projects these trends into the future. The other three approaches break down total demand into a series of district components and project demand for each component in to the future using each of these methods, the demand projection for both 2055 and 2025 the gross projected demand for 2055 is 19.59 million gallon per day and for 2025 is 15.26.

Mylopoulos and Theodossion (2004) applied a cubic functional form of an econometric model to study a residential water demand which allows the use of different price elasticity for different levels of water demand. The data used for the econometric analysis were obtained through a survey of consumers in the city of Thessaloniki, Greece, panel estimation methods were then employed to estimate model parameters. The results showed that a cubic form of the demand equation can provide appropriate estimates of price elasticities for different "consumption groups" of residential customers. According to the study conducted by Ahmed and Smith (1987) in Bangladesh, water consumption per person per day for drinking, kitchen (cooking and utensil washing), bathing (bathing and washing cloths), sanitary and other purposes were 2litre, 9litre, 20litre and 8litre respectively. Solley (2000) found out in his study that structural changes affected supply and demand for domestic water due to federal laws controlling water pollution, technological changes in processes that use water as an input (including cooling towers and a movement away from once through cooling) and increase recycling of water. The agricultural sector improved the delivery of

water for irrigation and this sector lessened its reliance on ground water because of the increased costs of pumped water.

Schleich and Hillenbrand (2007) studied the impact of economic, environmental and social determinants for the average per capita demand for water and sewage in about 600 water supply areas in Germany using econometric analyzes prices, income, household size, the effects of population age, the share of wells and rainfall and temperature during the summer months on water demand. The result suggests that the response of residential water demand in Germany is rather inelastic. Also found out that household size, the share of wells and summer rainfall have a negative impact on water demand. Mulwafu (2002) examines the status of water demand management in Malawi in genta and in the Lake Chilva catchment in particular. Finding indicate that, while water demand management is highly advocated in the urban and peri-urban areas and very few aspects of water demand management practiced in the rural areas.

In the light of this, the experience in the study area is that the existence of long queues indicated that water demand is inadequate in relation to water supplied. Meanwhile there is need for increase in water supply to fill the gap.

1.3 AIM AND OBJECTIVES

The aim of this work is with a view to providing information to urban water managers for effective spatial planning of water infrastructure. The specific objectives are to;

i) analyse sources of water for domestic use.

ii) assess factors affecting water demand and supply

iii) examine the relationship between domestic water demand and supply

1.4 SCOPE OF THE STUDY

This study focus on demand and supply for domestic water in Ilorin metropolis Kwara State.

The Areas of the study covers Gambari, Okelele, Pakata, Okekere, Ajikobi, Akerebiata, Adewole, Zango, Oja-oba and Baboko areas. The scope of the study in terms of content covers time and cost of water and the expenditure to get clean water, the increased in demand for domestic water and water shortage. The areas was chosen because problems of water shortage is more pronounced in the areas.

1.5 SIGNIFICANCE OF THE STUDY

Water is one of those resources that people take for granted until there is shortage of it or it becomes unsuitable for domestic uses. Water is a limited resource and there is more demand for it owing to increase in population in Ilorin central. For instance, Ilorin and its environs are extending at alarming rate but, instead of supply and distribution of domestic water to improve, water problems is worsening day by day and effort made by the government to expand Asa dam and Agba Dam in Kwara state capital yielded no positive result. The problems of busted and rusted pipes are hindrance to the distribution to places. This is why there is need for close monitoring and examination of demand and supply for domestic water for the purpose of spatial planning.

CHAPTER TWO
LITERATURE REVIEW

2.1 INTRODUCTION

Water is a natural resource of fundamental importance and supports all forms of life. Water demand already exceeds water supply in many parts of the world, and as world population continues to rise at an unprecedented rate, many more areas are expected to experience this inbalance in the near future (Wikipedia, 2008). It was revealed in the 4th World Water Forum march (2000) that a person living in an urban area uses an average of 250 liters/per day; but individual consumptions varies around the globe.

Nigeria is endowed with abundant natural water resources evident in her substantial yearly rainfall, large surface bodies of water-rivers, streams and lakes, as well as in abundant reservoirs of underground water whose extent and distribution have not been fully assessed. Figures of stream discharges of the flowing surface waters are now available and rainfall, which is perhaps the most important of the country's natural water resources, has long records which in some places date from as far back as 1906, (Orjiakor, 1985). The annual mean rainfall distribution ranges from about 4000mm at the coast to practically zero at the northern border and an average annual mean of 1200 mm for the entire country. Over eighty percent of the rains in the country fall within the six wet months (April to September), of each year. A sizeable amount of the rainwater is lost by percolation to underground flows. The bulk of the rain, however, flows as runoff into rivers, streams and lakes. From these surface water bodies and through vegetation some of the rainwater is lost to the atmosphere by evapotranspiration.

2.2 WATER RESOURCES OF NIGERIA

Nigeria is well drained with a close network of rivers and streams. Some of these, particularly the smaller ones in the north are seasonal. There are four principal surface water basins in Nigeria.

The Niger Basin which has an area of 584,193km^2 within the country, which is 63% of the total area of the country, and covers a large area in central and north-western Nigeria. And the most important rivers in the basin are the Niger and its tributaries Benue, Sokoto and Kaduna.

The Lake Chad Basin in the northeast with an area of 179,282km^2 or 20% of the total area of the country is the only internal drainage basin in Nigeria. This is because it does not terminate in the Atlantic Ocean. Important rivers are the Komadougou-Yobe and its tributaries at Hadejia, Jama'are and Komadougou-Gena.

The South-eastern littoral basins, with the main water courses being the cross and Imo rivers, have an area of 584493km^2, which is six percent of the total area of the country, and receive much of their runoff from the Plateau and mountain areas along the Cameroon border.

The south-western littoral basins, with an area of 101,802km^2, which is 11% of the total of the country. The rivers originates in the hilly areas to the south and west of the Niger river.

In addition to the surface water, Nigeria has extensive ground water resource, located in eight recognized hydrological areas together with local ground water in shallow alluvial (Fadama) aquifers adjacent to major rivers:

The Sokoto basin zone comprises sedimentary rocks in north – east Nigeria. Yields ranges from below 1.0 to 5.0 litres per second (l/s).

The Chad basin zone comprises sedimentary rocks. It has three aquifers zones: upper, middle and lower. Borehole yields are about 1.2 to 1.6 l/s from the upper unconfined aquifer and 1.5 to 2.1 l/s from the middle aquifer.

The middle Niger basin zone comprises sandstone aquifers yielding between 0.7 and 5.0 l/s and the alluvium in the Niger valley yielding between 7.5 and 37.0 l/s.

The Benue basin zone is the least exploited basin in Nigeria extending from the Cameroon border to the Niger – Benue confluence. The sandstone aquifers in the area yield between 1.0 and 8.0 l/s.

The south-western zone comprises sedimentary rocks bounded in the south by the coastal alluvium and in the north by the basement complex.

The south-central zone is made up of cretaceous and tertiary sediments centrerd on the Niger-Delta. Yields are 3.0 to 7.0l/s.

The south-eastern zone comprises of cretaceous sediments in the Anambra and Cross River basins. Borehole numbers are low due to abundant surface water resource.

The basement complex comprises over 60% of the country's area. It consists of low permeability rocks and ground water occurs in the weathered mantle and fracture zones with yields of between 1.0 to 2.0l/s

Coupled with the climatic characteristics, surface and ground water resource, Nigeria's total annual renewable water resource are estimated at 286.2 (AQUASTAT FAO, 2010). Annual internally produced resources amount to 221 Cubic kilometer (km^3), made up of 214km^3 surface water and 87km^3 ground water, while 80km^3 of the latter is assumed to be overlap between surface water and ground water. External water resources are estimated at 65.2km^3/year, being surface water coming from Niger, Cameroon, and Benin. Exploited surface water resources are estimated to be 80percent of the natural flow, which is about 96km^3/year. Annual extractable groundwater resource are about 59.51km3, distributed as flows; 10.27km^3 in northern Nigeria; 25.48km^3 in the middle belt; 23.76km^3 in the south. Dam capacity is estimated to be 44.2km^3 (Akpabio and Iniubong, 2013).

2.3 WATER MANAGEMENT PRACTICES AND POLICY IN NIGERIA

Nigeria has estimated water resources of 286.2km^3/year amounting to 893m^3/year per capita (AQUASTAT FAO, 2010). This is no doubt great resources which when harnessed will produce maximum benefit to the nation. In an attempt to maximize this potential, a number of agencies have been put in place for the management of water resources and provision of water service infrastructure in the country.

Nigeria's water resource management is anchored dominantly on a federal framework consisting of three tiers namely federal government, state government and local government.

Relevant laws and regulations on water resources use have been found in several documents and instruments (Table 2.1) as well as customary practices.

TABLE 2.1: POLICIES ON WATER RESOURCES IN NIGERIA.

NAMES OF STATUES	KEY PROVISION
The water works Act of 1915	Colonial Nigeria (shortly after Amalgamation in 1914) passed the law specifically to keep water from being polluted. It prohibits the pollution of water in Nigeria by obnoxious or harmful matters.
The minerals Act of 1917	The laws vested the Head of States of Nigeria with power to make regulations for prevention of pollution of any water course.
The public Health Act of 1917	It prohibits the functioning of water and vitiation of the atmosphere.
The oil in navigable water Act 1968	It prohibits water pollution by oil spillage.
The petroleum Act of	It covers prevention of pollution by inland waters, rivers, lakes and water course
The land use Act of 1978	Ownership of land linked to ownership of groundwater resources.
The Rivers Basin Development (RBDA) decree 25 of 1976 (Revealed by No. 87 of 1979 and also latter by the RBDA Act, decree 35 of 1987, i.e. Cap 396	In its presence from Cap 396 spells out diverse functions and objectives for these authorities to ensure a Pan-Nigerian program for water resources development.
The Environmental impact Assessment (EIA) Decree, No 86 of 1992	The law seeks to protect the physical and aquatic environment.
Water Resource Decree, No 101 of 1993	It vested the right to use control all surface waters and groundwater and of all water in any water course affecting more that one state in the Federal Government, with provisions that any person may take water without charge his domestic or livestock watering purposes (in any water course to which the public has free access).
The 1999 constitution of the Federal Republic of Nigeria	The constitution puts in the Exclusive Legislative list (ELL) shipping and navigation on the river Niger and on any such other inland water way as many be designated by the National Assembly to be sources affecting more than one state.
National Guidelines and standard for Environment pollution control of Nigeria (1991)	Pollution control in water course as part of the environment.
National Effluent Limitation Regulation 1991	Control of discharge of industrial waste and sewage into water courses.

Source: Federal Ministry of Water Resources, Legal and Regulatory Framework Theme Coup (2001).

Constitutionally, water resource is placed in the concurrent list of the 1999 constitution, involving all tiers of government and private sector. Matters bordering on international water rights and management come under the Exclusive Legislative List (e.g. Nigeria is a signatory to many

international regulations on water). This implies that issues bordering on international waters are strictly on the exclusive domain of the Federal Government. The basis for which Nigeria maintains peaceful relationships with her Nigerian neighbours (e.g. Chad and Niger Republics). Article 20 of the 1999 constitution also grants power to states of the Federation as thus "the state shall protect and improve the environment and safeguard the water, air and land, forest and wild life of Nigeria". Prior to 1999, domestic water management had no position in the political decision making process. There were, however, selected but water related legislation at pre independence colonial (e.g. the water works Act of 1915;the minerals Act of 1917; and the public health Act of 1917), at post-colonial periods (e.g. the oil in Navigable waters Act, 1968; the petroleum Act 1969, among others).

Water management practices during these periods were more disjointed in approach (responding to agencies), with a number of vague and unrealistic assumptions (e.g. Land use Act of 1978). More so, implementation mechanisms were stronger and reliance at pre-independent and colonial periods and very weak at post colonial period (Akpabio and Iniubong, 2013). This probably was so given the fact that the colonial masters were stronger and sensitive to water based and water-washed problems. Although the colonial masters attempted to put down some statutes to guide water management, the influence of customary laws were and are very strong among the natives both at pre-colonial and post colonial periods.

Generally and with regard to domestic water issues, statutory rights of management are embedded in the land use Act of 1978 and the water resources decree of 1993. While the water resources decree vested all the water within the territorial borders of Nigeria, the land use Acts give the right to groundwater exploitation within a given tenure boundary. The division between surface and groundwater has important implications with regard to the issue of ownership of water. Here there is a partial riparian perspective to rights to water which is, essentially one of the rights to the waters of a flowing river inhering in, or as claimed by different users located along side (or in the vicinity) of that river.

In contrast, ownership of groundwater is linked to land ownership which, though subject to governmental; control and regulation is difficult to regulate legally, been obscure regulatory legislation and multiplicity of users. The linking of water and rights, led to a situation of unmitigated tapping of ground water by individuals with means and capacities to do so, especially in the urban areas (Akpabios, 2006). And as such has important implications bordering on the health aquifers and quality of water people drink.

The authority of the minister for water resources to control groundwater use includes the power to define the time, places, and manner in which water may be taken or used; to fix the amount that may be taken in time of shortage; to prohibit the taking or use of water for health reasons; to regulate the construction and operation of boreholes; and finally to revoke a right to use or take water in the public interest. In the discharge of its statutory duties, the ministry is required to make proper provision for adequate supplies of suitable water for domestic use; the watering of animals, irrigation, agricultural purposes as well as the generation of hydro-electric energy for navigation, fisheries and recreation. As defined in the water resources decree, the term "domestic use" means the use of water for drinking, washing, bathing, cooling, gardening, or for any other purposes.

In any residential premises utilized for non profit motives; the term "non domestic use" means the use of water from any water works for profit or gain; while the term "public use" refers to any domestic or agricultural use from any water works provided through any fountain, standpipe, valve tap or appliances used by the public.

The Federal Ministry of Water Resources (FMWR) is the main government agency responsible for management and control of water resources in Nigeria. An institutional framework comprising the River Basin Authorities and the National Water Resources Institute supports it. With the mission of harnessing underground and surface water resources for irrigation, and water supply for domestic and industrial use.

In year 2000, the Federal Government formulated a new National Water supply and sanitation policy which was not subsumed under the National Policy on the Environment. This

policy states the center-piece of Nigeria's water supply and sanitation policy shall be the provision of sufficient potable water and adequate sanitation to all Nigerian in an affordable and sustainable way through participatory investment by the three tiers of government, the private sector and the beneficiaries. The policy document goes further to set water supply improvement standard for urban, semi-urban and rural dwellers (Niyi and Felix, 2007).

With respect to the policy, separate water supply and sanitation considerations were made to match the three socio-economic profiles of the populations as follows:

a. Rural water supply guaranteed minimum level of service of 30 litres per capita day within 250meters of the community.
b. Semi-urban (small towns) the water supply represent settlements with population of between 5000 – 20,000 with a fair measure of economic activity with minimum supply standard of 60litres per capita per day with reticulation and limited of full house connections as determined by the beneficiaries.
c. Urban water supply of 120litres per capita per day for urban areas with population greater that 20,000 inhabitants to be served by full reticulation and consumer premises connection.

2.4 HOUSEHOLD WATER DEMAND

Demand for a good or service is an economic function because it is influenced by an individual's budget, the price of the good, the price of other goods, and individual preferences. In terms of water supply, demand is defined as the quantity and quality of water householders will choose to consume at a given price. Price, as used here, signifies all valued resources' including an individual's time or labour given in exchange for service.

Water, just like other commodities, is a normal commodity whose demand is complementary, that is, the demand is for the purpose of providing support services necessary for productive activities (ADB, 1994; Reinikka and Svensson, 1999; World Bank, 1994).

The determinants of the demand for water can be viewed from both the macro and micro level. According to Seleth and Diner (1993) at the macro level, the most dominant factors that determine the demand for water in any society are the scarcity and the cost of purchase, large geographic coverage, large number of residential buildings, population growth and density and the level of commercial and industrial activities.

At the micro level, often referred to as the household level, the most dominant factors are the socio-economic and demographic characteristics of the households (which include the education of the family members, their occupation, the size and composition of the family), the income of the household members, the quality of water, the reliability of supply, the existence of water and the household attitude towards the government that provide the water which, to most of them, is supposed to be free or subsidized (World Bank, 1993). Empirical studies on factors that affect the demand for residential water of households are discussed as follows:

2.4.1 Water Price

Despite heterogeneity in places and time periods studied, authors seem to agree on the inelasticity of water demand in developing countries, with most estimates for households with a private connection in the range of -0.3 to -0.6. Espey, (1997) report an average own-price elasticity of -0.51 from industrialized countries, suggesting that own-price elasticity for households in developed countries and for those in developing countries is in the same range. Only two studies from developing countries find evidence of an elastic water demand. David and Inocencio (1998) use data from Metro Manila, Philippines, to establish price elasticity for vended water at -2.1, and Rietveld (2000) use data from Jakarta, Indonesia, to estimate price elasticity for piped water at -1.2.

2.4.2 Costs of Water Collection

Collection time and distance to the source are found to be significant drivers of household choice of water source(s) (Mu, 1990). Using data from Ukunda, Kenya; Persson (2002), using data from metropolitan Strand and Walker 2005; Larson, 2006; Nauges and Strand Ana, Sonsouate and

San Miguel (el Salvador) and Tegucigalpa (Honduras), Nauges and Strand (2007) estimate elasticity to price and hauling cost to be in the range of -0.4 to -0.7.

2.5 WATER SUPPLY SCENARIOS

Human search for pure water began in pre historic times. Water was the root of human civilization, which sprang up only where abundant water supply was available. These areas of civilization were those which flourished on the banks of the Nile, the Tigris and Euphrates and in other countries like India and China. Admassu M. (1996).

Access to safe and adequate potable water supply is a basic human right. In Pakistan, groundwater is the main source for drinking water. However, the cities of Karachi and Hyderabad depend on surface water as a drinking source. Domestic water supply and demand is not uniform in different cities of Pakistan and varies significantly base on location, climatic change, house characteristics, and socio-economic variables. Water demand is increasing rapidly while the options for new development of water are limited. In Pakistan, the major contribution to water supply within the home comes from private hand which boost domestic water supply. World Bank (2006).

2.6 HOUSEHOLD USE OF DOMESTIC WATER

In its guidelines for drinking water quality, WHO defines domestic water as being "water" used for all usual domestic purposes including drinking, bathing and food preparation (WHO, 1993; 2002). This implies that the requirements with regard to the adequacy of water apply across all these uses and not solely in relation to drinking of water. The guidelines exclude some specific uses (for dialysis and contact lens cleaning) and elevated requirements for some particularly sensitive sub-populations (for instance the several immune-compromised).

In the "Drawers of water" study on water use pattern in Africa, White, (1972) suggested that three types of use could be defined in relation to normal domestic supply:

i. Drinking and cooking

ii. Hygiene

iii. Amenity use (for instance car washing, lawn watering etc).

In addition the Drawers of water supply, Thompson (2001) suggested a forth category can be included of "productive use" which was of particular relevance to poor households in developing countries. Productive use of water includes uses such as brewing, animal watering, construction and small scale horticulture.

2.7 AVERAGE WATER CONSUMED BY HOUSEHOLD

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 households activities expressed as a percentage of the total population. It reflects the health of a country's people and the country's capacity to collect, clean and distribute water to consumers. World Health Organization (WHO), defines basic access to potable water as the availability of drinking water at least 20litres per day per person, a distance of not more than 1km from the source to the house and a maximum time taken to collect round trip of 30minutes. The UNDP (2008) says the minimum absolute daily water need per person per day is 50liter (13.2gallons) which include: 5litre for drinking, 20litres for sanitation and hygiene, 15litres for bathing and 10litres for preparing food.

The total domestic water needs in homes with piped water and inside sanitation is at least 115litres per head per day. The actual amount used may be greater depending on the ease and convenience of supply (Ayoade and Oyebande, 1983). The international consumption figures released by the 4th World Water Forum (2006), indicates that a person living in an urban area, uses an average of 250liters per day; but individual consumption varies widely around the globe (THD, 2007).

Wide differences exist between water consumption levels in industrialized and developing countries. Average per capita daily water consumption (l/c/d) for Switzerland, the least among

industrialized countries, is 110l/c/d, USA (668l/c/d) and Japan (342l/c/d) (World Bank, 1997 as cited by Rosen and Vincent, 1999).

2.8 TIME OF COLLECTING WATER

The amount of time spent by householders collecting water in order to secure water for the household is an evidence of water scarcity. Mehretu and Mutambirwa (1992) observe that in Zimbabwe, women spend approximately 91% of total time devoted for household chores to collect water. In Madagascar, Minten, (2002) indicate that women spend an average of 12 minutes daily collecting water. Boven, Collier and Gunning (1989) indicates that women aged20 – 29 spend 56minutes daily fetching water; age 30 – 49 (69minutes); over 50years (77 minutes). In a village in Mozambique, Cairncross and Cliff (1987) indicates that about 5hours is devoted to water collection (return trip) from a public standpipe located 4kilometers (average of 131minutes per carrier per day) whilst a similar source located 300meters takes an average of 25minuets per carrier per day. Women in Oyo state, Nigeria spend about 58minutes daily collecting water at an average distance of 537meters (Sangodoyin, 1992).

When drinking water is available at some reasonable distance, households saves time. Such substantial amount of time saved could improve the welfare through time and energy availability for education, high-status work and civic activities (WHO, 1995). Studies reviewed by Rosen and Vincent (1999) suggest that time saved by women is channeled into housework (for example, cooking and hygiene), rest, social and personal activities. Others allocated time saved to having quality time with the family and as well engaging themselves in income generating activities (Ariyabandu, 2001).

2.9 WATER SCARCITY AND ITS ASSOCIATED PROBLEMS

Water scarcity is defined as the point at which the aggregate impact of all users impinges on the supply of water under prevailing institutional arrangement to the extent that the demand by all

sectors, including the environment cannot be satisfied fully. Water scarcity is a relative concept and can occur at any level of supply or demand. Scarcity may be a social construct (a product of affluence, expectations and customary behaviour) or the consequence of altered supply pattern-streaming from climatic change for example (UN, 2011).

Water scarcity situation is severe in developing countries with a an estimate of about 1.2billion people in developing countries without access to 'safe water' (WHO, 1998). The World Commission for Water (2000) estimates that more than 1billion people in developing countries do not have access to clean water whilst 2billion people lack adequate sanitation. In the case of Sub-Saharan Africa, Rosen and Vincent (1999) estimates that about 67% of the rural population (about 250million people) lack safe and accessible water supply whilst 81% do not have access to sanitation facilities. 20% of the urban population (322million people) do not have access to water supply whilst 37% lack access to sanitation facilities (WHO/UNICEF and JMP, 2010).

In an attempt to enhance water security, households device coping strategies that could enable them cope with water scarcity. And in most situations, the coping strategies are normally associated with some sort of costs, costs that can be of detriment to their health, time and socioeconomic activities.

2.9.1 Problems Associated with Water Scarcity

Water scarcity is the lack of sufficient available water resources to meet the demands of water usage within a region. It already affects every continent and around 2.8billion people around the world at least one month out of every year. More than 1.2billion people lack access to clean drinking water.

Water scarcity involves water stress, water shortage or deficits, and water crisis. While the concept of water stress is relatively new, it is the difficulty of obtaining sources of fresh water for use during a period of time and may result in further depletion and deterioration of available water resources. Water shortages may be caused by climate change, such as altered weather patterns including droughts or floods, increased pollution, and increased human demand and overuse of

water. A water crisis is a situation where the available potable, unpolluted water within a region is less than that region's demand. Water scarcity is being driven by two converging phenomena: growing freshwater use and depletion of usable freshwater resources.

Water scarcity can be a result of two mechanisms: physical (absolute) water scarcity and economic water scarcity, where physical water scarcity is a result of inadequate natural resources to supply a region's demand, and economic water scarcity is a result of poor management of the sufficient available water resources. According to the United Nations Development Programme, the latter is found more often to be the case of countries of regions experiencing water scarcity, as most countries or regions have enough water to meet household, industrial, agricultural, and environmental needs, but lack the means to provide it in an accessible manner.

The reduction of water scarcity is a goal of many countries and governments. The UN recognizes the importance of reducing the number of people without sustainable access to clean water and sanitation. The Millennium Development Goals within the United Nations Millennium Declaration state that by 2015 they resolve to "halve the proportion of people who are unable to reach or afford safe drinking water."

2.9.2 Causes of Water Crisis

When there is not enough potable water for a given population, the threat of a water crisis is realized. The United Nations and other world organizations consider a variety of regions to have water crisis such that it is a global concern.

There are several principal consequences of water crisis.

- Inadequate access to safe drinking water for about 884 million people.
- Inadequate access to water for sanitation and waste disposal for 2.5bilion people.
- Groundwater over drafting (excessive use) leading to diminished agricultural yields.
- Overuse and pollution of water resources harming biodiversity.
- Regional conflicts over scarce water resources sometimes resulting in warfare.

Waterborne diseases and the absence of sanitary domestic water are some of the leading causes of death worldwide. For children under age five, waterborne diseases are the leading cause of death. At any given time, half of the world's hospital beds are occupied by patients suffering from waterborne diseases. According to the World Bank, 88 percent of all waterborne diseases are caused by unsafe drinking water, inadequate sanitation and poor hygiene.

A 2006 United Nations report focuses on issues of governance as the core of the water crisis , saying "There is enough water for everyone" and "Water insufficiency is often due to mismanagement, corruption, lack of appropriate institutions, bureaucratic inertia and a shortage of investment in both human capacity and physical infrastructure. Official data also shows a clear correlation between access to safe water and GDP per capita.

It has also been claimed, primarily by economists, that the water situation has occurred because of a lack of property rights, government regulations and subsidies in the water sector, causing prices to be too low and consumption too high.

Vegetation and wildlife are fundamentally dependent upon adequate freshwater resources. Marshes, bogs and riparian zones are more obviously dependent upon sustainable water supply, but forests and other upland ecosystems are equally at risk of significant productivity changes as water availability is diminished. In the case of wetlands, considerable area has been simply taken from wildlife use to feed and house the expanding human population. But other areas have suffered reduced productivity from gradual diminishing freshwater inflow, as upstream sources are diverted for human use. In seven states of the US over 80% of all historic wetlands were filled by the 1980s, when Congress acted to create a "no net loss" of wetlands.

In Europe extensive loss of wetland has occurred with resulting loss of biodiversity. For example many bogs in Scotland have been developed or diminished through human population expansion. One example is the Portlethen Moss in Aberdeenshire. On Madagascar's highland plateau, a massive transformation occurred that eliminated virtually all the heavily forested vegetation in the period 1970 to 2000. The slash and burn agriculture eliminated about ten percent of

the total country's native biomass and converted it to a barren wasteland. These effects were from overpopulation and the necessity to feed poor indigenous peoples, but the adverse effects included widespread gully erosion that in turn produced heavily silted rivers that "run red" decades after the deforestation.

CHAPTER THREE
THE STUDY AREA AND METHODOLOGY

3.1 THE STUDY AREA

3.1.1 Location

Kwara State is located between latitudes 8^o and 10^o North of the equator and 3^o and 6^o East of the Greenwich Meridian (Oyebanji, 2000). The state occupies an area of 36,825km^2 of land and shares boundary with Niger state in the North, Kogi and Ekiti in the East, Osun and Oyo in the South and an International boundary with the Republic of Benin in the West. Ilorin Local Government shares boundary with Moro, Ifelodun Local Government.

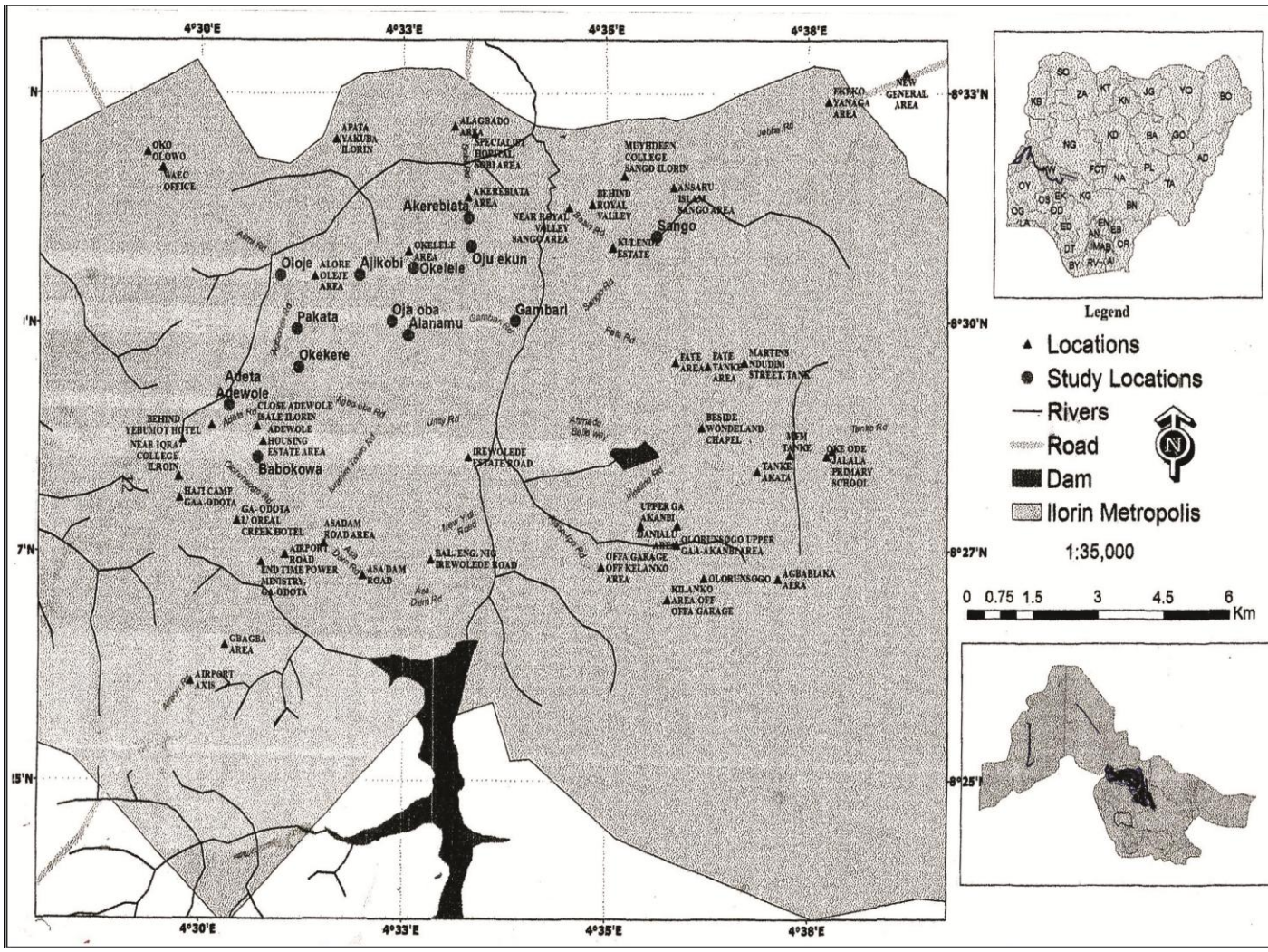


Figure. 1: Map of Ilorin Central

3.1.2 Relief and Drainage

The area is a well-dissected landscape, with plateau-like surfaces covered by laterite crust. The plateau-like surfaces are best observed at the Adewole Housing Estate facing the Sobi rock and at the Kwara State Polytechnic Ilorin facing south. The Sobi rock is an inserberg (a prominent landmark) with its summit at over 390m elevation. The lowest point in the area lies between the 240 and 255m contours and it is within the Asa valley system (Alao 1982).

Although the whole area appears to be well drained, those parts of the city lying within or close to the flood plain of the Asa River valley have drainage problems caused by the high ground water table during the rainy season. There are a few seasonal springs at different locations in or close to the flood plain. The fluctuating ground water table seems to have an influence on the life-span of roads and shallow foundations (Alao 1982).

3.1.3 Climate

In the study area, rain water which comes at the right time is adequate and the area is generally blessed with the existence of good water supply which can be for human, animal consumption and irrigation purposes. The climate of the study area is characterized by both the wet and dry season, for about six month. The raining season begins at about the end of March and lasts till the end of October, while the dry season begins in November and ends early March. The total annual rainfall in the area ranges between 1000 millimeter and 1500 millimeter (Lawal and Omotesho, 2006). Average temperature ranges between 30 degree centigrade and 35 degree centigrade (Taiwo,2005).The climatic conditions in the area greatly influence the activity of the people. Food crops such as maize, sorghum, bean, groundnut, yam, cassava, sweat potatoes and guinea corn are cultivated in most parts of the area. The climate of the area is tropical continental with high temperature throughout the year.

3.1.4 Soil

The area is covered mainly by ferruginous tropical soils and crystalline acid soils. These types of soil posses good potential for a large variety of crop production provided modern farming

improvement methods are applied extensively. The alluvia plains of river belts provide suitable condition for arable farming for most part of the year. Soil is the function of climate, vegetation, relief, organisms as well as geological processes. The combine effects of these factors produce soil of uniform characteristics in the area. Soil is mostly derived from the parents rocks of the basement complex and granite crystalline rocks with a well-developed profiles high nutrient, well structure and high biological activities which enhance farming activities in the study area(Jimoh,1997).

3.1.5 Vegetation

There are two broad vegetation types: Forest and Savanna. There are three variant of each, running as near parallel bands east to west across Nigeria. The savanna, especially Guinea and Sudan, are the major grains, grasses, tubers, vegetable and cotton growing regions. Vegetation is also characterized by scattered tall trees and tall grasses, trees such as Parkia biglobosa, Actosonia digitata, Butryspernum parkii, Acacias etc. Ilorin falls within the derived savanna cover with existence of dry lowland rainforest vegetal cover.(Ifabiyi 1991).

3.1.6 Occupation and People

The inhabitants of the area are industrious and enterprising, they engage in commercial activities like trading craft work i.e hide and skin training using local leather for all sorts of articles like shoes, handbags and other household materials. Also grains and root crops such as maize, millet, yam and cassava are growing in the area. Livestock rearing, especially cattle are kept by the nomadic Fulani's with semi-permanent and sedentary structures in few places. Few residents in the area also keep other livestock such as goats, sheep, and poultry. The important socio- economic facilities of the study area include educational facilities, health facilities and marked just to mention a few. Other economic activities in the study area of the state include trading artisans and salary earning opportunity in industries, companies private offices, education institutions, hospital and few available government establishments (Oyebanji, 2000).

The city is a confluence of cultures, populated by Yoruba, Hausa, Fulani, Nupe, Baruba, other Nigerians and foreign nationals. The indigenous people's culture is predominantly Islamic, as most of the Islamic festivals are greatly celebrated compared with anywhere in the country. Many ceremonial activities, mostly with religions aspects, take place throughout the year. Ilorin presents the visitors with friendly environment(generally known as "Home of peace") hence hosts different religious practices and training institutions. The college of Arabic and Islamic Legal Studies in "Adeta" area trains Muslim in various Islamic, Arabic and social science disciplines. Located on the city's GRA (Government Residential Area), the degree- awarding United Missionary Theological College (affiliated with the University of Ibadan) produces many church ministers, teachers and theologians of all denominations (Oyebanji, 2000).

Ilorin Central location makes it easily accessible to all parts of the country by air, road and rail. Although the Ilorin International Airport has been re-designed and equipped as an international Cargo Airport, there are scheduled commercial flights to and from Ilorin by overland Capital Airlines. Current destinations include Lagos, Abuja and Jos. Ilorin offers reliable road transport services to Lagos, Ogun, Osun, Ondo, Oyo Ekiti, Kogi, Niger, Kaduna and Plateau States. Similar services are available to and from Onitsha, Port Harcourt, Abuja, Aba and others.

The major roads in the city are generally good, with relatively well-developed intra-city public transportation. Other roads that need repairs are gradually receiving the attention of the Kwara state Government. There are three modes of transiting from place to place in the city – the most popular being the conventional taxis. Car hire services are available in major hotels. There are commercial motor bikes commonly called "Express", and the more recent additional on Ilorin's roads, "keke NAPEP", imported commercial tricycles given on loan to beneficiaries in the National Poverty Eradication Programme (NAPEP) introduced by the government of President Olusegun Obasanjo. Compared to other cites and state capitals in Nigeria, transport fares in Ilorin are cheap. While taxis charge ₦50 per drop, a ride on the tricycle currently cost N50 per drop. The commercial motorbikes charge more but are available in less accessible parts of the city.

3.2 METHODOLOGY

3.2.1 Reconnaissance Survey

A reconnaissance survey was conducted to be well acquainted with the study areas and to properly identify the areas to be surveyed. Initially, some are reluctant to give information until when they realize the actual purpose of the visit they cooperated.

3.2.2 Types of Data

i. Basic demographic data like sex, age, marital status, occupation, level of education, household size and residential preference.

ii. Information on household socio-economic characteristics, access and sources of water, time spent daily in search for domestic water, distance covered and the amount of income spent to get water daily.

iii. Information on respondent's water storage pattern.

3.2.3 Sources of Data

3.2.3.1 *Primary Sources of Data*

This provides first hand information that was derived through observations, questionnaire administration and oral interviews. The question administered was designed to elicit information on the following:

3.2.3.2 Secondary Source of Data

The secondary data was obtained from related books, journals, published and unpublished texts, documents magazines, conference articles, government ministries and agencies. The ministries concern are the ministry of water board, ministry of local government and chieftaincy and ministry of information sourced from published of the united nation, world bank, world health organization etc.

3.2.4 Sample Size and Sampling Techniques

The population of Ilorin was estimated to be 908,490 (population census 2011). In every 3,634 people one person was chosen. Meanwhile sample size of two hundred and fifty respondents was selected at random from total the population. A simple random sampling technique was adopted in this study in which each element (members) of the population has an equal chance of being included in the desired sample. Therefore the total retrieved questionnaires which samples worked with is two hundred and twenty five persons.

The secondary data on water supply was generated from the state public water board, while data on demand was based on household water consumption lifestyle on cooking, washing, bathing and other domestic uses. This is because there is no rate measuring meters which would have been accurate for determination of water use pattern. Questionnaire method was employed to facilitate the estimation of water use in the study area. The questionnaire method involved designing a set of questions.

The research was designed to cover the following areas in Ilorin central, Gambari, Okelele, Pakata, Okekere, Ajikobi, Akerebiata, Adewole, Zango, Ojaoba and Baboko area.

3.2.5 Methods of Data Analysis

Descriptive and inferential statistics was used in the analysis of generated field data. This is because the data collected are both quantitative and qualitative in nature. The descriptive statistics employed include percentage and frequency distribution table. Equally, the inferential test like correlation was employed in this research to determine weather or not people's demand for water is met by the supplied water by the water board in Ilorin metropolis.

Objective I: Analyze sources of water for domestic uses

This was analyzed using descriptive statistics like percentage, frequency distribution table, pie chart and bar chart.

Objective II: Assess factors affecting water demand and supply

This was assessed by employing descriptive statistics, frequency table, percentage.

Objective III: Examine the relationship between domestic water demand and supply. Thus correlation analysis was employed to examine the extent of water demand and water supply.

Correlation is given as $$r_{xy} = \frac{N \sum x y - (\sum x)(\sum y)}{\sqrt{[N\sum x^2 - (\sum x)^2][N\sum y^2 - (\sum y)^2}}$$

Where r_{xy} is the correlation coefficient of water demand and supply (i.e. X and Y)

X = water demand

Y = water supplied

N = number of selected areas

CHAPTER FOUR
RESULT AND DISCUSSION

4.1 INTRODUCTION

This chapter presents the analysis of data and interpretation of findings based on the research questions.

4.2 SOCIOECONOMIC CHARACTERISTICS OF THE RESPONDENTS

The study examined the socio-economic characteristics of the respondents in the study area. The result is presented in Table 4.1 The key issues analyzed are: sex, age, marital status, household size, level of income, occupation and educational background.

From Table 4.1 the sex is unevenly distributed across the gender with a majority of respondents being female 68% of the respondents. This revealed that 68% of the female struggle for water.

On the distribution of respondent based on age it could be seen that there is an uneven distribution of ages across the age groups with a majority 34.67% of the respondents within the age range of 15 – 25 years

TABLE 4.1: SOCIO-ECONOMIC CHARACTERISTICS OF THE RESPONDENTS.

RESPONDENTS BACKGROUND	FREQUENCY	PERCENTAGE
SEX		
Male	72	32
Female	153	68
Total	**225**	**100**
AGE RANGE (IN YEARS)		
≤15	25	11.11
15 – 25	78	34.67
26 – 35	63	28.00
36 – 45	35	15.56
≥46	24	10.67
Total	**225**	**100**
MARITAL STATUS		
Married	147	65.33
Single	31	13.78
Divorced	8	3.00
Widow	36	16.00
Widower	3	1.33

Total	**225**	**100**
HOUSEHOLD SIZE		
1 – 5	82	36.44
6 – 10	111	49.33
11 – 15	23	10.22
≥16	9	4.00
Total	**225**	**100**
LEVEL OF INCOME (N) PER MONTH		
0 – 5000	55	24.44
>5000 – 10000	73	32.44
>10000 – 20000	72	32.00
>20000	25	11.11
Total	**225**	**100**
OCCUPATION		
Farming	2	0.89
Trading	80	35.56
Civil service	54	24.0
Full housewife	7	3.11
Artisan	63	28.0
Others	19	8.44
Total	**225**	**100**
EDUCATIONAL BACKGROUND		
Tertiary	67	29.78
Secondary	88	37.11
Primary	16	7.11
Only Islamic	36	16.00
No formal education	18	8.00
Total	**225**	**100**

Source: Filed Survey, 2015.

About 15.56% of respondents were within 36 – 45 years, 11.11% of respondents were less than 15 years and about 10.67% of respondents were equal or above 46 years.

On distribution of respondents base on marital status 65.33% are married, 13.77% are single, 16.0% are widows and about 1.34% are widower while 3.0% are divorce.

With respect to household sizes, the majority 49.33% of the households comprises 6 - 10 persons, followed by 36.44% which comprises of 1 – 5 persons, 10.22% comprises of 11-15 persons and 4.0% more or equals to 16 persons.

On the distribution of respondents based on income level 324% of the respondent earn N5,000 to N10,000 per month; 32.0% of the respondents earn N10,000 to 20,000 per month. 11.1%

of the respondents collected more than N20,000 per month and 24% of the respondents collected N5,000 per month.

It could be seen on the distribution of respondents based on occupation, non of the respondents were idle, this implies that all of the respondents had something doing to earn a living. 28% were artisan, 24% were civil servants, 3.11% were full house wives while 8.44% falls to other categories of occupation.

With respect to the educational level attained by the respondents, only 8.0% of the respondents were without educational background, majority 39.11% of the respondents had only secondary education, 29.23% of the respondents had tertiary education, 7.11% of the respondent had primary education, 16.0% of the respondents had only Islamic education.

From the above analysis it was revealed that the majority of the respondents were females owing to the fact that they are the one majorly involved with collecting water. Also, the level of income of the household is low. This could be attributed to the fact that majority of the respondents were secondary school certificate holders. Finding also revealed that majority of the respondents were artisans who mainly depend on the salary earners.

4.3 THE ANALYSIS OF WATER DEMAND BY HOUSEHOLD

Issues discussed under this section includes the sources of water demand, distance of source, who responsible for the water collection, payment mode by house holds source for water, the duration or time taken to collect water demand according to household usage, water storage and the methods.

4.3.1 Source of water supply for domestic use in Ilorin Central

From the Figure 2, 70.11% of the people of Ilorin Central source water from tap, 12.89% of the respondents source water from borehole, 5.33% of the respondents source water from well, 9.00% of the respondents source water from rain and only 2.66% of the respondents source water

from other water sources. It shows that highest number of people in the study area depend on pipe borne water.

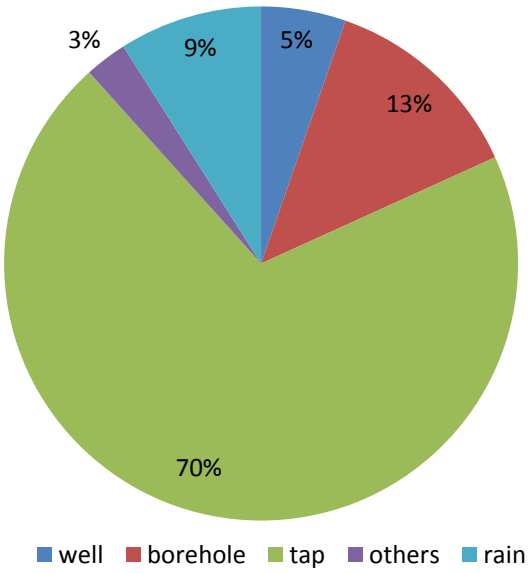


Figure. 2 Sources of Water

4.3.2 Distance to Water Sources for domestic uses in Ilorin Central

With respect to distance covered Figure 3 reveals that 76.0% of the household members trek a distance between 100 – 150m, about 12.89% of the households trek a distance less than or equal to 50m, 4.89% of the household member trek between 151 – 200m, and 6.62% of the household member trek above 200m. This shows that the people in some areas of study trekked long distance before they can get tap water because its far from their residential area.

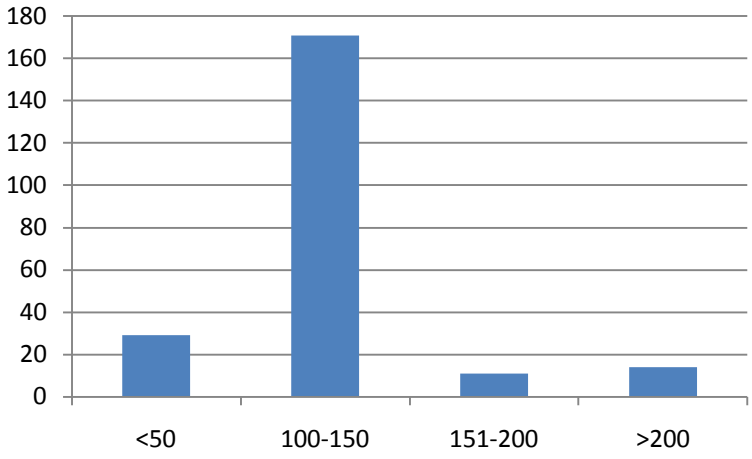


Figure 3. Distance to water source

4.3.3 Water collection responsibility among household members in Ilorin central

On the collection of water, Figure 4 shows that 81.33% of water collectors were housewives, followed by 12.44% were children, as only 1.33%) were husband while 4.88% falls to other categories. This indicates that women were responsible for collection of water in the study as could be seen percentage recorded compared with their men counterpart.

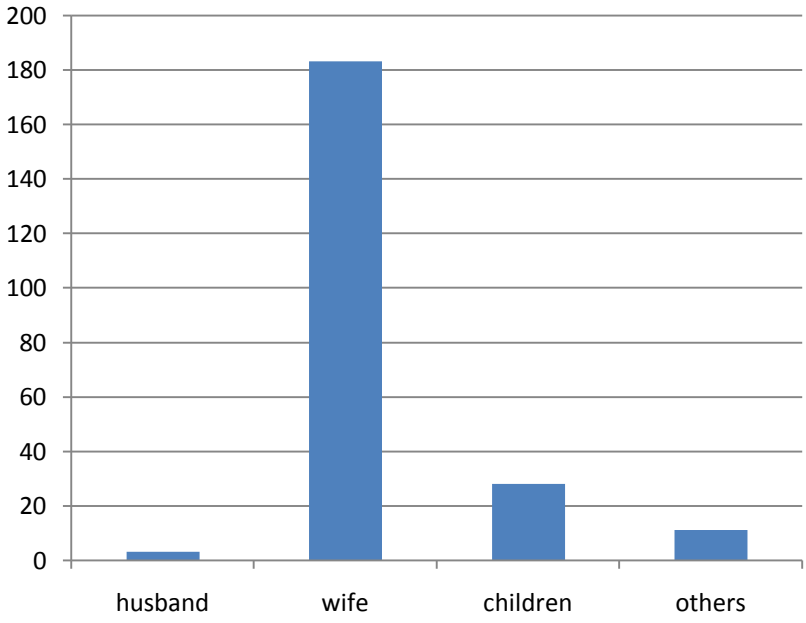


Figure 4. Water Collection

4.3.4 Mode of Payment for household water services among Respondent in Ilorin Central

With respect to payment for the water 90.22% of the respondents reported that they pay for water while 9.78% of the respondents reported that they do not pay. The reason being that the water is occasionally supplied to their area and some are of the view that the water bill is not constantly given.

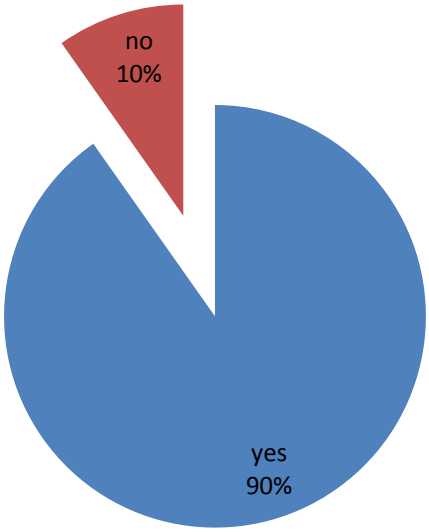


Figure 5 Mode of Payment of Water Bill

4.3.5 Amount Paid for Water services Among households in Ilorin central

On the amount paid to the Water Board Figure 4.6 shows that 58.22% of the respondents pay 1500 naira, 32.00% of the respondents pay 1000 naira while only 9.6% of the respondents do not pay. Those refuse to pay is simply because water is not connected to their apartment.

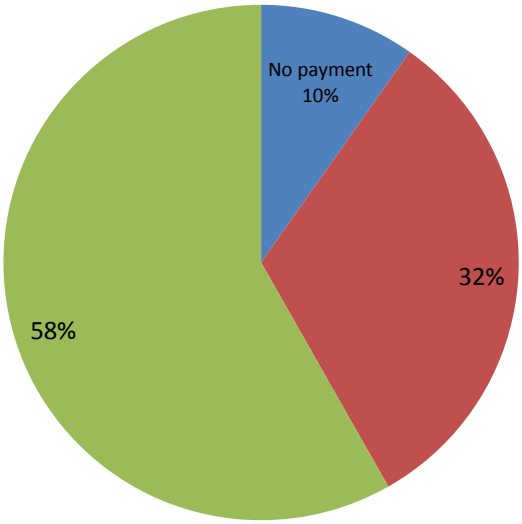


Figure 6. Amount Paid for Water

4.3.6 Time taken to get water services by households in Ilorin Central

On the issue of duration or time spent for the collection of water, Figure 7 reveals that 49.33% of the respondents spend between 31 minutes to 1hour to get water, 24% of the respondents spent above 1 hour to get water, 16.44% of respondent spend between 11 to 30 minutes to get water, while 10.22% of the respondents spent less than 10 minutes to get water. In an area where 49.3% of respondent spend 30minutes to 1 hour to get water it was revealed that they do experience long queues coupled with mammoth crowd of people struggling to fetch tap water.

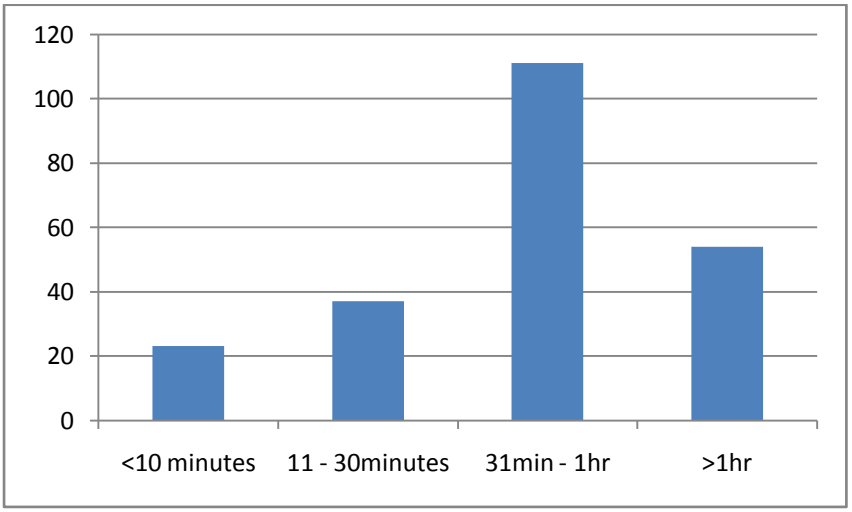


Figure 7. Time Taken to Get Water

4.3.7 Water storage by households in Ilorin Central

On the issue of water storage, it was revealed that 89% of the household store water while only 11% do not store water. In addition, reasons for storing water by the respondents were as follows: for sustainability of the households when there is water crisis, to reduce their trekking every day in search of water, to save them from buying from water vendors and to make water available whenever they want to use it. This became necessary because of inconsistency of water supply.

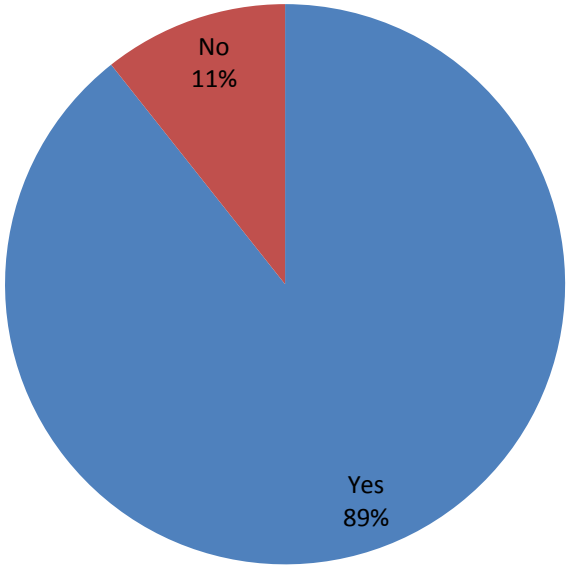


Figure 8. Water Storage

4.3.8 Method of Storage of water among respondents in Ilorin central

On the method used for water storage 37.33% make use of jerry can, 24.588% use bucket for storage while 12.44% of the respondents use overhead tank for storage, 10.666% do not store at all and 10% of the respondent store in pots. The method of water storage is employed in order to reserve water in case of shortage.

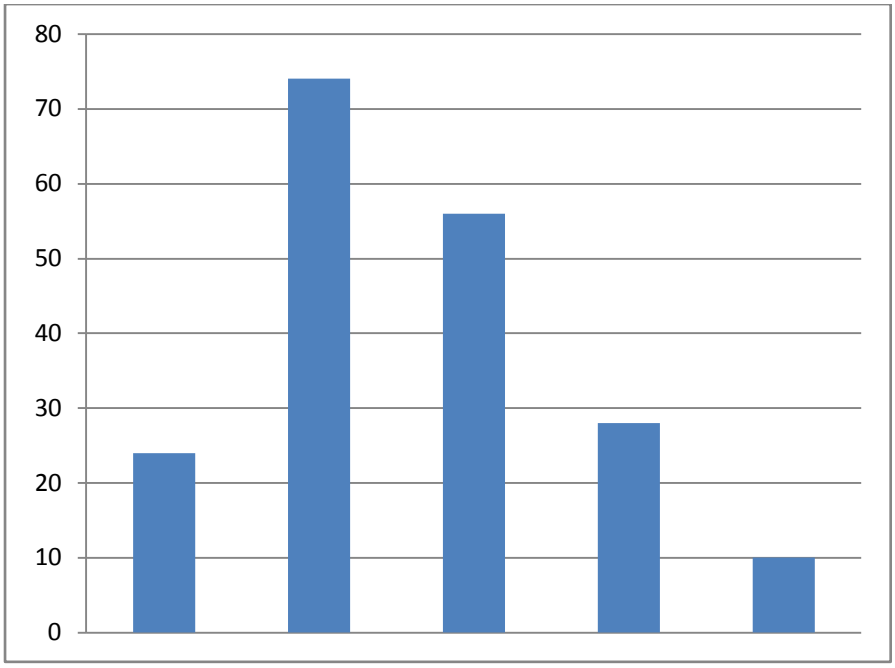


Figure 9. Method of Storage

TABLE 4.2: KEY USES OF WATER AMONG THE HOUSEHOLDS OF ILORIN CENTRAL.

WATER DEMAND ACCORDING TO HOUSEHOLDS USAGE	NUMBER OF HOUSEHOLDS	QUANTITY IN LITRES	PERCENTAGE
Drinking	225	3154	11.3
Cooking	225	2366	8.48
Washing	225	14,193	50.85
Others	225	8,198.25	29.37
Total		**27911.25**	**100**

Source: Field Survey, 2015.

Therefore the total water needed by the household is 27,711.25 per day.

With respect to water demand according to house hold usage it was revealed that 11.3% of household use 3154litres for drinking, 5.48% members of the household use 2366litres for cooking, 50.55% of household members use 14,193 litres for washing while 29.32% of the household members use 8,198 litres for other domestic purpose. From the above analysis it was revealed that total water demanded for domestic use by 225 household is 27,913litres.

4.4 ANALYSIS OF WATER SUPPLY BY WATER BOARD

The study examined the water supply by the Water Board within the period under study. The result is presented in Table 4.4.Issues discussed under this section include the sources of water supply and estimate of water supplied to household per liter per day.

Based on the oral interview conducted, it was revealed that the major sources of water supply is through dam. Also, the estimate of water supplied to the household in liters per day was estimated to 300,000 litres to 10,000 household per day.

4.5 FACTORS AFFECTING WATER DEMAND AND SUPPLY

TABLE 4.3: FACTORS AFFECTING WATER DEMAND

FACTORS	FREQUENCY	PERCENTAGE
Topography of the area	28	12.0
Bursting of pipe	68	30.0
Biasness in water supply	22	15.0
Construction of road and telecommunication cable	45	20.0
Poor management by the water board	44	20.0
Water wastage by the households	18	8.0
TOTAL	**225**	**100**

Source: Author's Field Work, 2014

The study investigated the factors influencing water demand and supply in the study area and the result is presented in Table 4.3. It shows that 30.0% of the respondents stated that bursting of pipe is the strong factor, 20% of the respondents said construction of road and communication are the factor hindering the constant supply of water, closely followed by 20% who assume the factors to be as a result of poor management by the water board, 10% linked the factor to the act of biasness in the supply of water by water board owing to the fact that, the water board tends to favour some highly placed consumers at the expense of the masses. In this regard, government residential areas were favoured as well. 12% of the respondents see topography of some areas as hindrance to the adequate supply of water in some areas. While 8.0% of the respondents linked the factor to wastage by the household.

TABLE 4.4: FACTORS AFFECTING WATER SUPPLY

FACTORS	FREQUENCY	PERCENTAGE
Electricity	7	28.0
Insufficient materials e.g chlorine and alum	5	20.0
Capital	3	12.0
Pipe leakage	4	16.0
Topography	2	8.0
Water wastage by households	3	12.0
Road construction	1	4.0
TOTAL	25	100

Source: Author's Field Work, 2014

From the Table 4.4 above it can be seen that insufficient purification agent e.g. (Chlorine and alum) was said to be one factor affecting adequate water supply where about 20.0% of the respondents. 28.0% of the respondents link the factor hindering the supply of water to the inadequate supply of electricity as the strongest factor. 16.0% of the respondents link the factor threatening water supply to leakage in various channels caused by different factors. 12.0% of the respondents assumed the factor to be as a result of water wastage by households, 12.0% of the respondents presumed the factor of inadequate water supply by corporation to be as a result of insufficient fund or capital made available for the water board, 8.0% of the respondents linked the factors of hindering the water supply to sloppiness of some area of topography as some houses were located on high topography which influence water supply to reach the area due to low pressure, 4.0% of the respondents link the factor influencing water supply by the water board to road construction and repair in some areas.

4.5 RELATIONSHIP BETWEEN WATER DEMAND AND SUPPLY

The study investigated the relationship between water supply and demand during the period using the correlation analysis technique. The result is presented in Table 4.5

TABLE 4.5: CORRELATION ANALYSIS OF WATER SUPPLY AND DEMAND

S/N	Survey Area	Questionnaire Administered	Questionnaire Recovered	(X) Total Water Demand (Ltrs)	(Y) Total Water Supplied (Ltrs)	X^2	Y^2	XY
1	Gambari	25	24	2,977.2	720	8863719.84	518400	2143584
2	Okelele	25	17	2108.85	510	4447248.323	260100	1075513.50
3	Pakata	25	23	2853.15	690	8140464.923	476,100	1968673.5
4	Okekere	25	23	2853.15	690	8140464.923	476,100	1968673.5
5	Ajikobi	25	25	3101.25	750	9617751.563	562500	2325937.5
6	Akerebiata	25	20	2481	600	6153361	360000	1488600
7	Adewole	25	24	2977.2	720	8863719.84	518400	2143584
8	Zango	25	25	3101.25	750	9617751.563	562500	2325937.5
9	Oja oba	25	19	235.95	570	2356.95	314900	1343461.5
10	Baboko	25	25	3101.25	750	9617751.563	562500	2325937.5
	Total	250	225	27911.25	6750	79019446.84	4621500	19109902.5

Source: Field Survey, 2015.

For water demanded

$$\frac{\text{Total water demanded}}{\text{Number of respondents}} = \frac{27,911.25}{225}$$

$$= 124.05 \text{ liters per person per day}$$

For water supplied

$$\frac{\text{Total water supplied}}{\text{Estimated household}} = \frac{300,000}{10,000}$$

$$= 30 \text{ litres per households}$$

This implies that water supply to individual in the area $= \frac{300,000}{1577}$

$$= 190.2 \text{ liters per person per day}$$

$$rxy = \frac{n\sum xy - (\sum x)(\sum y)}{\sqrt{(n\sum x^2 - (\sum x)(n\sum y^2 - (\sum y)^2}}$$

$$rxy = \frac{10(19109902.2) - (27,911.25)(6750)}{\sqrt{(10(79,019,446.84) - (27,911.25)^2(10(462500) - (6750)^2}}$$

$$rxy = \frac{19,1099025 - 188,400,937.5}{\sqrt{(790,194,468.4 - 779037876.6)(46,215,000 - 45,562,500)^2}}$$

$$rxy = \frac{2,697087.5}{\sqrt{(11,156591.8) - (652,500)}}$$

rxy = $\frac{2{,}697087\ .5}{\sqrt{7279676150000\ )}}$

rxy = $\frac{2{,}697087\ .5}{2698087\ .498}$

rxy = 0.9996.

It can be observed from the result of the correlation coefficient (0.9996) that there exist a very high positive linear relationship between the households water demand and water supplied in the study area

Test of significance of correlation coefficient

Hypothesis

Ho: P = 0 (There is no significance, relationship between water demand and water supply in the study area

Level of significance is set at 0.05

Decision rule is that reject null hypothesis if calculated t is greater than critical value at 0.05 significance level with n – 2 degree of freedom

Statistics = $t_{cal} = \frac{r\sqrt{n-2}}{\sqrt{1-r}}$

Computation

N=10, r= 0.9996, α = 0.05

= $t_{cal} = \frac{0.9996\sqrt{10-2}}{\sqrt{1-0.9996)}}$

= $\frac{0.9996(2.8284)}{\sqrt{0.0004)}}$

= $\frac{2.8273}{0.02}$

= 141.365

t_{cal} = 141.36

$t_{tabulated}$ = t(0.05, 8)(1.86)

Since t_{cal} (141.36) > t_{tab} 0.05(1.86), we reject null hypothesis (Ho) and conclude that the estimated correlation coefficient is statistically significant and it can be said that the conclusion of the estimate is reliable.

CHAPTER FIVE
SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 SUMMARY OF FINDINGS

Findings from the study indicate that demand for domestic water varies in terms of household size which shows that the number of people found in a household determines the quantity of water needed for domestic purpose.

The study also shows that females are more involved in collecting water as compared with male counterpart. This findings therefore is in line with the studies of Barkingham (2000) which reported that even though the water crisis is observed as a general problem, women bear the greatest burden because of their social gendered roles, which involve looking for and collecting water for households. The study equally affirmed that water demand and allocation in the household has got a direct link with accessibility of the water supply sources.

The study also reveals that the time spent in collecting water by household is a constraint to their socioeconomic activities, since the household members spend a better part of their time collecting water. This finding is also in line with WHO, (2003) who reported that in Anona and Rakai district of Uganda, young men and women spend most of their time and resources in search of water, which in turn influence the productive time and income generation.

5.2 CONCLUSION

A number of studies have been carried out on water resources such as impact of water shortage and depletion on the productive time of women in Ilorin metropolis Ijaya (2000) and distribution of water and the role of public agencies in Ilorin. Adedayo and Ifabiyi (1999). This study however analyzed the Domestic Water Demand and Supply in Ilorin Metropolis, Kwara State with emphasis on Ilorin Central.

The study therefore, found that the study area depends mostly on pipe borne water. The percentage of respondents that source water through tap is higher that other water sources. The study also found that bursting of pipe had been the strongest factor influencing water demand in the study

area base on the respondent view. While inadequate supply of electricity is the strongest factor hindering the supply of water as stated by staff of Water Board.

The study further found that, there exist very high positive linear relationship between the household water demand and water supplied by the Kwara State Water Board. From the study, pipe borne water supply in the study area is inadequate to meet the demand of households. In view of these therefore, there is a need for improvement in the quantity of water supply in Ilorin metropolis.

5.3 RECOMMENDATIONS

Based on the findings, the following recommendations were made:

1. The water board management should be carrying out constant repair, that is reparing of busted pipes around the metropolis.
2. There should be constant monitoring of pipe line so as to be able to repair damaged pipes, this could be achieved by going round to check the water distribution.
3. The government should endeavor to come to water board aid by proper funding so as to purchase the material needed. i.e special allocation of fund should be make available to the water board so as to improve their service.
4. The water board should change their attitude of bias in distributing water to households not to favour Government Residential Areas at the expense of the masses in the town.
5. There should be concerted efforts by water corporation and household to avoid water wastage, this can be achieved by public enlightenment through the mass media and the customers also should endeavor to report cases that can cause failure in water distribution.
6. There should be an extension of water pipe to cover more areas especially in the rural areas and rusted pipes in the urban centre should also be replace with new one.
7. The consumers should endeavour to pay their water bill regularly so as to improve the water supply.

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Appendix 1

DEPARTMENT OF GEOGRAPHY,

FACULTY OF SCIENCE, AHMADU BELLO UNIVERSITY ZARIA.

MSC GEOGRAPHY

QUESTIONNAIRE FOR HOUSEHOLDS.

INTRODUCTION

This research is being carried out on water demand problems. The aim is to access the impact of domestic water demand in Ilorin central. The purpose is to examine the challenges facing demand and supply of domestic water.

Your cooperation is kindly requested for the provision of adequate and accurate information to the questions as all information provided will be treated as confidential. Thank you.

Please tick [√] where appropriate.

Section One: <u>Respondents Background.</u>

1. Survey point: …….
2. Sex: Male [ ] Female [ ]
3. Age (Years) ≤15 [ ] 15-20 [ ] 26-35 [ ] 36-45 [ ] ≥46 [ ]
4. Marital status: Married [ ] Single [ ] Divorced [ ] Widow [ ] Widower [ ]
5. House hold size 1-5 [ ] 6-10 [ ] 11-15 [ ] ≥16 [ ]
6. Level of income (~~₦~~) per month. 0 – 5000 [ ] above 5000 to 10000 [ ] above 10000 to 200,000 [ ] Above 20,000 [ ].
7. Occupation Farming [ ] Trading [ ] Civil Service [ ]
   Full house wife [ ] Artisan [ ] Others (specify) ……..
8. Educational background Tertiary [ ] Secondary [ ] Primary [ ]
   Only Islamic [ ] No formal education [ ]

Section Two: <u>Water Use and Demand</u>

9. How much water do you use in household on the following activities? Please estimate in litres / jerry can of 4 litres.

   Activities: (i) Drinking _____ litres or _____ jerry can

(ii) cooking _____ litres or _____ jerry can

(iii) washing _____ litres or _____ jerry can

(iv) cleaning including personal hygiene _____ litres or _____ jerry can

10. Sources of water: Well [ ] Borehole [ ] Tap [ ] River [ ] Other (specify) ……..

11. Distance of water source(s) from your household?

Please specify in metre / kilometer ……

12. Who is responsible for collection of water in your household?

i) Husband [ ] ii) wife [ ] iii) children [ ] iv) other specify ……..

13. Do you pay for the water? Yes / No

14. If yes please specify how much in ₦ ……

15. How long does it take you to get the water (i) Less than 10minutes [ ]

(ii) between 11 to 30 minutes [ ] iii) between 31 minutes to 1 hour [ ]

above 1hour [ ]

16. Do you have to store the water i) Yes ii) No

17. If yes in question above, what are your reasons ……..

……

18. What method do you employ in storing water?

i) Jerican [ ]

ii) bucket [ ]

iv) Overhead tank [ ]

v) others specify ……..

19. What are the factors affecting water demand? Please state …….

……..

Thank you so much for your time and ideas.

Appendix 2

DEPARTMENT OF GEOGRAPHY,

FACULTY OF SCIENCE, AHMADU BELLO UNIVERSITY ZARIA.

MSC GEOGRAPHY

QUESTIONNAIRE FOR THE WATER BOARD STAFF MEMBERS.

INTRODUCTION

This research is being carried out on water supply. The aim is to access the impact of domestic water supply in Ilorin central. The purpose is to examine the challenges facing demand and supply of domestic water. Your cooperation is kindly requested for the provision of adequate and accurate information to the questions as all information provided will be treated as confidential.

Thank you.

Section 1: RESPONDENTS BACKGROUND

Please tick appropriately [ ] where necessary.

Source(s) of water

1. What is the source of your water supply?

   (i) Dam [ ] (ii) Borehole [ ] (iii) Others [ ]

2. What is the estimate of water supply to a household (in litres) please estimate ……..

3. a. Is the source of water supply enough to meet up with the demand of water Yes / No

3.b. If no, suggest on how to increase the source of water supply. …….

4. Do seasonal variations affect water availability in the source? …….

5. Who is responsible for the construction of the facilities? I) Government [ ]

   ii) NGO / CBOs [ ] (iii) Private Individual [ ] (iv) Others please specify …….

6. Who is responsible for the repairs of damaged route of water supply. ……..

7. How do you feel about self supply or private investment in water supply construction and management? …….. .

8. How does the information get to you on the problems associated with supply of water? ……

9. What are the factors influencing the supply of water: please state …….

……..

Thank you so much for your time and ideas.

Appendix III

USED WATER ACCORDING TO THE NUMBER OF PERSONS IN THE HOUSEHOLD

DRINKING (2LITRES PER PERSON)				
Members	Mid point	Frequency	Multiple	Total (litre)
1 – 5 6 – 10 11 – 15 ≥16	3 8 13	82 111 23 9	3(82) =246 (2) 8(111) = 888(2) 13(23) = 299(2) 9(16) = 144(2)	492 1776 598 288
Total		**225**	**1577**	**3154**
COOKING ONE PERSON = 1.5LITRES				
Members		**Frequency**	**Multiple**	**Total (litre)**
1 – 5 6 – 10 11 – 15 ≥16	3 8 13	82 111 23 9	(82) 4.5 (111)12 (23)19.5 (9) 24	369 1332 448.5≈ 449 216
Total		**225**		**2366 litres**
WASHING = 9 LITERS PER PERSON				
Members		**Frequency**	**Multiple**	**Total (litre)**
1 – 5 6 – 10 11 – 15 ≥16	3 8 13	82 111 23 9	3(82) =246 (9) 8(111) = 888(9) 13(23) = 299(9) 9(16) = 144(9)	2214 7992 2691 1292
TOTAL		**229**		**14,193**
OTHERS= 5.2 LITERS PER PERSON				
Members		**Frequency**	**Multiple**	**Total (litre)**
1 – 5 = 3 6 – 10 = 8 11 – 15 = 13 ≥16	3 8 13	82 111 23 9	3(82) =246 8(111) = 888 13(23) = 299 9(16) = 144	1279.2 4617.6 1554.8 748.8
TOTAL		**225**		**82010**

Source: Field Survey, 2015.