EFFECTS OF WATER SCARCITY ON RESIDENTIAL PROPERTY VALUE: A CASE STUDY OF AUCHI EDO STATE.

By

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NOVERMBER, 2022

DECLARATION

I hereby declare that this report titled the effects of water scarcity on residential property value: a case study of Auchi Edo State is the product of my personal research work, To the best of my Knowledge, it has not been produced anywhere before for similar degree. All works encountered in the course of this research have been appropriately acknowledged in the reference list.

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CERTIFICATION

This is to certify that this research project is an original work undertaken by AFESO VICTOR JOHN (ENV/2242005143) under the supervision of TPL, DR.OBAJINA, O.T. and has been prepared in accordance with the regulations governing the preparation of projects in the Department of urban and regional planning, Auchi polytechnic Auchi, school of environmental studies. This project has been read and approved by:

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ACKNOWLEDGMENT

The success of this work will not be complete without mentioning the name of those who have been helpers of destiny. First and foremost, I remain eternal grateful to Almighty God for life and strength through school.

My profound gratitude goes to my supervisor, TPL. DR OBAJINA, O.T, I say thanks for your effort towards the successful completion of this work.

To my lovely parent, MR and MRS JOHN AFESO and my siblings for their support.

To my lecturer, MR NASIRU, for his assistance, and to everyone who contributed to making this research work a success.

The story of my success in life cannot be complete without mentioning you. My God Almighty bless you all. Amen.

DEDICATION

This research project is dedicated to Almighty God and my lovely family.

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Abstract

This study was intended to examine effect of water scarcity on residential property value a case study of Auchi Edo state. This study was guided by the following objectives; examine the sources and access to water supply by residents in Auchi, examine the quality (potability), regularity of water supply to residential building in the study area, to assess the socio-economic status of residents in the study area, examine the condition of water in the study area, examine how water availability to a property places value and demand on residential housing infrastructure and to assess the amount payable for renting a bedroom self-contain apartment with potable water supply with amount payable for renting a bedroom self-contain apartment without water supply. The study employed the descriptive and explanatory design; questionnaires in addition to library research were applied in order to collect data. Primary and secondary data sources were used and data was analyzed using graphs, charts and research questions contained in the research work.

This research work is a cautious study of effects of water on residential property value in Auchi Edo state. The work was a handiwork of thorough and detailed fact finding task about water supply embarked upon by the researcher as is portrayed in various chapters and sections of this report.

This work therefore tends to disclose the impact of water to many Nigerian citizens with direct reference to residential property value of housing infrastructure in Auchi Edo State.

There existed great disparity in the value of properties with very good sources of water supply and those without, leading to unnecessary social strata definition amongst the citizens as the rich who could afford the pleasure does so while the poor masses are left to wallow in scarcely furnished residential structures and poor water supply condition coupled with untold hardship.

Also revealed in this study was the inability of the state government to conclude the MDG water project in the state for very long time which would have minimized the suffering of the people. The masses who this report gathered to be consistent to reasonable extent in paying their taxes preferred the government to provide better social facilities with their public fund instead of allowing them to cater for their needs themselves. The government in conclusion were urged to harness other alternative sources of water supplies available to the masses like the bore-holes, rain and stream waters and put them in better conditions so as to prevent the sharp gap created between the well to do and the poor who cannot afford the pleasure of expensive residential properties with convenient water supply sources.

In the course of the research, many existing articles, journals, periodicals and statistical records were gathered from reliable sources and used in the compilation process. The researcher also made use of primary data collected through interviews and questionnaires. The structured questionnaire which was captioned "Effect of Water scarcity on Residential Property value in Auchi, Etsako West Local Government headquarter Edo State, Nigeria – Questionnaire was distributed to residence in Auchi Town Edo state. Amounting to 84, final sample size gotten from a sample population of 85 people

Data collected were presented and analyzed with the help of graphs, charts and research questions contained in the work. The sample size was determined using the Yaro Yamani statistical tool.

Just as every good work would never come so easy, there also existed several challenges that in one way or the other constrained the researcher from producing a totally constraint-free research report. Like every other post graduate student, severe academic and work demands competed for limited time available for carrying out this research work. Meanwhile official laxity or bureaucratic bottlenecks better put severally reared its ugly head as the researcher never got any needed assistance or information from Edo state ministry of water resources without passing through unnecessary delays and postponements. Unforgettably, limited finance almost quenched the processes of this research as the researcher had to extend his tentacles far and wide to source information and materials on the research topic as very scanty or none existed prior to this work.

Summary, recommendation and conclusion were clearly stated at the final chapter of this work, they were arrived at based on the findings and analysis of data and facts gotten from chapters three and four respectively.

CHAPTER ONE

1.0 INTRODUCTION

1.1 BACKGROUND OF THE STUDY

According to Onokerhoraye and Omuta (2002) the main aim of town planning is to attain functionality, orderly, safe, healthy, and aesthetic environment for working, transportation and recreation. Water like other utilities for example, gas supply, and telecommunication is very essential for obtaining this aim. The growth and development of urban centers in most developing countries hinges on these indispensable utilities including water supply system. It is not surprising to observe that early civilization such as those of the Nile in Egypt, Indus in Indian, Hwang HO in China, the Euphrates and Tagris in ancient Mesoptamia flourish around the river valley owing to abundant water availability, adequate alluvial soil for farming, good soil for construction works, availability of nutritious river food convenient transportation and suitable climate for healthy human existence (Ayodele 2005,Okhahu, 2014).

Water supply like other urban utilities is very important for urban development. As a result of this, knowledge of the source and management of water is of interest to physical planners. In planning for development of a place, there is no way town planning can be feasible without considering the source of water supply. Urban areas can obtain water supplies from groundwater, surface water and rainwater.

Water project is capital intensive to setup, the provision of this utility has been the responsibility of the government as a social amenity for her citizens in most countries. Presently, in Nigeria, the system of urban water supply through water board is being outdated or being ignored for many reasons. Hardly you see any urban center with suitable water board for urban water supply. The private sector involvement in water through bore holes, well water and tanker supply has taking over in most cities. The need to meet the dynamic water requirements of the population is a most crucial issue facing the international organizations, all tiers of government

and some non-governmental organizations. This could be attributed to rural and urban expansion; population increase and lifestyle changes. The international community has continued to make effort to resolve water issues, which includes: the sustainable development goals number six (6).

The importance of adequate water quantity for human health has been recognized for many years and there has been an extensive debate about the relative importance of water and it quality, water, sanitation and hygiene in protecting and improving health (cairncross, 1990: Esrey, 1985 and 1991). Despite this debate, international guidelines or norms for minimum water quantities that domestic water supplies should provide remain largely lacking. For instance, whilst the sustainable development goals number six(6) declaration includes a target to have the proportion of people who are unable to reach or to afford safe drinking water by 2015 (UN,2000) it does not specify in what quantity such water should be supplied. The WHO/UNICEF joint monitoring programme, which produces the global assessment of water supply and sanitation data, describe reasonable access as being "the availability of at least 20 liters per person per day from a source within one kilometer of the users dwelling" (WHO and UNICEF, 2000). However, it should be noted that this definition relates to primarily to access and should not necessarily be taken as evidence that 20 liters per capital per day is a recommended quantity of water for domestic use. There is no uniform standard to the quantity of water need per person per day due to the dynamic nature of water use in different places. Recommended standard of operation of water-board for water quantity provision for local government headquarters is 135L per gallon per day. The standard is used as a bench mark in the provision of water in local government headquarters in Edo state. (Ehizotu, 2002).

The importance of water as a public utility cannot be over emphasized. Apart from the fact that human body is 65% water, water is needed for: domestic- for all house hold purposes including watering and washing of cars, revenue generation – water rate trade for all industries and factories, businesses, shops, offices, hotels, institutions, agriculture- irrigations and for livestock and diary purposes, public – for firefighting, street washing, public gardens and fountains etc.

The issue of water supply has reached a disturbing proportion in many countries, there is cause of anxiety about the state of water supply in most urban center. Firstly, water for drinking

and food preparation supposed to be free from organisms capable of causing disease minerals and organic substances producing physiological effect on man. World health organization revealed that 80% of diseases in developing world are water related. Also, population continues to grow so also is the rate of water consumption. Water is gradually becoming like gold in some places depending on the demand and supply only available for those who can pay. Rationalization of water supply is now being practices in many cities because of inadequacy and high cost of purchase. Water trading market is becoming an Eldorado. It is no longer a natural resource but a commodity. All this makes the need to always plan and manage the source of urban water supply of interest to town planners so that it sources of supply can be conserved, well planned and managed and avoid inadequacy both now and in the future. It is because of this anxiety that this research probed the adequacy of water supply in the study area in order to know the gap that need to be addressed, it is also hoped that this research will help to maximize the use of this essential utility for the development of the study area.

1.2. STATEMENT OF PROBLEM

One of the major problems of developing countries of which Nigeria is inclusive is the problem of acute shortage of potable water as described by (WHO 2010). In Nigeria urban centers, there is problem of water scarcity as a result of conflicts and drought. This is more pronounced in some areas including Auchi where increasing rural urban migration and shift in socio economic activities have given rise to high use of essential resource like water. In Auchi, several attempts have been made to improve access to safe drinking water and ensure water safety by successive government at all levels. This effort includes construction and provision of water networks in major location of the town, construction of bore holes by several organizations and individuals, as well as the release of constituency allowance to legislators and local government authority to construct boreholes in their localities among others. Yet, the problem of water remains in the study area. All these programmes have not been able to solve problems associated with quantity and quality of water for domestic and other uses.

Past researchers in the related topic are often interested in per capital consumption rate of individual or household in a particular geographical area as domestic function undermining the influential value water have on property. Availability of water in good quantity and quality is as important to the value of property just as it is to human being. There are many properties in the study area which have other good characteristics such as accessible location, quality environment, standard construction techniques and materials but attract low economic values due to scarcity of water supply. This is to say that the more the availability of water, the more the value of the property.

Since there is no effective water supply programme in the area, property owners in quest to enhance property values were able to drilled a borehole for household used only. The consequences of this act is that underground water which have been tapped in some areas are not potable for consumption while according to geological scientist too many borehole in a particular area could lead to building collapse (SURCON 2017) and possibly trigger landslide or related disaster risk. It is also noticed that only residential properties can effectively enjoy this source of water supply while other landuses suffers. Therefore, the need for provision of effective water supply to ensure quality and sustainable environment with high economic values is critical. Hence, there is need for more research into way forward for provision of potable water supply for use for various landuses in a built environment.

1.3. RESEARCH QUESTION

i. What is the importance of water?

ii. What effect does water have on the rental value of residential property (housing)?

iii. What is the current sources of water supply in the study area (Auchi)?

1.4. AIM AND OBJECTIVE OF THE STUDY

The aim of this study is to examine the effect of water availability to residential property value in Auchi, Etsako west Local Government Headquarters, Edo State.

The objectives for achieving the said aim include to:

i. Examine the sources and access to water supply by residents in Auchi, Etsako west Local Government Headquarter, Auchi Edo State,
ii. Examine the quality (potability), regularity of water supply to residential building in the study area.
iii. Assess the socio-economic status of residents in the study area
iv. Examine the condition of water in the study area and
v. Examine how water availability to a property places value and demand on residential housing infrastructure.
vi. Assess the amount payable for renting a bedroom self-contain apartment with potable water supply with amount payable for renting a bedroom self-contain apartment without water supply.

1.5 SCOPE OF STUDY

The study is will focus on socio-economic status of respondents in the study area, the scope of the study will assess the amount payable for renting a bedroom self-contain apartment with potably water supply with the amount payable for renting a bedroom self-contain apartment without water supply, the study will examine how availability of water to a property places value and demand on residential housing infrastructure, the study will seek to examine the condition of water in the study area, also to examine the sources and access to water supply by residents in

Auchi,Etsako west local government headquarter, and lastly the scope of study will examine the quality (potability),regularity of water supply to residential buildings within the study area.

1.6 DELIMITATION AND LIMITATIONS OF THE STUDY

- Time frame:

In the course of sourcing of dada and analysis there was not a enough time to carryout far-reaching research

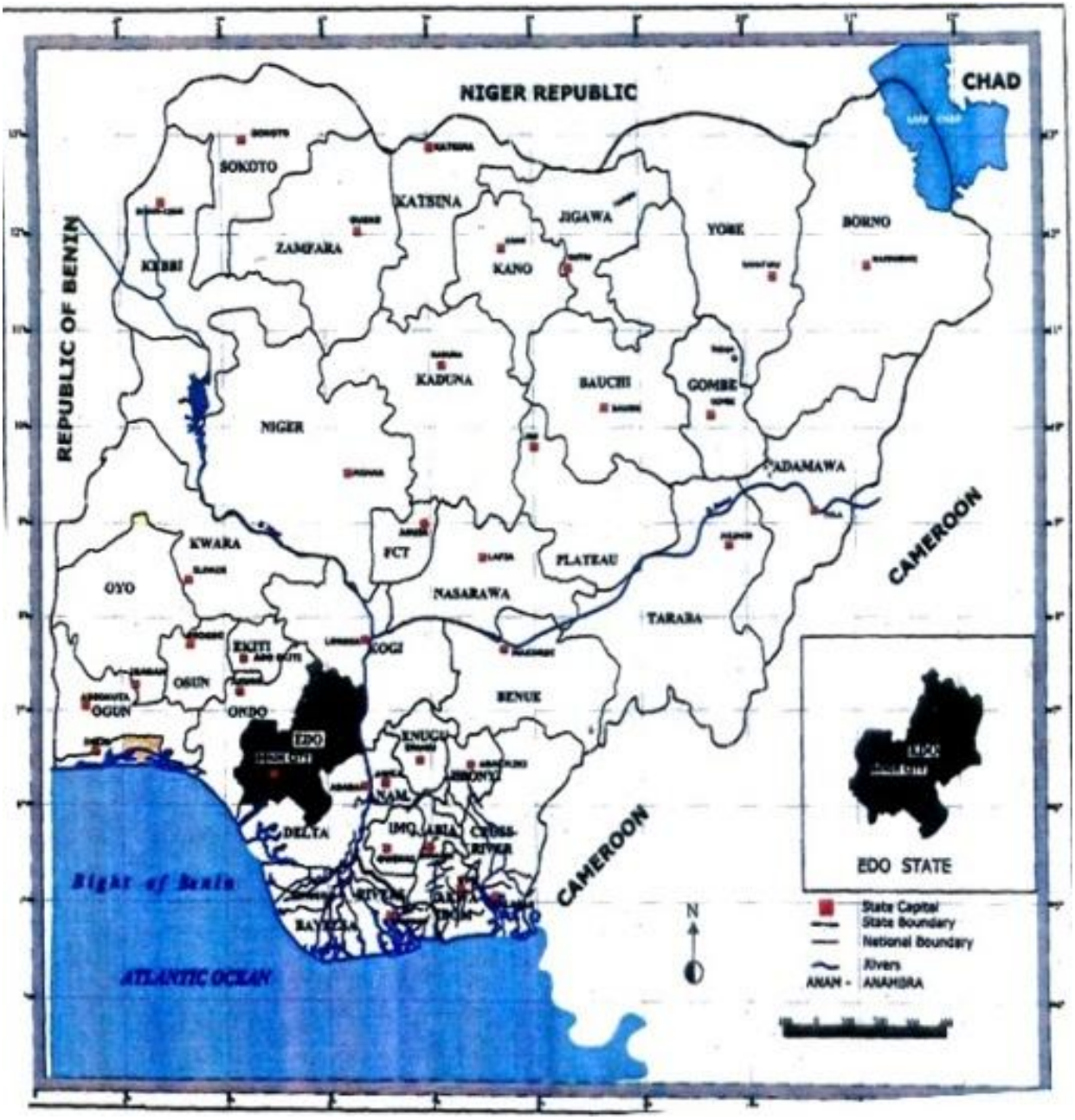
- Finance:

In the process of carryout research on the study, finance was a major hurdle.

1.7 STUDY AREA

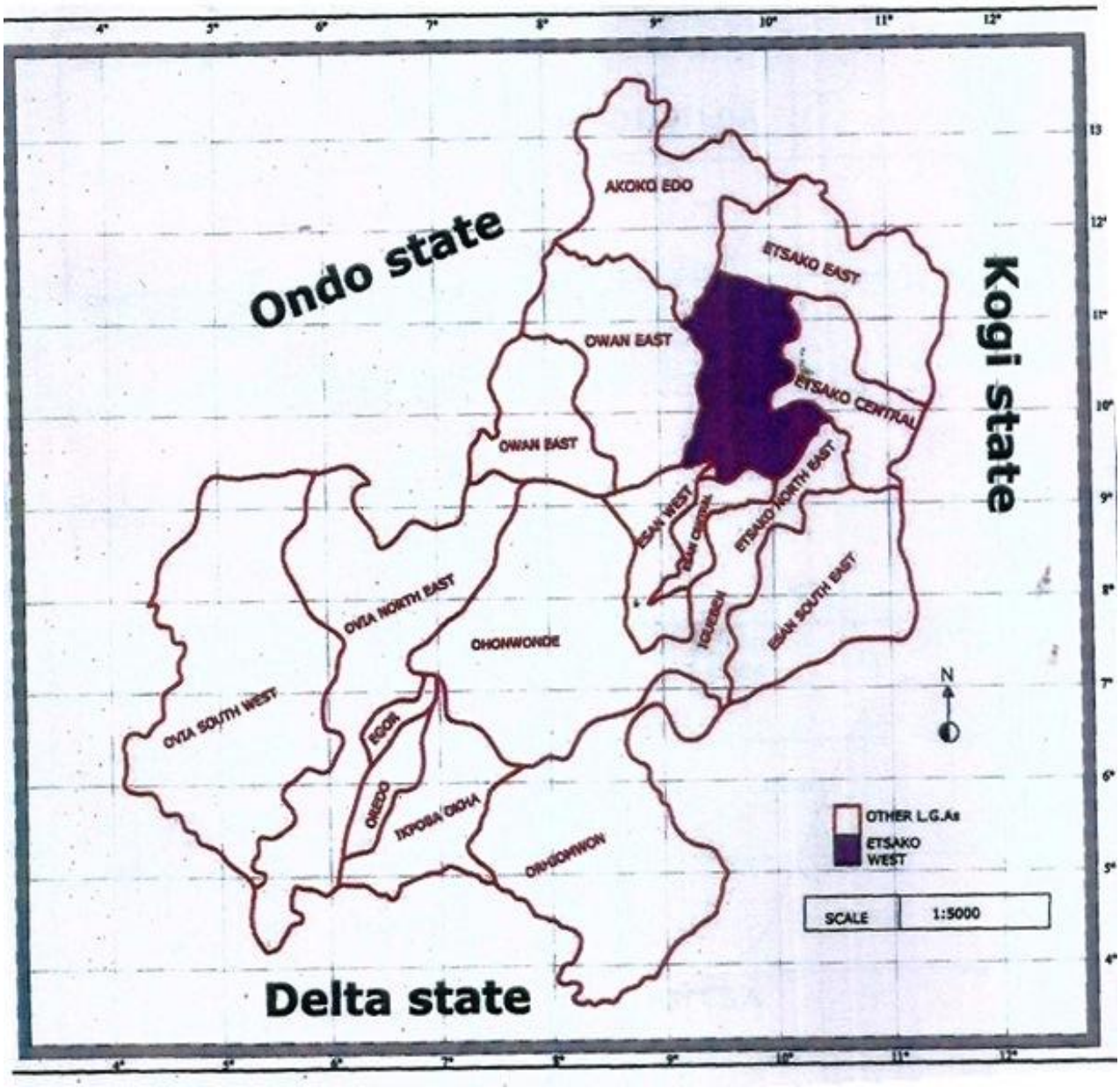
Auchi is the second largest town in Edo state, Nigeria after Benin City, the capital Auchi is in the Etsako West Local Government Area of Edo State and is also the headquarter of the local government area which comprises of Auchi, Uzairue, South Ibie, Agbede and the Anwain clan. During the British colonial rule, it was the headquarter of the Kukuruku Division the administrative headquarter of five districts. The town is also regarded as the administrative capital of the Afemai Region of Edo north and the Edo north senatorial district of Nigeria. It is bounded to the north by Jattu, to the south by Aviele, to the east by Iyakpi and to the west by Owan Local Government Area and is the seat of the Auchi Polytechnic Auchi. The study area.

FIG 1: MAP OF NIGERIA SHOWING EDO STATE



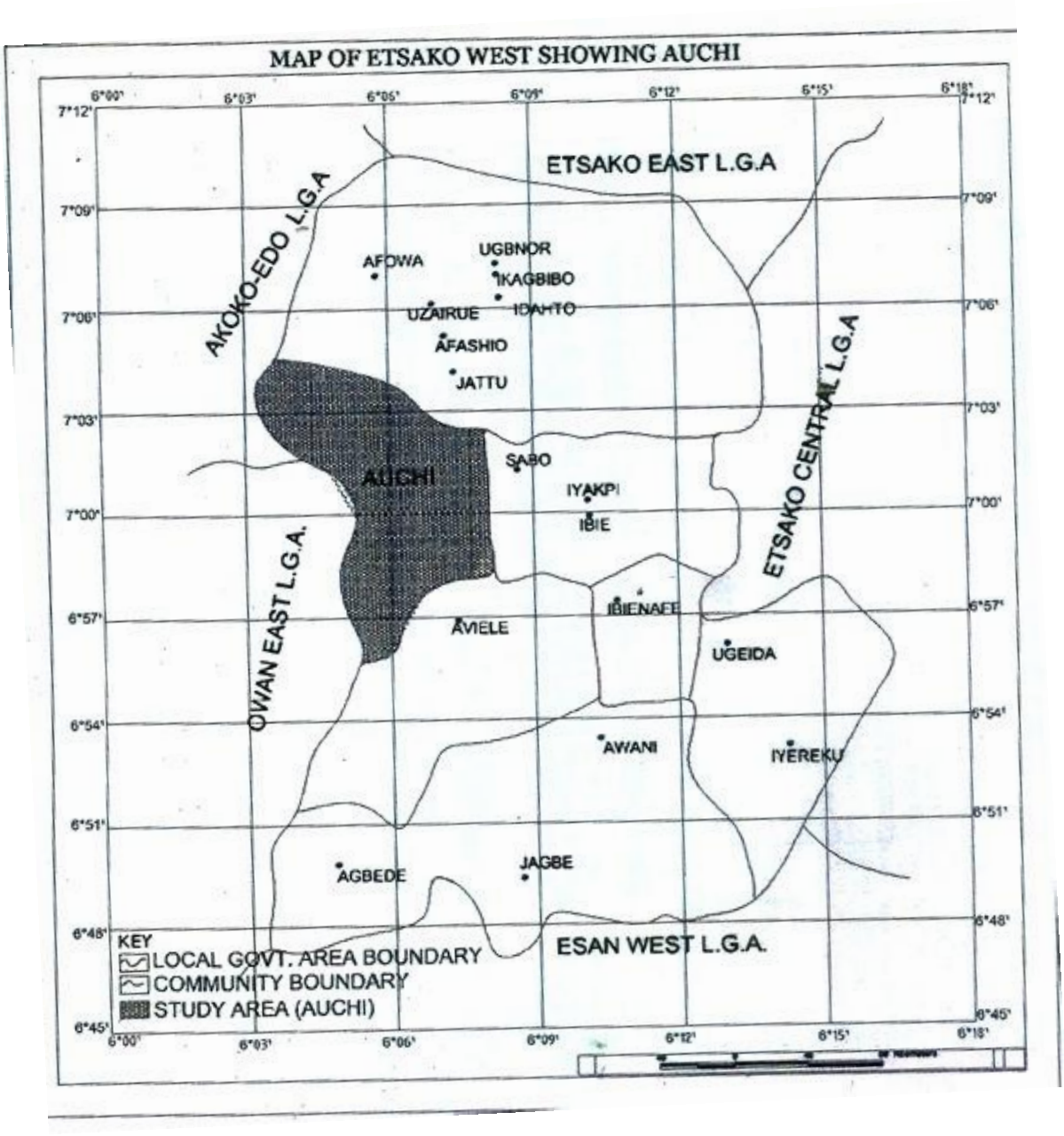
Source: Google Earth, 2022.

FIG2. MAP OF EDO STATE SHOWING ETSAKO WEST L.G.A



Source: Google Earth, 2022.

FIG. 3 MAP OF ETSAKO WEST SHOWING AUCHI



Source: Google Earth, 2022.

and its environs fall into the Guinea Savannah Vegetation belt of Southern Nigeria. The vegetation here is prominently made up of sparsely distributed trees, shrubs and grasses. Socially, spatially and economically, Auchi is one of the fastest growing towns in Nigeria

especially due to the presence of a Federal Institution of leaning (Auchi Polytechnic Auchi) which has remained the major pull factor for the many people coming to live, work and study in Auchi annually.

1.7.1 LOCATION OF THE STUDY AREA

Geographical Location: Acceding to Geonames Geographical Data Base, on a small scale map. Auchi is located between (co-ordinate) longitude 6'16" and 6'45" East and longitude7'4" and 7'54" North respectively, with land area above 946km. Auchi growing fast and encroaching its adjoining villages. It is bounded in the East by Jattu, in the West it shares boundaries with warrake and ivbiaro in the North it is bounded with iyamoh and in the South it has boundaries with Aviele. Auchi is easily accessible from most part of Edo Sate. it is about 130km from Benin City, which is the State capital. See the administrative map in figure 1.1, 1.2, and 1.3

Source: location of Auchi (https://en.m.wikipedia.org/wiki/Auchi)

1.7.2 POPULATION OF THE SYUDY AREA

According to the 1991population census of Nigeria, Auchi population was estimated at 42,610 persons (NPC 1991). And it was projected to this year 2022 through projection growth rate at 3.4% the population of Auchi will be 120,130 persons. (Details see Appendix).

1.7.3 HISTORICAL BACKGROUND OF THE STUDY

According to history, the people of Auchi originated from the Ancient Benin kingdom. A prominent hunter and an idol worshipper named Uchi founded Auchi. He migrated with his son as a result of fierce battle between the Oba's Army and the people of Udo, for their refusal to pay their tributes to the Oba. This was during the reign of Oba Ozalua between the year 1481 and 1500. Uchi and his sons arrive and settled where "Uchi Market" is situated today. The five communities in Auchi were named after the sons and order of seniority.

Table 1.1 Showing the five major quarters in Auchi Town

Name of the sons	*Quarter*	*Location in the town*
Ogun	Usogun	West of Auchi
Ekpe	Akpekpe	North
Ortse	Aibotse	North East
Igbhei	Igbei	East
Ekhei	Iyekhei	South

Source: location of Auchi (https://en.m.wikipedia.org/wiki/Auchi)

From the table shown above, are Ogu-Usogun Quarters, Ekpe-Akpekpe Quarters, Ortse-Aibotse Quarters, Igbei Quarter and Iyiekhei Quarter. On the death of their father Uchi, they spread and expanded to their present day location. Usogun to the West, Akpekpe to the North, Aibotse to the North-East, Igbe to the East and Iyiekhei to the Southern part of the town their original home Uchi was left for meetings and market known as Uchi market and to discuss other vital issues affecting the community. Auchi assumed the administrative headquarters of what was formerly known as Kukuruku or Afemai division until it was divided into Etsako, Akoko Edo and Owan division and Auchi remain the headquarter of Etsako West Local Government. Due to its vantage position and the influx of strangers into the community since the Edo State Government granted it an urban status in 1978.

Source: location of Auchi (https://en.m.wikipedia.org/wiki/Auchi)

The initial five (5) quarters have been increased for effective administration they are;

Usogun Egelesor	Akpekpe Osuali	Aibotse Oguokhai	Igbei Ozomode	Iyiekhei Aimhanesi

Ughidane Idani-Yelwa Osomeke Oluedide Oki Oshiomhole	Idanirace Omemi Isaami Ikelebe	Aliogbmhi	Akharumha	Utsokhwill Oikilokhai Igiebor

This made the total of number of villages in Auchi a total of 25. The villages are headed by chiefs who represent their people at its Otaru's (King) palace, where decisions and laws are made to develop the community. Auchi is essentially a Muslim town, but been a cosmopolitan town, most other religion like Christianity, Eekanka, Grail message and Polytheism also been practice in the town. The people speak the Iyekhei/ Etsako version of the Afemai language. Auchi today is a commercial town with several thriving businesses owned by indigenes and non-indigenes alike. This probably explains why most banks in Nigeria have a branch in Auchi, the town which is headquarter of Etsako west local government area.

Source: location of Auchi (https://en.m.wikipedia.org/wiki/Auchi)

1.7.4 CLIMATE AND VEGETATION

Auchi has a tropical climate characterized by two district seasons, the wet and the dry season. The wet season occurs between April and October with a break in August and average rain fall of 150 cm. The dry season cast from November to April with a cold harmattan between December and January. The average temperature of Auchi is about 25 degrees Celsius in the rainy season and 28 degrees Celsius in the dry season. The vegetation covers of the town is predominately that of the Guinea Savanna, part of the town Supported luxuriant vegetation cover, the type that is found in tropical rain forest, but had been removed and disturbed by constructions, farming, and urbanization processes.

Source: location of Auchi (https://en.m.wikipedia.org/wiki/Auchi)

1.7.5 PHYSICAL FEATURES (RELIEF AND DRAINAGE)

Auchi is a town situated on a depression almost surrounded by hills. The landscape is divided into two hypsographic regions, they are the low land and high land. This is further divided into parts for easy and more effective description. One of it is located in the Northeast while the other part is made up of these in the south; the higher land to the north is highest and has a height of 300 meters. The northern part of the high land is undulating to the east and to the south and are lower with an average height of about 300 meters. The landscape here is comparable level and hot and undulating as that of the north generally, the whole high land has deep slope. Average range from sight above 2 degrees in steepest past of the town, the low land is at the Centre and continues to the valley of river while, the length area about four (4) kilometers. The low land has the height of 260-300 meters. It slopes from center to where it terminates at river Orie.

Source: location of Auchi (https://en.m.wikipedia.org/wiki/Auchi)

1.7.6 SOCIO ECONOMIC BACKGROUNG OF THE STUDY AREA

The persons in Auchi, in regards to social aspect of life have a unique cultural heritage which is common to the people. They believe in culture which has taken its root from Muslim addicts (suna), this they believe in extended family system into marriage and living with close relations with each other. Auchi is a predominantly Muslim town with majority of the natives at Muslims. People living in Auchi in terms of economic aspect are primarily engage in farming activities (specifically the indigenes). However, Auchi also being an administrative Centre which gives opportunities for white collar jobs. Trading is one of the most common economic activities in Auchi usually coordinated by women (such as street retail, trading and other commercial business). Auchi has a central market called Uchi market where buying and selling continue throughout the week days; Apart from being an administrative headquarter Centre, Auchi provides higher other services like education facilities up to tertiary institution level. With recent development on political areas in Nigeria couple with ever increasing population of the area (Nation increase and immigration) the town has witnessed tremendous changes in the internal structure. The rapid urban population growth in the town which has increased from 35,000 in 1979 to an estimated value of 42,610 in 1991 most have resulted in changes in the physical environment of Auchi.

Auchi town is a home to Auchi Polytechnic Auchi. It comprises of some infrastructures or amenities which has led to its development and of course the migration of people from their own towns and villages to Auchi. Such amenities include the Auchi Polytechnic, Nigeria army school of electrical and mechanical engineering; Edo fertilizer milling plant (commercial operation in June 2017), Zenith Bank, Uchi Market, UBA, GTB, Access Bank, Eco Bank, First Bank, Fidelity Bank, Union Bank, Uchi Micro Finance Bank etc

Source: location of Auchi (https://en.m.wikipedia.org/wiki/Auchi)

1.8 DEFINITION OF TERMS

- Scarcity:

The gap between insufficient resources and the theoretical needs of an individual or group of individuals.

- Value:

Value has to do with how much something is worth, either in terms of cash or importance.

- Property:

Anything that is owned by a person or entity..

1.9 SIGNIFICANCE OF STUDY

The way in which, the presence of water can affect the worth of housing infrastructure as well as provide the means of minimizing and managing adverse controls on the environment will significantly alter the development process in any economy. Any short-term achievements of long-term sustainable goals must therefore be preceded by a critical focus on the activities of the housing sector. This need arises because the housing sector can immensely contribute to sustainable development especially since it is well positioned to transfer sound practices and habits to the rest of the economy and in the process play a key role by functioning simultaneously as a major engine of development and as a means to improving the national environment. However, the housing sector, especially in the developing world is rarely the repository of scarce technical skills for preservation and enhancement of the environmental resources while they continue to conduct their activities in a sector that has known severe impact on the natural resources and environment. This adverse phenomenon is compounded by the fact

that little is currently known about the effect of policies on practices of the residencies in general with regard to natural resource exploitation issues. In order to determine the current patterns of behavior as well as the potential of their residential sector in fostering sustainable water use in Nigeria, a policy response study is proposed

CHAPTER TWO

2.0 CONCEPTUAL FRAME WORK/LITERATURE REVIEW

2.1 INTRODUCTION

The importance of water for socio-economic development is globally recognized but with Increased population growth and rapid industrialization and the demands for water for various uses. Water scarcity seems to be looming in many countries of the world especially in developing nations. Adequate water supply is central to lite, hence of the five basic human needs (water, food. health, education, peace). Water is a common factor to the other four. The supply and distribution of adequately safe water are vital for societal wellbeing and human existence. This will help to safeguard public health and the prevention of water natural water sources (Akpor and Muchie 2010).

The important of the water supply and sanitation system has been a subject of serious attention reflected in the measurement of human development and in their inclusion in the Post Millennium Development Goals (PMDGs) & Sustainable Development Goals (SDGs) this priority treatment follows official reports estimate about one billion people in the world living without access to improved drinking water supplied while 2.6 billion people live without Adequate sanitation (Lane, 2012, WHO, 2010; 2012; WHOUNICEF, 2004; UN-Habitat. 2003 ;). Nearly 80% of the people using water from unimproved sources are reportedly concentrated in three regions namely, sub-Saharan Africa.

Eastern and southern Asia. For sanitation, overall levels of use of improved facilities are noted to be far lower than for drinking water (WHO UNICEF, 2006). These represent serious global health burdens especially when viewed in term of the hygiene. Although Countries, are making significant progress in addressing the challenges of water supply and Sanitation, reports on sub-Saharan Africa is particular not encourages of water supply and reports on sub-Saharan Africa Is particularly not encouraging as only 36% of the population was officially estimated to have access to basic sanitation (UNICEF/WHO, 2004).

While 37% of the population still relies on unimproved sources of water (Onabolu et al, 2011). Nigeria is one of the countries in sub-Sahara Africa whose records on general access to water supply and sanitation facilities by the citizens remain very poor.

The Nigerian cities in particular are fraught with inexorable rise of squatter settlements, overcrowding dwellings, breakdown of waste disposal arrangements, air and water pollution and inadequate water and sanitation services. Many problems of mortal, mobility and poverty described in the literature as consequence of a lack of drinking water supplies as well as poor sanitation coverage (Nwankwoala, 2011; WHO, 2010; Nyong Kanaroglou 1999; sodehinde, et al, 1997). Given these pictures, the question arose of what, Probability, could be the main problem of the lack of access to safe drinking water and basic sanitation for the population, many studies seem to agree to the fact that a lack of political will to tackle the problem is one of the most responsible factors (Mara, 2012, larne, 2012; Moe and Rheingans, 2006).

One way of assessing how, probably, this hypothesis could hold some validity is by Attempting an understanding of the various institutional, discursive and practical tools that Attempting an understanding of the various institutional, discursive and practical tools that followed in addressing the water challenges in the country over some periods. As knowledge of the relationship between water and sanitation as well as how it should be managed has dramatically expanded over the past several decades through the various global knowledge channels, it is equally important to understand how various institutional domains at national and state level are configured to advantage of such knowledge opportunities in addressing local challenges.

The system theory is explored in this research to explain water management as a system. It is imperative however to first examine the definition of a system theory and then relate it to water management.

Chorley and Kennedy (1971) define a system as a structured set of objects and or Attributes. Harvey, (1969), also explained system as,

- A set of elements identified with some viable attributes or objects.
- A set of relationship between the attributes of objects.
- A set of relationship between the attributes and or object and the environment.

From the above definitions, these objects and attributes consists of components or variable and exhibits discernible relationship with one another and operates together as a complex whole according to some observed pattern. Also, from the foregoing water management can be explained through the spectrum of its chart.

A System has component part, water management consists of different parts (Subsystems) like the sources of water, water treatment and distributions, cost recovery, maintenance and administration.

A system operates in a special environment and consists of well define subsystem so at when one of them is affected, it could influence the whole entire system. Also the system would be an open, isolated or closed system depending on the exchanges of mass and energy in the wider environment. Water management is actually an open system since it allow for exchanged of mass and energy with the wider environment (Mabogunje, 1970). For example, if the maintenance components are improved. There could be positive impacts on the performance of the management system. The dominance of unskilled manpower in the management system could spell doom for the entire system.

A System has a goal to achieve. The ultimate goal for water management is the provision of safe and adequate water in a sustainable fashion for domestic. Industrial agricultural and recreational uses. A system has a boundary. It has an area of operation that is distinct from another system. Its parts can be identified along with its relationship and its area of influence. For example, Water Cooperation, of Edo state is quite distinct from the National Electric Power Authority.

A system has inputs and outputs. These inputs and outputs are parts of the system. They sustain the system and are in the form of mass and energy. Rainwater and the Groundwater, which falls into rivers and ground water catchments, are inputs of mass, also.

Chemicals like alum and chlorine are considered as input of mass, electricity on the other Hand, is an input of energy and is used to operate pumping machines.

Finally, a system has a feedback. The presence of feedback process ensures adjustment in the system. Any subsystem within the water management system that is faulty can be traced through

the mechanism of management feedback. All the subsystem within the water management system can be controlled. The management can regulate inputs and outputs.

2.1.1 Sources of Water for Domestic use

Water supply for domestic use can be traced back to 560 BC when rainwater harvesting was practiced in the Axumite Kingdom. During that time, rainwater was collected and stored in ponds for agriculture and water supply purposes. Evidence for this is in documented literature and may be observed in visible remains of ponds (Seyoum, n.d.). The story of modern piped water supply in Ethiopia began in 1924 when a piped supply was established from the Kebena River to the patriarch's compound and Menelik Hospital in Addis Ababa, using an 80-mm pipe. Until the inauguration of the Gefersa Dam in 1951 the town of Addis Ababa was supplied from wells and springs (AAWSA, 2011) as far as water resources development is concerned, the nature of the water source determines the mode of planning, design, selection, purification, transmission and distribution work. The three main sources of water: groundwater, surface water and rainwater. In and regions where seawater is accessible (such as in the Middle East), desalination (the removal of salts from water) is used to generate drinking water. Another potential source of water is treated wastewater. In practice, the term 'water source' can be used to mean both the origin of the water and also the place where people get their water (spring, piped supply to household tap, water point, and well water.

2.1.2 Rainwater

Rainwater harvesting (RWH) is the collection and storage of rain, rather than allowing it to run off. Rainwater is collected from a roof-like surface and redirected to a tank. Cistern, deep pit (well, shaft, or borehole), aquifer, or a reservoir with percolation, so that it seeps down and restores the ground water. Dew and fog can also be collected with nets or other tools. Rainwater harvesting differs from storm water harvesting as the runoff is collected from roofs, rather than creeks, drains, roads, or any other land surfaces. Its uses include watering gardens, livestock, irrigation, domestic use with proper treatment, and domestic heating, the harvested water can also be committed to longer-term storage or groundwater recharge.

Rainwater harvesting is one of the simplest and oldest methods of self-supply of water for households, and residential and household-scale projects, usually financed by the user.

However, larger systems for schools, hospitals, and other facilities can run up costs only able to be financed by owners, organizations, and governmental units.

2.1.3 Advantages of Rainwater sources of water supply

Rainwater harvesting provides the independent water supply during regional water restrictions, and in developed countries, it is often used to supplement the main supply. It provides water when a drought occurs, can help mitigate flooding of low-lying areas, and reduces demand on wells making up for back up. It also helps in the availability of potable water, as rainwater is substantially free of salinity and other salts. Applications of rainwater harvesting in urban water system provides a substantial benefit for both water supply and wastewater subsystems by reducing the need for clean water in water distribution systems, less generated storm water in sewer systems, and a reduction in storm water runoff polluting freshwater bodies, rainwater harvesting system that could be easily installed and maintained by local people.

2.1.4 River Water

A river is defined as a large natural stream of water emptying into an ocean, lake, or other Body of Water and usually fed along its course by converging tributaries. Rivers and streams drain water that falls in upland areas. Moving water dilutes and decomposes pollutants more rapidly than standing water, but many rivers and streams are significantly polluted all around the world. A primary reason for this is that all three major sources of pollution (industry, agriculture and domestic) are concentrated along the rivers.

2.1.5 Ground Water Sources:

Groundwater sources are beneath the land surface and include rom the hydrologic cycle, when rain falls to the ground, some water flows along the land to streams or lakes, some water evaporates into the atmosphere, some is taken up by plants, and some seeps into the ground.

Aquifer is a rock unit that will yield water in usable quantities to wells or springs or other point of recovery. And the top of the saturated zone in such an aquifer is called the water table, (Garg,

2007). Yield is a measure of how much and how quickly groundwater is recharged. Safe yield is commonly defined as the attainment and maintenance of a long-term balance between the amount of ground water withdrawn annually and the annual amount of recharge (Sophocleous, 1997; Sophocleous and Sawin, 1997). Consequently, if pumping equals recharge, eventually streams, marshes, and springs may dry up.

2.1.6 Spring Water

A spring is a point at which water flows from an aquifer to the Earth's surface. It is a Component of the hydrosphere. Springs have long been important for humans as a source of water, especially in arid regions which have relatively little annual rainfall. They range in flow rate from nearly zero to more than 450 cubic feet per second, for the biggest springs.

Springs are fed by groundwater, which is forced to the surface by various natural forces such as gravity and water pressure. Springs are formed when groundwater flows onto the surface. This typically happens when the groundwater table reaches above the surface level. Springs may also be formed as a result of karst topography, aquifers, or volcanic activity. Springs also have been observed on the ocean floor, spewing hot water directly into the ocean.

Springs formed as a result of karst topography create karst springs, in which groundwater travels through a network of cracks and fissures openings ranging from intergranular spaces to large caves, later emerging in a spring. A natural spring on Mackinac Island in Michigan.

The forcing of the spring to the surface can be the result of a confined aquifer in which the recharge area of the spring water table rests at a higher elevation than that of the outlet. Spring water forced to the surface by elevated sources are artesian wells. This is possible even if the outlet is in the form of a 300-foot-deep (91 m) cave. In this case the cave is used like a hose by the higher elevated recharge area of groundwater to exit through the lower elevation opening.

Non-artesian springs may simply flow from a higher elevation through the earth to a lower elevation and exit in the form of a spring, using the ground like a drainage pipe. Still other springs are the result of pressure from an underground source in the earth, in the form of volcanic activity. The result can be water at elevated temperature such as a hot spring. The action of the

groundwater continually dissolves permeable bedrock such as limestone and dolomite, creating vast cave systems.

2.1.7 Well and Boreholes

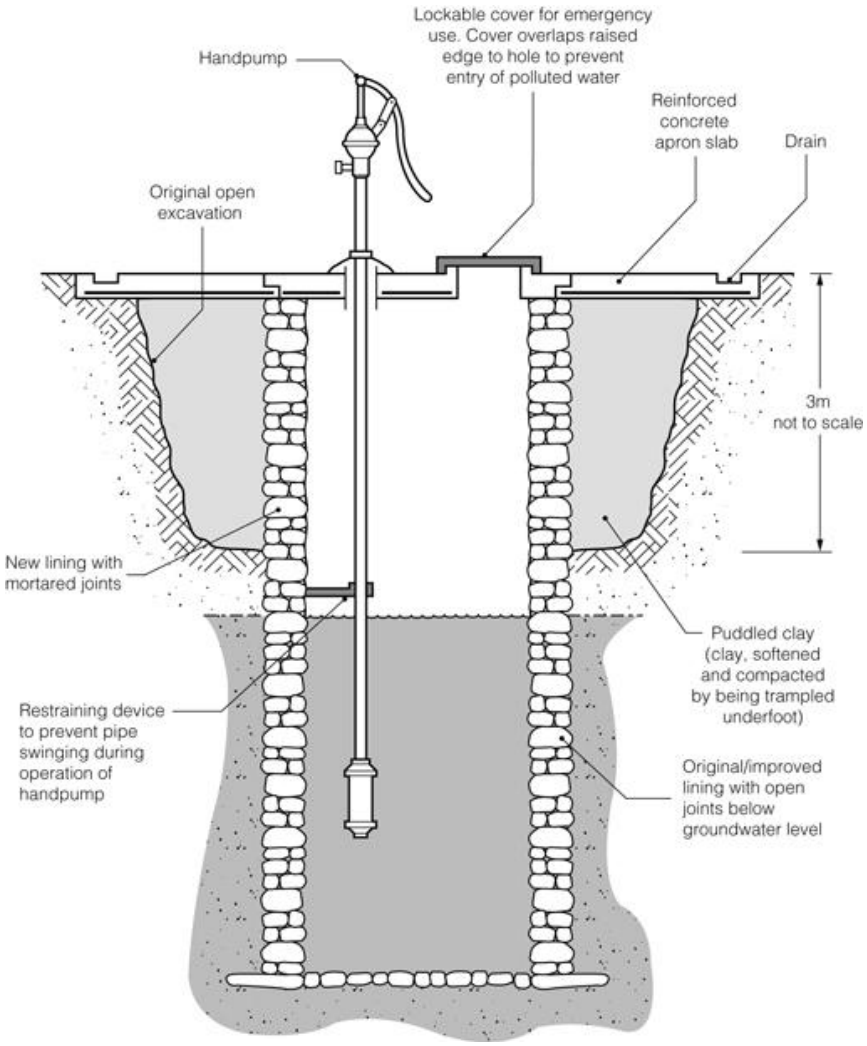
Groundwater is water held within the interconnected openings of saturated rock beneath the earth's surface. Groundwater bearing formations which are sufficiently permeable to yield usable quantity of water are called aquifers. Thus, an aquifer is a rock unit that will yield water in usable quantities to wells or springs or other point of recovery. And the top of the saturated zone in such an aquifer is called the water table, (Garg, 2007). Wells and boreholes can be described by their depth, or by the way they are constructed. They may also use different types of pumps at the surface to raise the water.

2.1.8 Shallow Well

Shallow wells and boreholes usually have a depth of less than 30 m, although they can be as much as 60 m deep, especially in very dry areas of Ethiopia where the water table is low, Figure 3.4 is a diagram of a protected hand-dug well. Wells can be excavated by hand if the soil is not too hard or the water table is high. Hand-dug wells have a relatively large diameter because they have to be wide enough for a person to be able to stand inside and dig.

Several factors influence the Likelihood of groundwater becoming contaminated from a polluting source such as a pit latrine. The geology is important because in areas with permeable rocks, or where there are small cracks in the rock formation, fluids can pass through more easily into the aquifer. Other factors include the depth of the pit and its vertical distance from the water table. In Ethiopia, federal guidelines state that latrines must be sited at least 30 meters from any water source to be used for human consumption and if on sloping ground be lower than the source.

Figure 4: Diagram of a hand-dug well.



Source: Study Session 3 Water Sources and their Characteristics (https://www.open.edu/openlearncreate/mod/oucontent/view.php?id=79999&section=5.1)

The inside wall of the top 3 m or so of the dug well should be made waterproof by constructing a well casing (lining). In small-diameter wells the casing can be a pipe, but in large wells the casing needs to be constructed in concrete from the top of the well minimum depth of 3 m. The casing of the well should also be extended for a minimum depth of 3cm above the surrounding ground level to prevent the entrance of surface run-off water that runs off the surface of the land,

carrying debris, wastes and other pollutants as it flows. A concrete cover should be fitted over the well casing to prevent dust, insects. small animals and any other contaminants from falling in.

Depending on the depth of the well, water may be drawn up by a bucket and rope or by using a pump. Hand pumps, such as the one in Figure 3.6, are built over the well and the concrete cover extends to cover the surrounding ground. The immediate area of the well should preferably be fenced to keep animals away. The area surrounding the well should be graded off (i.e. should slope away from the well) in order to prevent the flow of storm water run-off into the well. Any pipework associated with the pump that enters the well needs to have watertight connections so that it operates efficiently. The well, pump, pipework and associated structure should be regularly disinfected using chlorine solution to eliminate pathogens and ensure the water is safe to drink.

Plate 1: Hand pump over a protected dug well

Source: Study Session 3 Water Sources and their Characteristics (https://www.open.edu/openlearnt/mod/oucontent/view.php?id=79999&section=5.1)

Water can also be drawn from a well using a rope pump. A long continuous loop of rope, with washers at regularly spaced intervals, runs around a wheel at the top of a well and around a smaller roller encased below the water line. The rope runs through a PVC pipe and, as the wheel

is turned, water is drawn up the pipe by suction. A rope pump can be made recycled parts, such as bicycle wheels, scrap metal and plastic, and it can be mended quickly and cheaply.

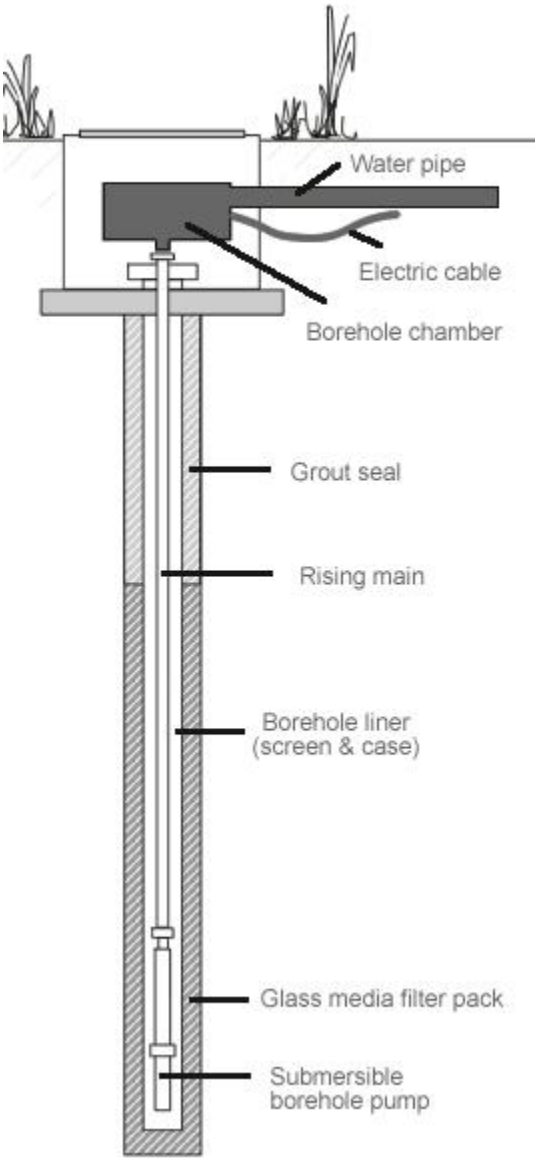
2.1.9 Deep Well or Boreholes

These are wells that have been sunk with drilling machines designed for constructing water extraction boreholes. These machines are able to penetrate through harder material that cannot be tackled by hand digging and can therefore pass through at least one impermeable layer of rock to a productive aquifer underneath. They typically obtain water from depths ranging from 30 to 60 m, but large urban supply boreholes can be much deeper than this. A casing of metal or plastic pipe is usually necessary to line the borehole and prevent the soil and rock from collapsing into it. The lower part of the casing must have suitable openings to allow water to enter the borehole from the aquifer, although in hard rocks- such as some of the volcanic aquifers of Ethiopia -the borehole can be left open and will not collapse.

Plate 2: Drilling rig for a borehole

Source: Study Session 3 Water Sources and their Characteristics (https://www.open.edu/openlearnt/mod/oucontent/view.php?id=79999&section=5.1)

Fig.5: A Borehole.



Source: Study Session 3 Water Sources and their Characteristics (https://www.open.edu/openlearnt/mod/oucontent/view.php?id=79999&section=5.1)

At the surface, different types of pumps may be used including hand pumps. For larger boreholes in urban areas electric or diesel-powered pumps would be used.

Plate: 3 Borehole with manual hand pump

Source: Study Session 3 Water Sources and their Characteristics (https://www.open.edu/openlearnt/mod/oucontent/view.php?id=79999&section=5.1)

2.2.0 Water Demand

1. Water Demand Management (WDM) or Economic of water supply.

2. The concept of water demand management explains the management of water resources which entails better use of existing water supplies instead of automatically investing in new supply capacity to satisfy imagined future requirement supply augmentation. It can therefore be defined as those conservation measures that improve water use efficiently, increase water uses, recycling and minimizing water wastage (Emeka, 1978).

3. The concept advocates the wise and judicious use of available water to meet the demand capacity without unnecessarily embarking on new water projects. (Dracup,1978), funnel, and hey, (1974), National Water Commission, (1973) in Ojo (1985). The concept of WDM has given

rise to different slogans from its advocates for example waste not, want not, (Carrol, 2003) and lets water better (Short, 2003). This concept therefore calls for adoption of practice that will ensure efficient use of water. For example, the use of water saving services, curtail water loss from the distribution network or the point of consumption. Also, appropriate pricing of water is needed to recoup at least a sizeable amount of maintenance and operation. In addition to the above, the water demand management also calls for integrated approach, which would not only create sufficient distribution network, but also allow unhindered and relatively inexpensive extension of utilities to new demands areas. In this case, the public and private sectors are encouraged in this option to participate in the supply and management of water to ensure its sustainability.

2.2.1 Municipal Water Consumption

Water consumption in a community is characterized by several types of demand, including domestic, public, commercial, and industrial uses. Domestic demand includes water for drinking, cooking, washing, laundering, and other household functions. Public demand includes water for fire protection, street cleaning, and use in schools and other public buildings. Commercial and industrial demands include water for stores, offices, hotels, laundries, restaurants, and most manufacturing plants. There is usually a wide variation in total water demand among different communities. This variation depends on population, geographic location, climate, the extent of local commercial and industrial activity, and the cost of water. Water use or demand is expressed numerically by average daily consumption per Capita (per person). In the United States the average is approximately 380 liters (100 gallons) per capita per day for domestic and public needs. Overall, the average total demand is about 680 liters (180 gallons) per capita per day, when commercial and industrial water uses are included. (These figures do not include withdrawals from freshwater sources for such purposes as crop irrigation or cooling operations at electric power-generating facilities.) Water consumption in some developing countries may average as little as 15 liters (4 gallons) per capita per day. The world average is estimated to be approximately 60 litres (16 gallons) per person per day.

2.2.2 Europe Experience

Water shortages are increasingly making news headlines around the world with cities such as Cape Town, South Africa, and Cairo, Egypt- already facing or expected to face severe shortages in water supply. With many major rivers and lakes scattered across its territory, Europe might appear unaffected by water shortages or water stress. This is not at all the case. In fact, water stress is a problem that affects millions around the world, including over 100 million people in Europe. Similar to many regions in the rest of the world, worries Over water stress and scarcity are increasing in Europe too, amid an increased risk of droughts due to climate change. About 88.2 % of Europe's freshwater use (drinking and other uses) comes from rivers and groundwater, while the rest comes from Reservoirs (10.3 %) and Lakes (1,5 %), which makes these sources extremely vulnerable to threats posed by over-exploitation, pollution and climate change.

2.2.3 Water Quantity Under Pressure

Like any other vital resource or living organism, water can come under pressure, especially when demand for it exceeds supply or poor quality restricts its use. Climate Conditions and water demand are the two key factors that drive water stress. Such pressure on water causes a deterioration of freshwater resources in terms of quantity (over-exploitation or drought) and quality (pollution and eutrophication). Despite the relative abundance of freshwater resources in parts of Europe, water availability and socio-cconomic activity are unevenly distributed. leading to major differences in levels of water stress over seasons and regions. Water demand across Europe has steadily increased over the past 50 years, partly due to population growth. This has led to an overall decrease in renewable water resources per capita by 24 o across Europe. This decrease is particularly evident in southern Europe, caused mainly by lower precipitation levels, according to an EEA indicator. For instance, in the summer of 2015, renewable freshwater resources (such as groundwater, lakes, rivers or reservoirs) were 20 % less than in the same period in 2014 because of a 10 % net drop in precipitation. More people moving to cities and towns has also impacted demand, especially in densely populated areas. The EEA estimates that around one third of the EU territory is exposed to water stress conditions, either permanently or temporarily. Countries such as Greece, Portugal and Spain have already seen severe droughts during the summer months, but water scarcity is also becoming an issue in northern regions, including parts of the United Kingdom and Germany. Agricultural areas with intensive irrigation, islands in southern Europe popular with tourists and large urban agglomerations are deemed to

be the biggest water stress hotspots. Water shortages are expected to become more frequent because of climate change. However, improvements in water efficiency and management of water supplies have resulted in an overall decrease in total water abstraction of 19 % since 1990. Recent case studies analyzed in an EEA briefing found that the EU's water policies encourage Member States to implement better water management practices, especially when it comes to water pricing policies in combination with other measures such as public awareness campaigns promoting water efficiency through using water-saving devices.

2.2.4 Water Uses In Urban And Rural Areas

The major sectors of human water use are: (a) domestic consumption: (6) industrial production, (c) agricultural production (including livestock): and (d) recreational uses. Although domestic and industrial uses are usually associated with urban demand land agriculture with rural demand), a closer look indicates that all of these uses cut across rural, peri-urban, and urban divisions.

2.2.5 Domestic Water Consumption

Most societies and national policies accord highest priority to water for direct human consumption, including drinking, cooking, bathing, and cleaning. Lack of access to sufficient water for drinking and bathing increases the spread of many water-borne and water-washed diseases, especially diarrheal and skin diseases. Furthermore, domestic water should be of good quality. Both bacterial and chemical contamination can also cause disease (Van der Hoek, 2001). Defining basic human needs for water is difficult. Gleick (1999) estimates an average need of five liters/capita/day for drinking, plus 10 for food preparation, 15 for bathing, and 20 for basic hygiene and sanitation-making a total of 50 liters/capita/day. How- ever, domestic water demand is not simply a multiple of the population size. Per capita demand increases with urbanization and rising incomes. Rural water supply systems in India, for example, use a norm of 40 liters/capita/day for domestic use without house- hold piped connections, where it is assumed that other water sources can be used for bathing and washing clothes. Urban areas with piped water supply but no underground sewerage in India use 70 liters/capita/day, while India's urban areas with underground sewerage use 125 liters/capita/day, as in most major cities (MIDS, 1995). These norms refer to basic levels; water demand can rise even further with rising

incomes. Residential use in Europe. For example, averages around 200 liters/capita/day, and in the United States, 400 liters/capita/day (Cosgrove & Rijsberman, 2000). By Indiun standards, a population of one million people would require: 146 million cubic meters per year delivered o the end-users tor domestic water supply in rural areas; 25.5 million cubic meters for piped urban supplies but no sewerage; and 45.6 million cubic meters for sewerage. The same one million population in the United States would require 146 million cubic meters (plus transit losses). Despite the recognized importance of domestic water supplies, an estimated 1.I billion people worldwide do not have access to an adequate quantity or quality of domes- tic water. At least 2.2 million die annually of diarrheal diseases alone (WHO & UNICEF, 2000). This problem cuts across rural and urban divides. In rural areas, women and children often walk several kilometers to collect water. But urban dwellers are not necessarily better off. Both Lagos and Abidjan have average municipal water supplies of only 40-45 liters/capita/day for their entire populations. Nairobi has a mere 17.7 liters/capita/ day, and Lome and Accra supply less than 10 liters (UNCHS, 1998). Even in cities with high average domestic water consumption, many people- especially those living in slums and peri-urban areas do not receive an adequate share of the municipal supplies. A study in nine East African cities recorded a decrease from the late 1960s to the late 1990s in both (a) the proportion of households with piped water at their homes, and (b) the availability of water in the municipal systems. For those without household pipe connections, collection time for travel and queuing tripled from less than half an hour to more than an hour and a half per day, with private kiosks having the highest collection times (Thomp- son et al., 2000).

2.2.6 Industrial Water Use

Beyond domestic water needs, water is an input into the economic development process. Industrial production requires water, although the exact amount varies depending on the industry and the technology used. Because of the clustering of factories in cities, industrial demand forms a significant amount of urban water demand. However, a growing number of factories in rural areas also demand water. Industries not only require water for the manufacturing process itself but also for cooling or cleaning. This allows for the possibility of recycling water in factories.

2.2.7 Agricultural Water Use.

Agriculture is the largest water-consumption sector worldwide, especially in developing countries. Irrigation has been and will continue to be critical to achieving food security. Worldwide, irrigated agriculture contributes nearly 40 percent of total Food production on 17 percent of the global cultivated area. Irrigated production supplies over 60 percent of the food in India and nearly 70 percent of the grain in China (Rosegrant & Ringler, 1998). Controlled water supplies were critical to the dramatic yield increases of the Green Revolution period of the 1960s-1980s, which allowed per capita food consumption to go up in developing countries (especially in Asia) despite increases in overall population. The increased food production needed to supply the growing urban and rural populations of the future will likely require even more irrigation: the International Water Management Institute (IWM) estimates that 17 percent more water will be needed for irrigation by 2025 to meet food demand (IWMI, 2000). Many irrigation systems appear to use water inefficiently, so that crop production itself consumes a relatively low fraction of the water diverted. For example, with surface water applications, only one- to two-thirds of the water applied at the field level goes directly for crop growth, with the rest seeping away or evaporating. Consequently, it appears that cither increasing irrigation efficiency or reducing water losses (such as through new irrigation technology or management practices) would free up significant water for other uses, especially municipal and industrial uses. However, this process is not as simple as it seems: unused water from irrigating one field often becomes a source of water further downstream. Thus, overall basin-level efficiencies are generally much higher than they seem, leaving less "unused" water than is assumed (Seckler, 1996). Within the agricultural sector, crop production receives the greatest attention, but fish and livestock also require water. Animals (including fish) consume a relatively small volume of water 1 comparison to crop consumption and can produce a very high value of output (Bakker et al, 1999). Moreover, as worldwide demand for animal products increases, the importance of supplying water for aquaculture and livestock is also likely to increase. In terms of water quality, agricultural production does not require its water supplies to be as clean as those for domestic use. However, crop production is very sensitive to salinity levels and to some industrial pollutants. Treated sewage can actually provide nutrients to crops, but the danger from contamination depends on how and where the crops are used in the food chain (e.g.. vegetables that are eaten fresh are most susceptible, followed by grain and tree crops; danger of contamination is least for fiber or fuel crops). Furthermore, continuous use of recycled sewage

can lead to build-up of salts that make the soil unproductive. Meanwhile, agrochemicals in the runoff from irrigation systems can become a significant source of water pollution. Fertilizer runoff can cause eutrophication (excess al-gaegrowth) of water bodies and pesticide residues can be toxic for fish and human consumption. Although agriculture is a predominantly rural activity, urban agriculture is also significant. An estimated 800 million people worldwide take part in urban agriculture, with 150 million full-time farmers (UNDP. 1996). Gardens in cities and peri-urban areas contribute significantly to incomes, food Security, and nutritional quality of diets, especially for the poor. Livestock production (including dairy) is also a significant source of income and micronutrients, while trees contribute to food, fuel, and air quality as they improve the overall urban environment (Smit &Nasr, 1992). All of this activity requires water drawn from municipal systems, local wells, water harvesting, or recycled wastewater. Providing water for utilitarian purposes (production and domestic consumption) alone is not enough; people also demand water for recreational and aesthetic purposes. Orna- mental gardens, lawns, swimming pools, and golf courses may not be considered "essential" water uses, but demand for such uses rises with income levels. They thus need to be included in long-term plans for water supplies or managing water demand. In sum, stereotypical images of "thirsty cities" that equate (a) urban demand with drinking water or factories, and (b) rural water supply with irrigation do not adequately portray the water uses in each area. Rural areas also need domestic water supply:; and with rural industrialization, factories are increasingly drawing water (and discharging wastes) in rural areas. Nor should the water use of urban agriculture and landscaping be overlooked.

2.2.8 Factors Determining Domestic Water Use

Many of the water projects implemented over the last three decades in developing Countries are considered failures (World Bank 1992). Experts from a variety of disciplines have examined factors determining success. They identified knowledge of the health benefits of improved water supplies, affordability of tariffs, sensitivity by donor and the central government to local customs and beliefs, the ability to operate and maintain water systems by the local population, as well as community participation and local involvement in design and management as important factors for rural people to use improved water sources (Brookshireet al. 1993).

Regarding the supply side, economics studies have emphasized the importance of improving project identification, design and construction, of understanding the institutions providing water

and their tendency towards selecting capital-intensive enterprises and neglecting maintenance schemes, and of establishing strategic links between the water vestment sector and other macroeconomic policies (Howe and Dixon 1993; Rogers et al.1993). On the demand side, the economic literature focuses on the valuation by households different water sources and the analysis of determinants of water demand. Several studies conducted in developing countries over the past ten years have tried to evaluate the willingness to pay (WIP) for improved water supply by applying the contingent valuation approach (Whittington et al. 1990, 1991: Atlaf et al 1993, 1994; Briscoe et al. I990; World Bank Water (Demand Research Team 1993). The empirical results of all these studies show that the willingness to pay to improved water service does not depend solely on income, but equally on the characteristics of both the existing and the improved supplies. Income is often not the main 1actor determining water demand. The share of income that a household is willing to pay for water can vary widely from 0.5% to 10%. Moreover, income elasticities of demand for access to improved water services have been estimated to be very low, for example, 0.15 in Brazil, 0.14 in India, 0.07 in Zimbabwe (World Bank Water Demand Research Team 1993). Furthermore., empirical analysis showed that more educated households are willing to pay more for improved water supplies; and that gender was a statistically significant determinant in WTP for improved water supply. However, the direction of the relationship between gender and WTP depends on the specific cultural context.

A second group of factors influencing demand for improved water supply relate to the characteristics of the existing water source versus those of the improved supply, including the cost (both financial and opportunity cost of time for collecting water), the quality, and the reliability of supply. A third set of characteristics influencing households' WTP relates to their attitude towards government water supply policy and their sense of entitlement to government service (World Bank Water Demand Research Team 1993). A more recent study looked a household water demand for improved piped water services in Kathmandu, Nepal (Whittington et.al. 2002). Here respondents were asked how they would vote given they will vote given the choice between their existing water supply situation and an improved water service provided by a private operator. The study showed that households' willingness to pay for improved water services was much higher than the existing water bills. Using a discrete choice model of household water source decisions. Mu et al. (990) emphasizes the heterogeneous good characteristics of water in less developed countries. They argue that unavailability and bad

quality of data, as well as the lack of variation in prices in many developing countries are a major constraint to using the price-quantity approach. the authors therefore limit their analysis to the type of water source households choose, instead of considering the simultaneous choice of quantity and source.

The underlying assumption is that a household chooses the source independently of the amount of water used. Merret (2002) criticizes the previous methodologies because they do not take into account the multiple uses of water and their relationship to multiple sourcing. He suggests that behavioral studies into the domestic demand for water and wastewater services in low-income countries should be based on semi-structured interviews and incorporates the scale and composition of use and reuse and their relation to the quality of water. Madanat and Humplick (1993) actually implement an approach that takes Merret's suggested direction, considering the conditional demand for water by households according to each specific us withina multiple-stage-analysis framework, assuming that households only use one source for each specific use. This assumption is problematic, however. In the household survey for Ghana, for example, the majority of households use several sources for one activity, and water from one source is typically used for several activities.

Asante et al. (2002) analyze the access to different types of drinking water sources and the choice among sources for households in the Volta Basin in Ghana. They also provide an analysis of water-related diseases and relate migration to water access in the region. Their study finds that between 25-75 percent of households in the region use improved water Sources. They also find a higher probability of out-migration in communities with scarce low-quality drinking water sources and that education and household income are explanatory factors for households using improved water sources. However, due to lack of data, their analysis does not consider costs incurred by households using improved water sources, possible omitted variable bias in their analysis. The majority of the above-mentioned studies do not consider the fact that households facing deterrent pricing systems are subject to different decision processes. Merret (2002), for example, notes about the maximum willingness-to-pay approach that "...it lacks any clear meaning for a respondent who faces a volumetric pricing tariff for the scenario project. The maximum willingness to pay can have a practical significance only when it applies, for example, to a monthly fixed charge for access to a water supply. The results should be represented as that

fixed charge and not as a unit price, for the only sense attributable to the lathering this case is the statistical ratio of the fixed charge to the unknown volume of water used, a ratio the user never computes." Related to this is the fact that the pricing system has an important impact on decision-making and on water use choices. For example, a price charged per unit of water consumed implies a marginal price of water that is positive, while a that rate charged once per season or year implies a marginal price of zero and can be considered more like an investment decision. Our study will consider these issues by explicitly comparing determinants of the choice of water source for different pricing systems.

Structures of social relations determine who participates in a project and how the benefits off the project are distributed. Community management of improved water resources is based on the assumption that citizen involvement in planning decisions will foster both efficiency and equity. Lovei and Whittington (1993) point out that community participation in decisions and local control of water utilities is desired, in order to avoid rent-extracting behavior of agents that are able to gain control of water sources, restrict supply to users, and raise the water price.

Njoh (2002) underscores the importance of a participatory approach in water projects avoid problems such as a paternalistic posture of authorities, a prescriptive role of the state. selective participation, intra/inter-group conflicts, gate-keeping by leaders, excessive pressures for immediate results, and implementation problems because of lack of know ledge about belief systems. Rigorous analysis of who in the community actually participates in such projects is, however, missing. Weinberger and Juetting (2002) provide a theoretical framework to identify the determinants of participation. Their empirical analysis of two field sites in Chad and Kashmir suggests a "middle-class effect "in terms of income characteristics and a positive effect of membership in other informal groups, but renders inconclusive outcomes for the effect of bargaining power of individuals. However, their "middle-class effect" analysis, based on two separate regressions, needs further study. In our analysis below we test for the middle-class effect in a single regression. Furthermore, we directly link the participation decision to the water use decision.

2.2.9.1 Factor Militating Against The Provision Of Safe Water In Nigeria

2.2.9.2 Infrastructure Decay: Apart from the role of water contamination, infrastructure decay has also increased the challenges of water supply in some parts of Nigeria. Many water facilities are obsolete and in the state of total disrepair thus, remained cosmetic figures. There are many hands operated taps across the country, which remained dry most of the time. Paradoxically, irregular water supply itself hastens the deterioration of water equipment. It is responsible for pipes damages, rust and leakages, which further compounds the problem of Water supply (Yunusa, 2001).

2.2.9.3 Inadequate Power Supply: Electricity supply is instrumental to adequate provision of potable water to the masses. However, with the erratic power supply being experienced by he urban and rural communities, this is very different. Research has shown that power generating capacity of Nigeria's power station is 5400 Megawatts (MW) but just 1, 600 90) MW was generated. It further demonstrated that 37,500 MW was required to meet global benchmark, but only less than 3000 MW was actually realized in the 4th and 1st quarter of 2007 and 2008 respectively This indicates a per capita consumption rate of 27 KW hr per person while the world per capita consumption was fixed at 2500 KWhr per person Mawaii and Aminu, 2010) Diverse socio-economic activities including water generation and distribution are to a considerable extent dependent on sufficient power supply the absence of which has adverse consequences for the nation. In a study on the water question in Zaria, Y unusa (2001) succinctly informs that the water plants require a minimum require a minimum 22.4 hours of electricity supply per day the public corporation that supplies electricity to the water plants and pump stations supplies only about 5 hours of electricity daily in Auchi The result is the gross under supply of water to the entire city as the water equipment lie idle.

2.2.9.4 Under Funding: Funding, a critical factor to facilitate water supply is grossly inadequate. For instance, funds are required to be expend on the refurbishing or building of more laboratories for the implementation of water quality and control initiatives. The establishment of Hydrometer Data Collection Centers and refurbishing the existing ones in conformity with World Meteorological Organization (WMO) Specifications: for the provision of Chlorine and Water Treatment Plants, Water Preservation and Storage Facilities (provision of over-head tanks, etc.); and Generating Sets, development of more Water Basins and Dams, motorized bore-holes,

hand operated taps, and other related equipment. A closer examination of the Nigerian situation indicates that poor funding has resulted in infrastructure collapse in the water sector.

2.2.9.4 Industrial and Urban Pollution: The Niger Delta Region comprising Rivers, Bayelsa. Cross River. Delta, Edo, Akwa lbom, Abia, Imo and Ondo States, has been plagued with environmental degradation affecting negatively not only on drinking water, water resources vegetation, wild life but also on soil fertility. This was the devastating consequences of oil spillage and gas flaring in the region. Oil spillage has become a recurrent phenomenon in the area. network of pipelines that transport crude oil to refineries transverse farmlands, waterways and fishing grounds and over time some get eroded and burst and this is synonymous with the area under study. This coupled with the unpatriotic activities as if oil bunkering has increased the malaise. The studies conducted by Ukase (2009) indicate that between 1982 -1992, there was the spillage of over 1.6 million gallons of oil on the environment by Shell Petroleum alone. Moreover, in contemporary times, the same company records 200 separate spillages per annum. He further shows that over 2,300 cubic meters of crude oil in 300, different incidents were spilled into the river from 1999 2008 by the oil companies (Ukase, 2009). Indeed, the various Multi-National Oil Companies such as Mobil Oil (Exxon- Mobil), Chevron, Shell Petroleum Development Company and Agip operating in the region have not adequately succeeded in resuscitating the facilities including the sources of drinking water destroyed by their oil exploration. Thus, the masses are left to suffer from water scarcity.

The implication of this is the occurrence of acid rains and the acidification of sources of fresh water rendering it unfit for human consumption. Moreover, it was this degradation of the environment that informed youth restiveness in the region and posed a serious challenge to national development in the 21st century, but for the Amnesty Program. In addition to oil spillage and gas flaring, some sources of fresh water supply such as streams, rivers, and lakes have also been polluted through the emission of untreated industrial fluid waste and chemical substances into them. It is undoubtedly true that the effects of all these are not limited to aquatic beings but humans and animals as well since safe fresh water is a basic necessity to all. In addition, the generation of massive wastewater by residents preponderance of refuge dumps, toxic waste and open defecation in some areas to a considerable extent has played its role in contaminating fresh water.

2.2.9.6 Corruption: It is also worthwhile to note that corruption in the award of water Contracts has played an instrumental role in contributing to water Scarcity plaguing most Nigerians today. The implication is increased water challenges and resources that would otherwise be utilize to boost the functionalities of other sectors of the economy are wasted and siphoned.

2.2.9.7 Demographic Changes: The astronomical rise in population is another formidable factor militating against adequate provision of water to the citizenry, indeed, in the first decade after the attainment of political independence, the population of Nigeria could be view as moderate. However, the 1991 census result reported by the National Population Commission placed the Nigerian population at 88 million and the population census of 2006 presented the total estimate of over 140 million people. This shows that within 15 years after the 1991 census, our population soared with about 52 million people (Mamman, 1994). Currently, the Nigerian population is over 160 million. Paradoxically, there has been noticeable proliferation of rural- urban migration in Nigeria due to increased urbanization, which has its root after 1945.

Migrations were influenced by the development of communication, transportation. Extraction of mineral resources and water coupled with the atmosphere of commercialization industrialization and administration (Oyedele, 1995). According to Mamman (1994). The ethnic composition of the migrants suggesting the preponderance of the Igbos, Yoruba and other ethnic extractions in the urban centers of the North and some Hausa migrants in the South. In explaining the causes of migration of people into these areas, Mamman (1994) remarks that it was stimulated by the oil boom of the 1970s and the attendant construction boom for the provision of public works and services, private residential development, office and road construction coupled with the local government reforms of the 1970s and 1980s. he transfer of Nigerian capital caused influx of migrants to the Middle Belt from Lagos to Abuja in the 1990s in addition to the erection of the Ajaokuta Iron and Steel Complex (Mamman, 1994).

The poverty rate is also on the increase and it is more critical in the rural areas with attendant lower access to public services and infrastructure like schools, health facilities. roads, water and electricity (Mbafor and Kinge, 2008). Atempts at Addressing the Water Question in Nigeria Between 1999 -2002, the Obasanjo Administration executed a number of projects in the various States of the federation in a bid to resuscitate water supply. A few examples are presented here. Lagos State in the South West, witnessed the drilling of boreholes in Ifako-ljaye and Ise-Epe

Local Government Areas in addition to the provision of water to Lagos East, West and Central Senatorial Districts. There was the execution of water project worth 13.6 billion Naira in Rivers State. These included the Otamiri water project in nine local government areas of the State, in Port Harcourt and a host of others. In Benue State of North Central Nigeria, 618 million naira was expended on the water resources sector resulting in the construction of dams at Adoka, Ughoju, Igumade water works, the provision of boreholes at Oju and Obi, water supply scheme in Gboko, Tarka, Makardi, Naka, Aliade, Guma and Buruku including the Katsina-Ala River Project and other related issues. A similar gesture was carried out in Sokoto State situated in the North West part of the country. Bore holes were sunk in Bakolori, DadinMahe, Tidibale and Katani coupled with the rehabilitation of the Goronyo Dam to facilitate water supply to Sokoto, Argungu, BirninKebbi and other places. In Bornu State in the North East, the Alau Dam Project and the Biu Water Project were revamp and completed. Boreholes were provided in Bayo, Shani, Kwaya, Chibok, Jere. Askira, Uba, Bama, LawantiGamborul ungushe, Malam Macdora, Marte, Mongono, enc. Analysis Magazine, January, 2003).

The water related projects so executed by the Federal government was to supplement the role of the various State governments whose responsibility it is to ensure the flow of urban water supply in the 36 States of the federation. Subsequent regimes for example, the maru Yar'Adua administration also paid attention to the water resources sector, which culminated in the dredging of the River Niger. On its part, the MDGs in Nigeria made available sale drinking water and improved health care facilities to 26 million people between 2007 and 2009 (Mohammed, 2011). However, a critical assessment of Nigerian population. which is currently over 160 million, indicates that much work is required to satisfy the thirst of several million persons in need of water in the country. Due to its population factor, the daily water need of Lagos for example, was fixed at 500 million gallons but what was provided by the State was barely over 200 million gallons a day, which is obviously not up to half of what was required. Although, by 2010, the State government embarked on further construction of water works and power projects (Alao, 2011) the people of Lagos are still plagued with water scarcity. Kaduna State with a population of over 7 million has been experiencing acute water shortage especially in the Zaria axis. The Kaduna State government purportedly sank several billion of naira to resuscitate water supply across the State: yet, most parts of Zaria are still confronted with the problem (Omeayo, 2010).

With the persistent water problems in Zaria, in February 2011, some youths embarked on demonstration to express their dissatisfaction over the situation including the constant power failure in the area. This indicates the unbearable degree to which the water question has reached in Zaria that compelled the youths to openly protest (Liman, 2011). The role of donor agencies should not be ignored. It was reported that the sum of 26-billion-naira Intervention grant was made to the Niger-Delta States of Bayelsa, Delta, Edo and Rivers by the European Union to be expended on water Supply and sanitation services by 2012 in order to assist Nigeria on her millennium development goals on water by 2015.even the oil Companies that have degraded the ecosystem in the Niger Delta have been required to allocate 3% of their annual budget to the Niger Delta Development Commission saddled with the responsibility of ensuring the rejuvenation of the area (Akanmu, 2011 and Emordi and Azelaman, 2009)

In fact, it is pertinent to argue now that the whole question of water scarcity is paradoxical because Nigeria is endowed with sufficient bodies of water. For example, about 2/3 of the country lies in the watershed of the River Niger reputed to be one of Africa's longest and largest rivers in terms of its tributaries enjoyed by the people. Nigeria also has other rivers such as the Benue, Kaduna, Sokoto, and Anambra Rivers. There are also the Cross River. Ogun, Oshun and Osse Rivers and some of these rivers including the Niger and Benue Rivers eventually empty themselves into the Atlantic Occan. In the Northeastern. Part of the Country Rivers like the Komadugu Gana also exists with its tributaries and these flows into the Lake Chad. The nation also has the Kainji Lake constructed since the 1960s (Wakdok, 2011). However, in spite of the various rivers, lakes and dams Nigeria possesses which ought to be controlled to make sufficient water available for its citizenry and even surplus for export; they are plagued with water scarcity. This can partly be explained as the result of our behavior over the years. Water has been wasted and sources of fresh water allowed running wild and currently, they are increasingly becoming dry.

Even the River Basins established by the government since the 1970s with the aim of harnessing the nation's water resources. and which by 2000 were further saddled with the task of providing water for domestic, farming and industrial use have not function effectively In that direction, rather they diverted their attention to project execution thus, worsening People's plight of access to safe drinking water to date (Daily Trust Newspaper,. March 7. 2011). This, however, is not to

ignore the problem of climate change. Studies have demonstrated that between 1901- 2005, Nigeria experienced increased temperatures by 1.1 degree Celsius while the level of rainfall declined by 81mm. Surface water bodies are equally drying up. In fact, Lake Chad for example is shown to be currently 5.7o of its size in 960. The aftermath of increased temperature is rise in sea level claiming 3400km square of Nigerian coastal region while about 1-10 km arable land 1s affected with desertification in the Northern region (Muanya, 2011). The contention here however, is that if the available water in the country is well harnessed, the risk of thirst will be reduced. Undoubtedly, the Nigerian situation has not reached the case of Mexico, California, parts of Northern China. Some African countries and especially the Middle Eastern Region where there is water related conflicts. In fact, the battle in search of water in some parts of the world is so fierce that Barlow and Clarke (2002) argue that bottled water companies like Nestle, Coca Cola and Pepsi are in the scramble for new sources of water supply to sustain their business conglomerates. Moreover, that this phenomenon is worsening as corporate interests are buying up lands and water systems and proceed in search of new sources of supply when they are depleted.

Consequences of Inadequate Water Supply in Nigeria in analyzing the economic Consequences of the increase in inadequate water supply, it is necessary to bring into focus how this malaise has induced the incidence of privatization and commercialization of water. As early as the 1980s, private water sellers were already noticeable in some parts of the country like Lagos and have reached crescendo in 2011. Thus, the proliferation of private bole-holes and wells including commercial water tankers, sachet water sellers, among many others (Ali, 2009). Companies involved in the commercialization of water have been noted With the following characteristics- huge profits, the fixing of higher prices for water, disconnection of customers who are unable to pay their bills consistently, absence of transparency in their operations, indulgence in water quality reduction, bribery and corruption and so on. This is so because their central interest is profit maximization. A far-reaching economic consequence of water scarcity is that industries that are dependent on water as one of their inputs in the manufacturing of industrial goods could be incapacitated and where functional, the goods in question will be costly. the effect of this is worsened economic hardship for the populace. Socially, water scarcity has a devastating impact on sanitation and personal hygiene. Apart from that, most people Surfer from water borne

diseases like cholera diarrhea. guinea worm, river blindness, skin diseases in their bid to utilize water from sources other than treated water.

The World Health Organization Report shows that, "everyday 3,900 children die as a result of dirty water or poor hygiene" Also, studies have indicated that, diseases transmitted via human faces is the second top killer disease in the globe after respiratory diseases. In addition, the water problem is also connected with the 4 billion cases of diarrhea culminating in the death of 1.7 billion people annually in the world mostly children (Daily Trust Newspaper, March 7, 2011, p.32). This clearly suggests that, a lot needs to be done in the area of potable water supply worldwide and across the country because "Health is Wealth". The political implication of the challenges of water supply for any government, democratic or military is inducement of the impression of the absence of good governance. The denial of basic human rights, corruption and lack of accountability to the citizenry thus, the necessity for behavioral change on the part of the politicians to combat albeit effectively the water question in Nigeria. In fact, the United Nations predicted the possibility of water War in Nigeria by 2020, if the integrated water resources management and water efficiency Strategy are not implemented (Daily Trust Newspaper, March 7, 2011. p.32). Perhaps it can be averred that it was the attempt to avert water war in the country that necessitated the government's relentless effort in trying to surmount the water question. Nwankwere (2012) has indicated that due to the need to improve water supply above 58%, the current administration, has financed and witnessed the completion of several water related projects in Country. For instance, in Edo State (N2.5 billon) was expended, Plateau (N1 billion), Benue (N2.2 billion) with support from the State Government, Rivers State (N830 million), Taraba (N263 million), Bayelsa (N4.7 billion), Borno (N8.5 billion) and Sokoto (N40 million) There was also the rehabilitation of the main 33 dams and 28 earth dam nationwide. Again, the attempt to improve electricity Supply in the country also led to the Integration of dam projects with small hydropower schemes.

2.3.0 The Treatment Of Water

One of the major problems of developing countries of which Nigeria is inclusive is the problem of acute shortage of portable water as described by (WHO 2010). In Nigerian urban centers, there are problems is of water supply as a result conflicts and drought. This Is more pronounce in some areas including kuroko where increasing rural urban migration and shift in socio economic

activities have given rise to high use of essential resources like water. In kuroko, several attempts made to improve access to safe drinking water and ensure water safety by successive government all levels. These efforts include construction and provision of water networks in major locations of the town, construction of boreholes by several organizations and individuals, as well as the release of constituency allowance to legislators and local government authority to construct boreholes in their localities among others. Despite these efforts, access to safe drinking water is still a mirage to considerable proportion of the inhabitants of kuroko. Currently, kuroko is experiencing increasing water demand variability. uncontrolled development and high level of urbanization because of structural transformation and shift in economy leading to water supply problems. This situation compels the residents to resort to the traditional system of water supply through water vendors that source for water from streams, ponds and rivers to sell to the community at a very high price and specific period of the day in the week. (Bada, 2021) Water from these sources are not treated and are Prone to pollution and various health hazards as erosion often erode wastes into the various Streams and rivers where the water is sourced. The impact or the implementation principles to enhance water supply has not been thoroughly investigate among the resident. Also the relationship between water supply, accessibil1y and use and socio-economic development not yet been adequately interrogated. No adequate understanding there has not been much study strategies to water supply problems by households in kuroko. In the area of water supply in kuroko. this problem required immediate solution hence necessitated this research work to proffer solution to the issues of demand and supply of these essential resources in the area.

2.3.1 The Urban Water System

In urban settlements in low-and middle-income countries, water supply and sanitation provision typically leave a lot to be desired. Poorly functioning systems and low coverage inconvenience the inhabitants and allow infectious diseases to spread. Women bear a disproportionate share of the inconvenience, while infants and children bear a disproportionate share of the burden of disease.

The reasons for this problematic situation are many. Poverty is of course an underlying Problem in virtually all urban areas where water and sanitation inadequacies are Severe. Poor governance is an increasingly popular explanation for bad water management (World Water Assessment Programme, 2003). Rapid urban growth exacerbates the problem. Not everyone suffers, however. The wealthier segments of urban populations in developing countries often enjoy service levels similar to those in wealthy countries, or in any case substantially better than those available to their poorer co-inhabitants (McGranahan et al..2001). Great differences within low-income cities give room for parallel systems and variegated supply conditions. It is the urban poor who have to make do with the worst options, and it is tempting to dismiss these options as irrelevant to the future city that all should be aspiring to. There may be cases, however, where improving services from unacceptable options (including water vendors) can make a bigger difference to the wellbeing of the most deprived than can strive for "ideal solutions, such as universal piped water connections. The most convenient water supply, which is standard for all urban dwellers in wealthy countries, is water piped into the house from a reliable piped-water network. Such supplies rarely serve the urban poor of Africa, Asia and parts of Latin America a piped connection to the yard, however, can also constitute a fairly convenient service and may, as long as the water is forthcoming, Support good hygiene practices and, given adequate drainage. Safe water environments. In-house or yard connections are estimated to reach some 43 per cent of the urban population in Africa, and 77 per cent in both Asia and Latin America (WHO and UNICEF, 2000).

Those without functioning water connections or wells (in many cities beth water Connections and wells are of intermittent reliability) have to venture out to collect water from other sources, and often need to negotiate with other people. It is in this scramble to secure daily water needs where alternative systems of water resale and vending come in.

2.3.2 Private Initiatives In Water Provisioning

Given intermittent supply and low coverage of utility networks in many low-income Cities, there is great scope for alternative means of water provisioning. Small-scale private water providers are especially inclined to proliferate in (unserviced) informal areas, and in Cities with low connection rates and low levels of service (Conan and Paniagua, 2003).

The most common type of private initiative appears to be water vendors, including direct" vendors or resellers selling water to consumers from standpipes or household Connections, as well as distributing vendors, delivering water to people's homes. In urban areas in Africa and Asia, water kiosk stationary water sales points are particularly important (UN-HABITAT, 2003). It is difficult to say even roughly what share of the water market these vendors supply. Statistics often simply omit all of these vendors, even in urban centers with areas where vending is ubiquitous. Also, at the lower boundary it is difficult to distinguish between households sharing connections win their neighbors, and resellers who should be classified as vendors. At the upper boundary, on the other hand, it can be difficult to distinguish between a vendor selling water to a few hundred customers. Perhaps with the aid of some piping, and local companies operating small independent water networks. Even in comparatively heavily studied cities, it is usually difficult to provide more than a very crude estimate (plus or minus 30 per cent) of how much water vendors sell.

A rapidly emerging business is that of bottled or pre-packaged water. This ranges from industrially produced (and internationally traded) spring or mineral waters to home- produced (presumably boiled) water sold in plastic bags on the streets. Conan (2u03) estimates that 5- 20 per cent of the population in eight surveyed Asian cities drink bottled water. This increase is most likely a response to higher income levels, increased quality demands and the poor quality of the water provided by many utilities. In many developing countries, increasing numbers of bottling plants of various sizes are being established (Conan.2003; Elinaza, 2000). Khan and Siddique (2000) provide an example of a small business that could be seen as either a distributing vendor or a bottled-water producer.

2.3.4 European Effort To Improve Water Quality

Over the past 30 years substantial progress has been made by EU Member States to Improve the quality of Europe's freshwater bodies, thanks to EU rules, in particular the EU's Water Framework Directive, the Urban Waste Water Directive and the Drinking Water Directive. These key legislative texts underpin the EU's commitment to improve the state of Europe's water. The goal of EU policies is to significantly reduce the negative impacts of Pollution, over-abstraction and other pressures put on water and to ensure that a sufficient quality

of good-quality water is available for both human use and the environment Waste water treatment and reductions in the agricultural use of nitrogen and phosphorus have led in particular to significant improvements in water quality in recent decades. One of the tangible achievements is the substantial improvement in Europe's bathing waters at coastal and inland bathing Sites over the past 40 years. More than 21 500 sites across the EU were monitored in 2017, 85 % of which met the most stringent excellent standard. Thanks to the rules set out under EU legislation on bathing water and waste water. EU Member States have been able to tackle the contamination of bathing waters by sewage or water draining from farmland, which poses a risk to human health and water ecosystems. Today, despite the progress achieved, the overall environmental health of Europe's many water bodies remains precarious. The vast majority of Europe's lakes, rivers, estuaries and coastal waters struggle to meet the EU's minimum 'good' ecological status target under the EU Water Framework Directive, according to the EEA's recent report European waters -assessment of status and pressures 2018.

2.3.5 Africa/ America

Every day, the average American family uses about 552 gallons of water. Compare this to the average African family, which uses about 5 gallons of water a day. Most Americans get their water delivered to their home, usually through a tap. and can almost always count on it being sanitary. In the United States alone. almost 34 billion gallons of water are treated every day at water facilities. In developing countries, women have to walk an average of four miles a day to get water that may or may not be clean. This results in an average 40 billion work hours being lost each year in Africa. According to the UN, the average person needs between 20 and 50 liters (5.3-13.2 gallons) of water each day to satisfy their drinking, cooking, cleaning, and sanitation needs. however, 783 million people, or 11% the global population, still do not have access to clean drinking water, and 2.5 billion people live without basic sanitation.

In Sub-Saharan Africa, 12% of the health budget is used to treat diarrhea, and often, at least half of a hospital's beds are filled with people who have a fecal-related disease. Every 20 seconds, a child dies because of a lack of proper sanitation. Of Earth's 1.4 billion km3 of water, only 35 million km3 (2.5%) is fresh water. And of that, 24 million km3 (70%) is 1ce or permanent snow cover, another 30% is groundwater, 105,000 km3 (0.3%) is in freshwater lakes and rivers, and the atmosphere holds about 13,000 km3. This leaves about 200,000 km3, which is less than 1%

of all the water available on Earth, for human use, and even that must be split between humans and ecosystems. Over the past century, water use has grown at a rate twice that of the population increases. Right now, if the entire global population had the water habits of the average European or North American, we would need about three and a half Earths to sustain us.

By 2025, water withdrawals are expected to rise by 50% in developing countries and 18% in developed countries. In the United States, freshwater is divided into multiple uses: 41.5% is used for thermoelectric power, 37% for irrigation, 2.6% for aquaculture, 5% for industrial use, 8.5% for domestic use, and 5.4% goes to other publicly supplied users. The freshwater then used in the home usually gets broken down into these categories: 26.79% for the toilet, 21.7% for washing clothes, 16.8% for bathing, 15.7% for the faucets, 5.3% for other purposes, and 13.7% of the water is not used but wasted due to leaks. Each year, the average American home wastes 11,000 gallons of water from running toilets, dripping faucets, and other leaks. That's a total of I trillion gallons across the nation.

In Africa, though, the vast majority (85%) of the water used is used for agricultural Purpose another 10% of water is used in the household, and the remaining 5% is used industry. Right now about 40% of the global population is facing a shortage of water, but if the trend of high-water use continues, it could get a lot worst an estimated 1.8 billion people will be faced with severe water shortage and two-third of the global population will laced with severe water shortages and two-thirds of the global population will live in areas under pressure from a lack of water by the year 2025. By 2030, 47 o of the population will be lacing major water shortages. It's important to become more water-aware before it's too late. Doing simple things such as fixing leaks, taking shorter showers, turning off the tap when brushing your teeth or shaving, and washing full loads of dishes or clothes will help save a lot of water. If everyone is able to just do one or two of these things. Pretty soon all the water saved will start to add up, and the future will look a whole lot wetter.

2.3.6 Water Usage By The Numbers

Table 2.1: Quantity of water typically consume in some of our daily activities

Uses of Water	Numbers of Gallons
A full bath	About 36 gallons
A 10-minute shower	20 gallons
Average daily toilet flushes	19 – 24 gallons
Average dishwasher cycle	4 – 10 gallons
A wishing machine load	15 gallons
Drinking water	1 gallon
Hygiene	About 3 gallons

Source: Indiana American Water -June 28, 2021

2.3.7 Sanitation, Drinking-Water And Hygiene Status Overview In Nigeria

Nigeria is a party to the United Nations Declaration of the Right to Water, which entitles every one living in Nigeria to sufficient; affordable, safe and acceptable water for personal and domestic uses. The Federal Ministry of Water Resources (FMWR) is the lead agency for WASH activities in Nigeria. The Ministry works in collaboration with the national Task Group on Sanitation (NTGS) and development partners on sanitation and hygiene issues. The national standards and targets being followed areas stated in the Water road sector Map of 2010, the Vision20:2020, the Millennium Development Goals (MDGs) and the African Water Vision.

The primary responsibility for the provision of municipal and domestic water supply is that of the state and local governments. However, the federal government often intervenes to increase access in order to meet these targets. Although monitoring and evaluation are not taken seriously enough, there are pockets of monitoring activities in the WASH sector. The FMWR in collaboration with the NTGS carries out annual monitoring on sanitation and hygiene. National assessments on water and sanitation are carried out regularly and data generated from such monitoring activities are used for management decision-making. The waterworks are mostly owned and managed by the state governments, while the FMWR carries out independent water quality surveillance activities for these waterworks. The State Water Agencies carry out customer satisfaction surveys and use such information gathered to improve their services.

Access to water supply was 67% and access to sanitation facilities was 41% as of 2013. An estimated 100 million Nigerians still lack basic sanitation facilities and 63 million do not have access to improved source of drinking-water. Open defecation is still practiced by about a third of the rural population. Some 12% of the urban population also practices open defecation. While 75% of the urban population is served by improved water supply. Often people will collect water from vendors and carry water a good distance after collecting It in containers. Auchi areas, only about 42% of households have access to safe water, Thus, Nigeria is not likely to meet the MDG target of 75% coverage for improved drinking-water and 63% coverage for access to sanitation facilities by the year 2015.The human resources required to manage the water resources of the county are available within the country: however, the resources are not equitably distributed, as workers prefer working in urban rather than rural areas, Data in the area of financing are difficult to come by, almost agencies are usually are reluctant to release accurate data. However, there are plans in place to guide the channeling of funds for WASH activities. although the funds available for WASH are meager compared to the requirements. The structures required for adequate management are equally in place and they have the capacity to absorb any financial improvement in the sub-sector. Achieving more equitable provision of WASH services in Nigeria will require re-directing the little available resources to focus more on provision of WASH facilities in rural areas and the need to continue to subsidize the services in rural areas. Efforts are presently directed to the promotion of sanitation and improved hygiene in rural areas as evidenced by the increased promotion activities of the NTGS and development partners.

2.3.8 Water Quantity Demand In Nigeria

On the basis of water consumption per capital per day, the average domestic water requirement of a community is calculated. Typical water requirements for purpose of design as adopted by public utilities Board, Benin City is given in table 2.2

Table 2.2: Typical water requirement Standard of public utilities Board, Benin City

S/N	Community	Demand Rate (PCD)
1.	Federal and state capitals	130L
2.	Local Government Headquarters	130L
3.	Urban Towns	130L
4.	Rural Towns	100L

Source: Edo state public utilities Board 1990

Water demands in any community are a function of the water requirement of the community and are determined by. (a) Population (b) Climatic factors (C) habit and mode of living of the people (d) plumbing Facility sewage system (1) industry (g) capital (h) nearness of sources of water and water selection of suitable water source is the determination of the demand that would be place on it. The essential demand of that demand includes average daily consumption and peak rate demand. The average daily consumption must be estimate in order. (a) To determine availability of water source (b) To meet continuity demand during critical period when surface flow are low (c) To ascertain the quality of stored water that would sustain demand during the critical period.

The peak demand rate must be estimated to determine plumbing and pipe sizing pressure losses and storage facilities necessary. It supplies water during period of peak demand. The quantity of water supplied in any given community is determined by the average daily water use and peak period. Water demand is expressed in gallons per capital per day (GPCD), otherwise known as per capital consumption (PCC) or the quantity of water consumed by an individual per day. This varies with individual and community or municipality. It is expressed gallon per day (GPD). For example, in a community of 25,000 populations with an average consumption of 130 gallons per capital per day, the total consumption per day for the community is 3,750,000 gallons per day. For example Population 25.000 Gallons per capital per day (GPCD) - 150 gallons Total consumption = population x GPCD GC=25,000 x 150 3,750,000 gallons.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Introduction

The chapter contains the method and procedures that were used to collect and analyze data within the scope of study so as to enable the researcher accomplish the broad goal of the study. It involves a systematic gathering of data on demographic characteristics, the socio economic and environment activities, opinion or attitudes on the surrounding environment. Also, it's concerned with the way and manner various data for the study were extracted and analyzed in order to ensure objectivity in the level of work done. The data collection and analysis were based on the aim and objectives of the study. For the purpose of this research Work, various techniques and procedures were used to gather relevant data about the effect of Water scarcity on property value within the study area in the area.

3.2 Research Design

Research design is the researcher's overall exploration for answering the research question. it includes how data are to be collected, research instruments employed and how it used and method used for analyzing data collected. This will help to obtain the actual results that could be associated with the real situation and make useful inference about the Population sampled. The study employs a cross sectional design in an effort to examine the Effect of water scarcity on property value, a case study of Auchi, Edo State. It is survey-based research which entailed the use of survey questionnaire to collect information relating to the study from residents which were drawn carefully to represent the entire population of the study area. Therefore, this research design is basically survey and Observation methods.

3.3 Sources Of Data Collection

The task of data collection begins after a research problem has been defined and research design/plan checked out. Primary and Secondary data are to be collected in order to understand the effect of water scarcity on property value, a case study of Auchi Edo Sate.

3.4 Primary Source

The primary sources of data are those which are to be collected fresh for the first time and thus happen to be original in character. Primary data that are to be collected during the course of study were obtained through observation which is one of the major instruments for primary data collection in research generally; it is one of the earliest instruments used for scientific research. In the process of carrying out reconnaissance survey on the study area, Observation which will be beneficial to this work will be employed on the water supply. Management and related activities, Socio-economic development and environmental in the area. Questionnaires will also use to acquire information from respondents as an Instrument of data collection. The questionnaires were structured pertaining to the issues of the effect of water scarcity on property value to solicit relevant information from the residents, to achieve the objectives of the study.

3.5 Secondary Source

These are data obtained from second hand published or recorded sources and used for a purpose different from that of the agency that initially collected it from the field. It includes relevant information gathered from related literature compiled by both past and present Authors and writers on issues related to effect of water scarcity on property value, urban water supply and management. The aim is to accomplish their contribution and suggestions on the subject under study. Such materials considered includes text-books, journals. e-books, seminar papers, and dissertation, internet. materials which are published and unpublished. Also, publications of various scholars relating to the subject matter of the study is to be sourced for the study.

3.6 The Population Of The Study Area

Auchi town has an estimate population of 42,610 as indicated by the national Population commission (NPC) 1991. Using the growth rate of 3.4 % as stipulated by NPC (1991) for urban centers, the population was projected to 2022 and the total was 120,130. Population and household information are important characteristic factors in the selection criteria of a sample frame. The average family size in Nigeria is estimated at seven (7) Persons per family (NPC, 2006), there, this study is based on 7 persons per household as presented by NPC 2006. Hence, a

population total of 120,130 are estimated to 17,161 household in the study area. (See calculation in Appendix1)

3.6 The Sampling Procedure And Size

The questionnaire administration was done based on the household and there are 17,161 estimated household in the study area.

Since every household in the population cannot be examined by questionnaire. Hence, a total of 85 sample size representing 2.0% of the entire household was randomly selected to represent the entire population.

3.7 Methods Of Data Analysis

Basically, data that will be gotten from field survey will be analyzed. The variables from the questionnaire served as the basis for the data. For the purpose of this study both the descriptive statistics explanative are to use for the analysis of data collected from the field. The descriptive statistics include the use of figures, tables, maps, percentage to enhance visual impression. The use of explanatory paragraph is not left out and conclusions will be drawn from the result which was presented.

CHAPTER FOUR

4.0 DATA ANALYSIS AND PRESENTATION

4.1 INTRODCTION

The previous chapter considered the administration of questionnaire and method of data gathering. In this chapter, effort was made to analyze the data collected during the survey. The data will help to review the inherent problems and useful recommendations were given. This chapter presents the data collected with the questionnaire and the presentation of responses and interpretation of data obtained. This enabled the researcher to arrive at a reasonable interpretation in order to make necessary recommendations and suggestions for further research. Based on the population of the study, the researcher administered 85 questionnaires to respondents in the study area. Out of the 85 questionnaires that were administered. 84 (98.8%) were returned in valid and good condition. Systematic random sampling procedure was used to select the required number of respondents for the purpose of questionnaire administration. The questionnaire was designed as such that the respondents found it easy to Comprehend. Majority of the questionnaires were multiple choices in nature and cover all aspect of the objective of the study. The data collected were analyzed and presented as stated below:

BIO DATA

Table 4.1.1: Sex Distribution of Respondents in the Study Area

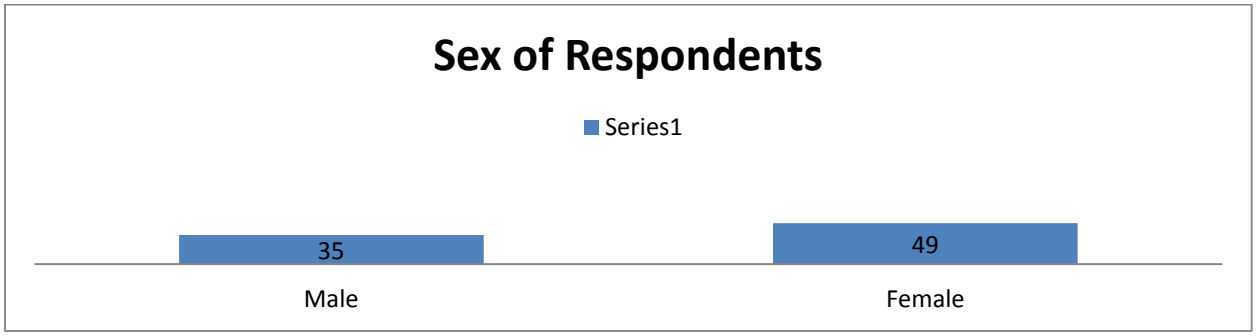


Table 4.1.1, above showed the distribution of respondent according to sex variable. Forty-nine(49) respondents (representing 58%) are male, while thirty-five(35) respondents (representing 42%) are female. From this analysis, it is clear that there were more Female

respondents than male respondents and they have more dominace the sex distribution with the study area.

Source: Field survey, 2022

Table 4.1.2: Marital Status of Respondents in the study Area

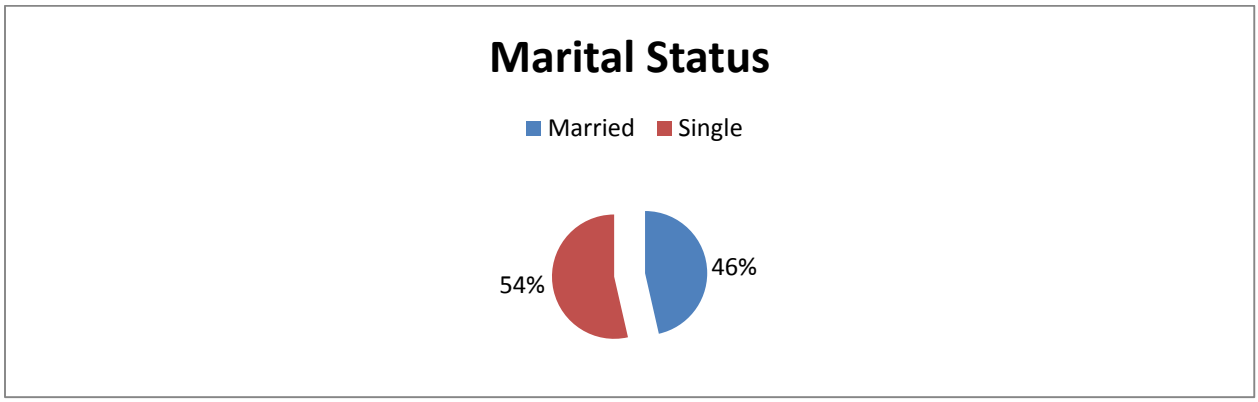


Table 4.1.2: shows the responses from the survey conducted in regards to the marital status of respondents, It was discovered that there is variation of respondents in terms of percentage. The respondents whose marital status are single where (45) 54%, and that of the respondents that where married is (39) 46%. This implied that the percentage of those that are single is supplementary and they are likely to consume more water because their population is higher.

Source: Field survey, 2022.

Table 4.1.3: Showing the household size of Respondents in the Study Area

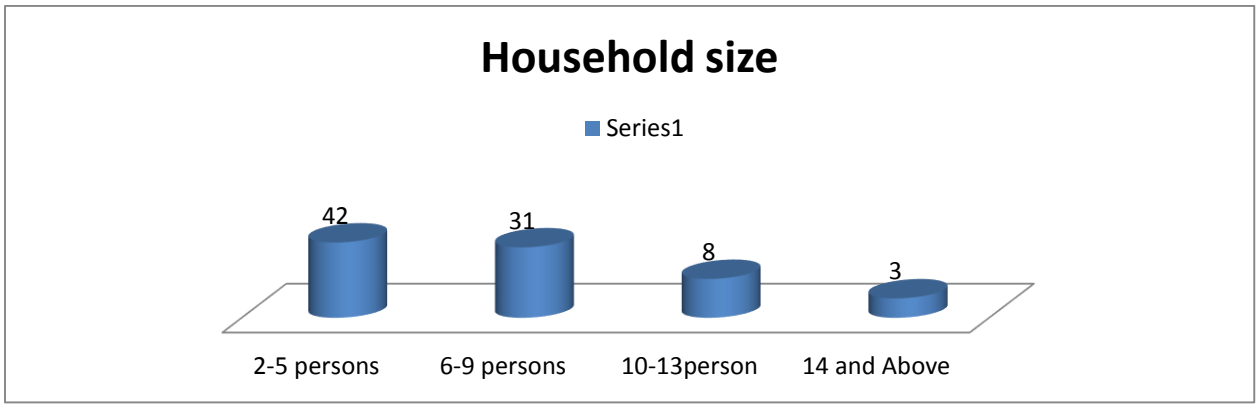


Table 4.1.3: shows the various household size distribution within the study are, which 2-5 persons where 42 (50%), 6-9 persons 31 (36%), 10-13persons 8 (10%) 14 and Above 3(4%).This implies that household size (2-5 persons) with 50% is more dominant within the study area.

Source: Field survey, 2022.

SOCIO-ECONOMIC DATA

Table 4.1.4: Showing the Occupation of Respondents in the Study Area

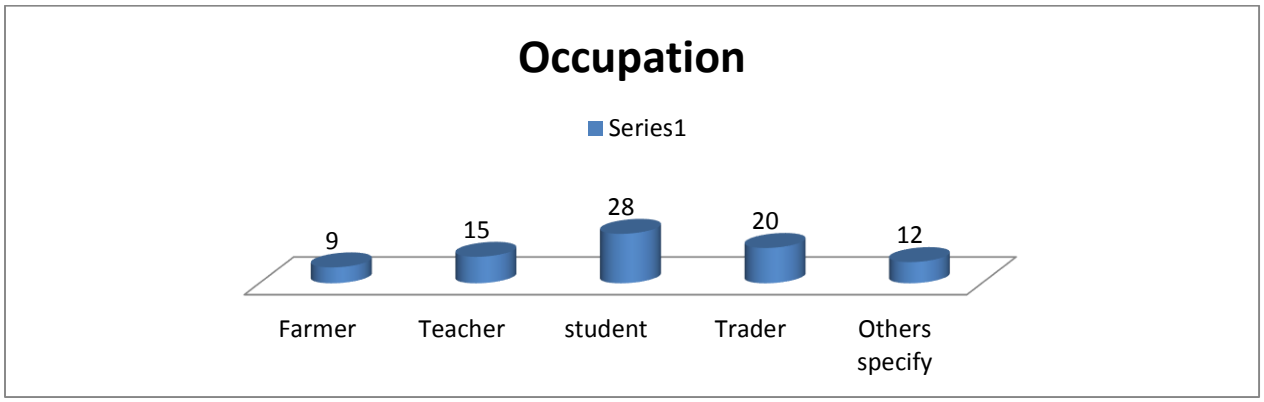


Table 4.1.4: this displays the occupation of respondents within the study area from the survey conducted. 9 (11%) are farmers, 15 (18%) are teachers, 28 (33%) are students, 20 (24%) are traders and others specify12 (14%) from the analysis, it shows that student are higher in the study area.

Source: Field survey, 2022

Table 4.1.5: Showing the Educational Background of Respondents in the study Area

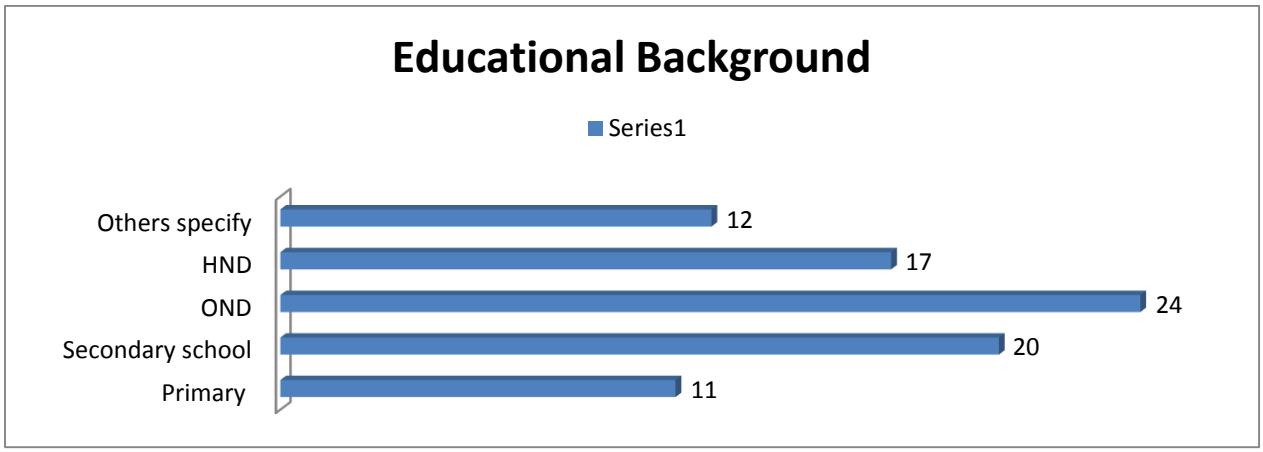


Table 4.1.6: shows the educational background analysis of responses from respondent from the survey carried out. It show that 11 (13.0%) primary education, secondary education 20 representing 23.8%, OND representing 24 (28.5%), HND representing 17 (20.2%), others specify representing 12 (14.2%) within the study area. From the analysis it shows that OND is higher when it come the educational background of the respondents in the study area.

Source: Field survey, 2022

Table 4.1.6: Showing the Monthly income of Respondents in the Study Area

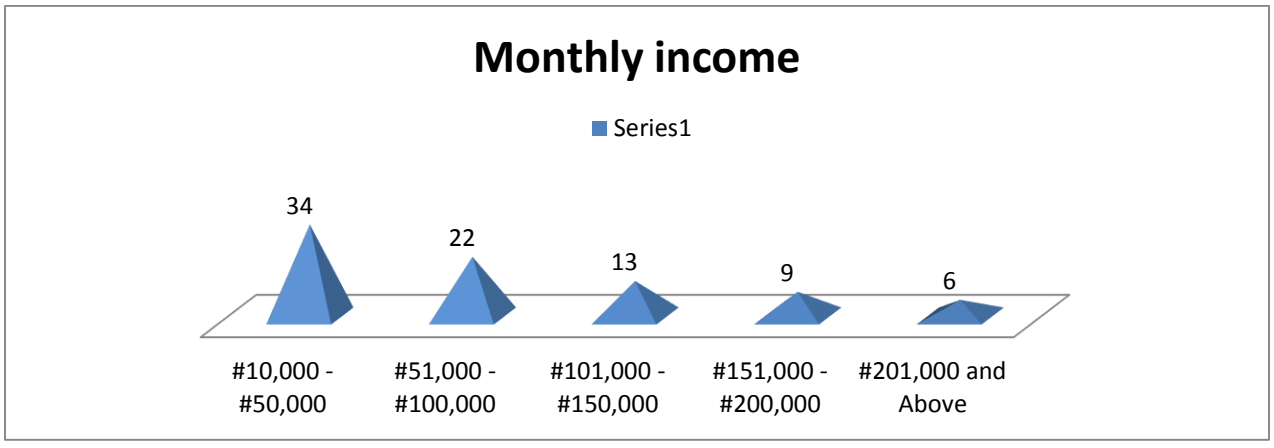


Table 4.1.7: shows the analysis of monthly income from the working group in the study area from responses from respondents during the field survey. It shows that, working group who earns #10,000 - #50,000 are 34 (40.4%) , #51,000 – 100,000 are 22 (26.1%), #101,000 - #150,000 are 13 (15.4%), #151, 000 - #200,000 are 9 (10.7%) and #201 and Above are 6 (7.1%) from the

analysis it interprets that, the working group who earns #10,000 - #50,000 is more higher in the study area.

Source: Field survey, 2022

Table 4.1.7: Showing the Location of Building in the Study Area

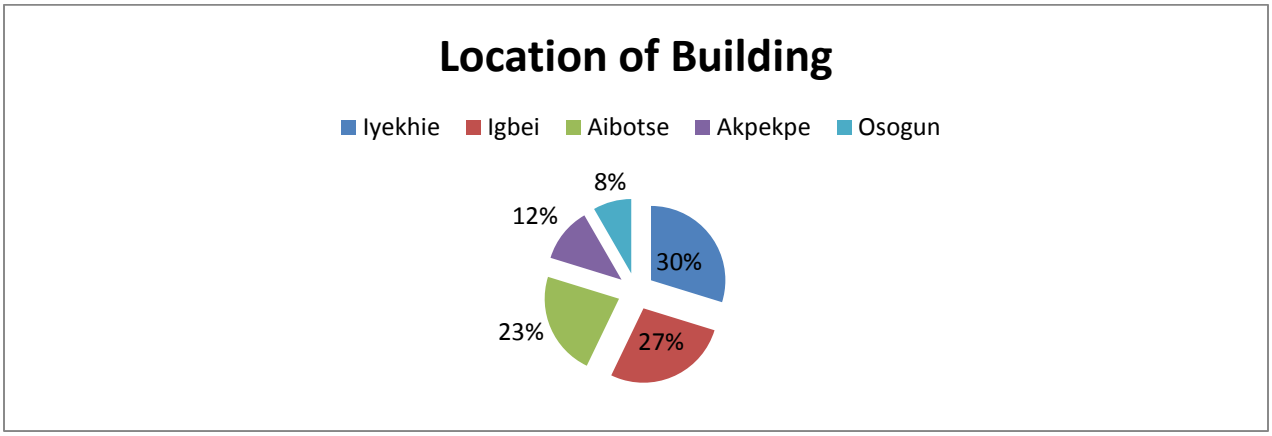


Table 4.1.7: showing the various location of building in the study area. Iyekhie 25 (30%), Igbei 23 (27%), Aibotse 19 (23%), Akpekpe 10 (12%), Osogun 7 (8%). this shows from the analysis that most the buildings are located in Iyekhie.

Source: Field survey, 2022

Table 4.1.8: Showing the Number of Years Respondents have been Residing in the Study Area

Variable	Frequency	Percentage
1-5 years	33	39%
6-10 years	20	24%
11-15 years	15	18%
16-20 years	10	12%
21 and above	6	7%
Total	84	100%

Table 4.1.8: showing the number of years the respondents have been residing in the study area. The following are number of year; 1-5 years with 33 respondents representing 39%, 5-110 years with 20 respondents representing 24%, 11-15years with 15 respondents representing 18%, 16-20 years with 10 respondents representing12%, 20 and Above with 6 representing 7% of the study area. From the analysis it tells that 1-5 years is higher.

Source: Field survey, 2022

Table 4.1.9: Showing Ownership of Building from Respondents in the Study Area

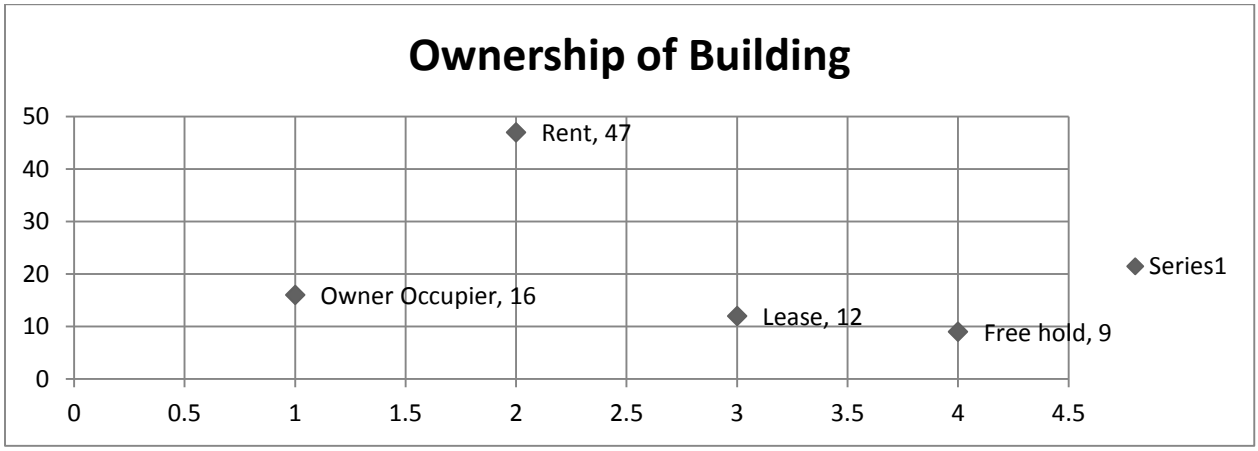


Table 4.1.9: analyzing the ownership of building from respondents in the study area which are: owner occupier 16 representing 19% of responses from respondents rent 47 representing 55.9% of responses from respondents, lease 12 representing 14.2% of responses from respondents, while free hold is 9 representing 10.7% of responses from respondents. The clearly notes that respondents residing in the study area living on rent.

Source: Field survey, 2022

Table 4.1.10: Showing the Age of Building from Respondents in the Study Area

Variables	Frequency	Percentage
1 - 5 years	10	12%
6 - 10 years	25	30%
11 - 15 years	19	23%
16 - 20 years	23	27%
21 – years and Above	7	8%
Total	84	100%

Table 4.1.10: showing the age of building in the study area: 1-5 years 10 representing 12%, 6-10 years representing 30%, 11-15 years 19 representing 19%, 16 -20 years 23 representing 27%, 21 years and Above. From the analysis it shows that 6-10years representing 30% is of the study area is higher when it comes to the age of building in the study area.

Source: Field survey, 2022

Table 4.1.11: Showing the Uses of Building within the Study Area

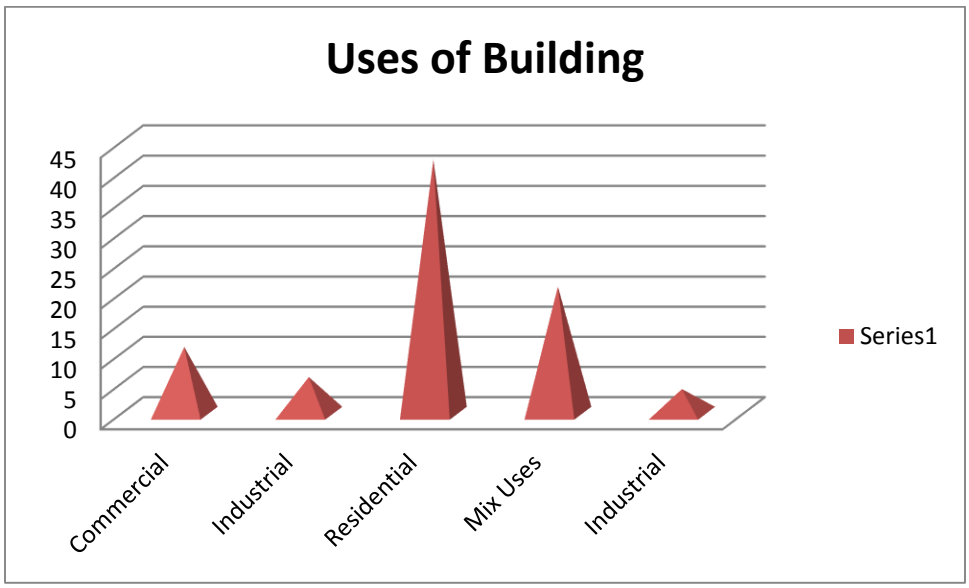


Table 4.1.11: showing the analysis of the various uses of the building in the study area which includes the following uses: commercial 13.0%, institutional 7.1%, residential 50% mix uses 25% and industrial 4.7%. From the analysis it shows that most of buildings are residential within the study area.

Source: Field survey, 2022

CONDITION OF WATER

Table 4.1.12: Showing the Sources of Water Supply in the Study Area

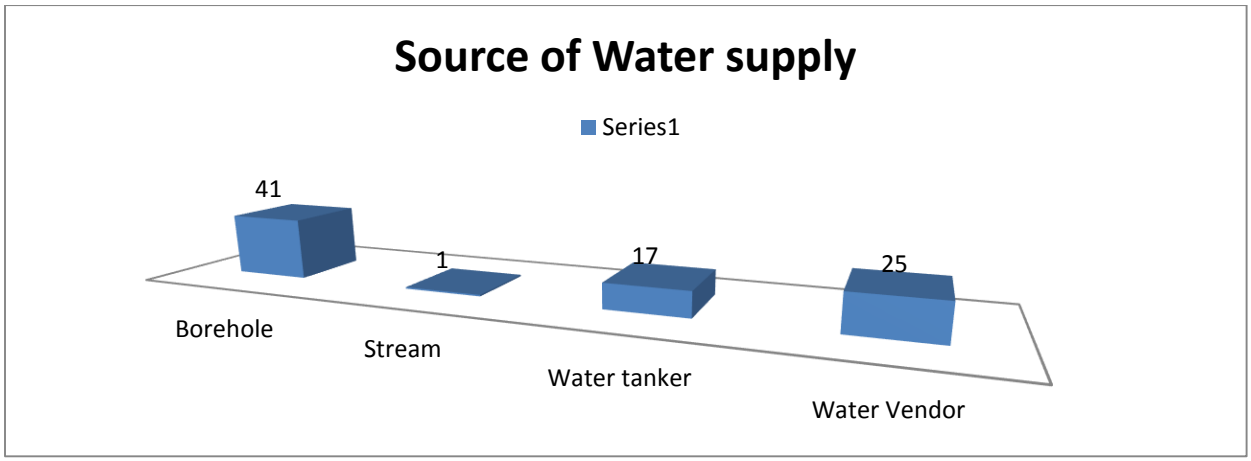


Table 4.1.12: from responds and observation from respondents during the field survey, it shows the various source of water available in the study area which includes: Borehole 41 responses form respondents, representing 48%, stream 1 response from respondent representing 1.2%, water tanker 17 responses from respondents representing 20.2% and water vendor 25 responses representing 29.7%. From the analysis is show that Borehole is the major source of water in the study area.

Source: Field survey, 2022

Table 4.1.13: Showing the Location of Water supply from Respondents in the Study Area

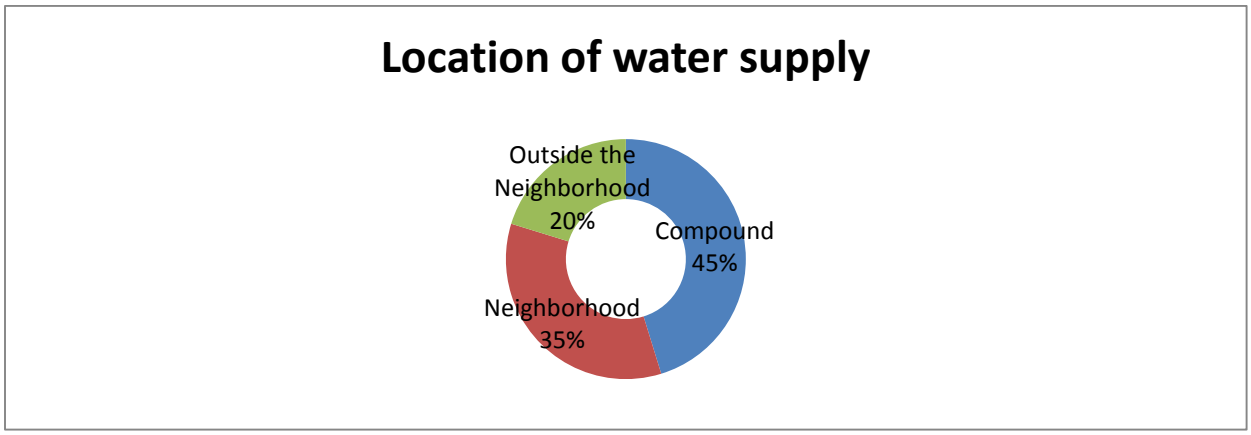


Table 4.1.13: showing the various location of water supply in the study area which are: outside the neighborhood 20%, neighborhood 35%, and within the compound 45%. From the analysis it shows that the major location of the water supply is within the compound.

Source: Field survey, 2022

Table 4.1.14: showing Analysis of distance to water supply if inside the compound (question 13)

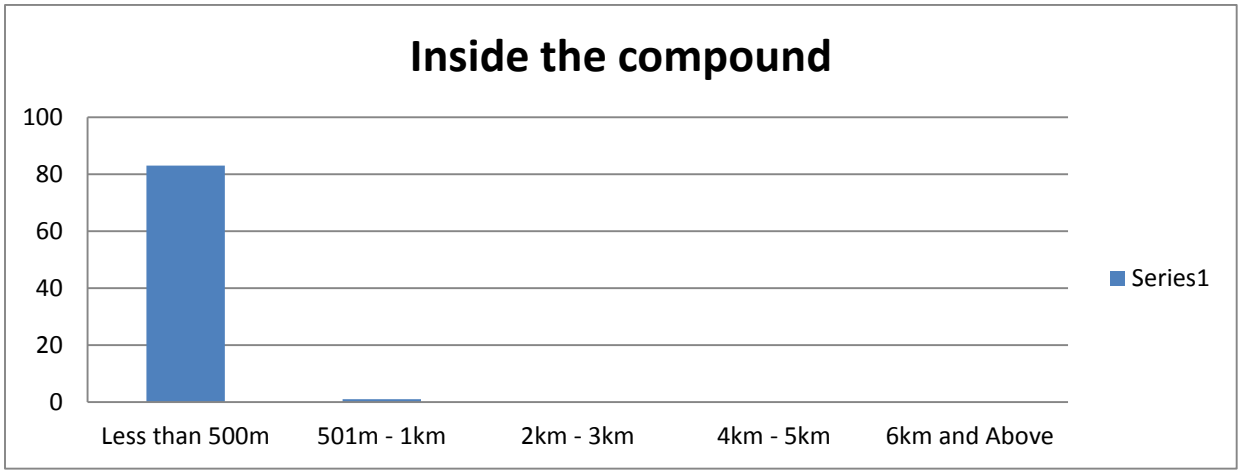


Table 4.1.14: shows the analysis of distance in average to water supply in inside the compound; less than 500m 98.8%, 501m – 1km 1.2%, 2km – 3km 0%, 4km – 5km 0% , 6km and Above 0%. From the analysis it shows that the distance to water supply is less than 500m.

Source: Field survey, 2022

Table 4.1.15: showing the Analysis of distance to water supply within the Neighborhood (question 13)

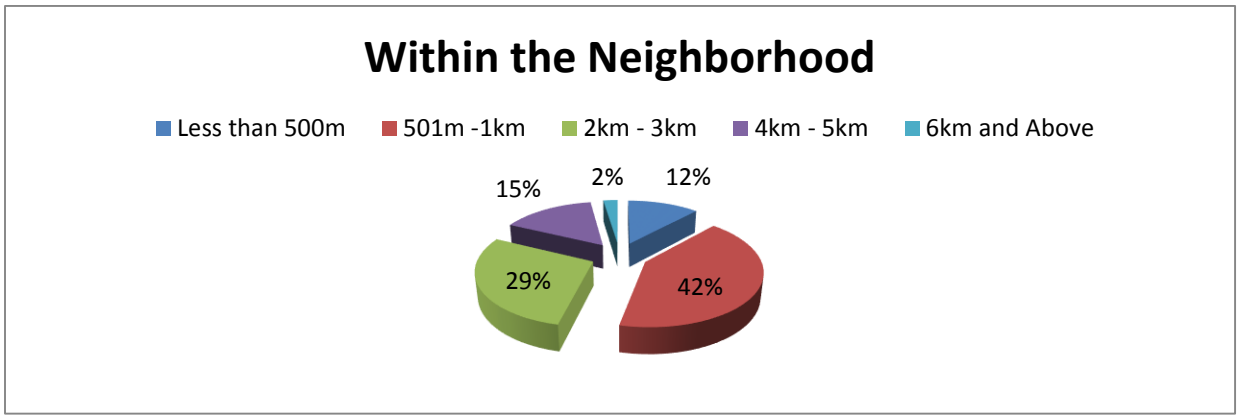


Table 4.1.15: shows the analysis of distance to water supply within the neighborhood which includes the following distances: less than 500m 12%, 501km – 1km 42%, 2km – 3km 29%, 4km – 5km 15%, 6km and Above 2%. From the analysis it shows that within the neighborhood the average is between 501km – 1km.

Source: Field survey, 2022

Table 4.1.16: showing the Analysis of distance to water supply outside the Neighborhood (question 13)

Variables	Frequency	Percentage
Less than 500m	**5**	**6%**
501m – 1km	**9**	**11%**
2km – 3km	**18**	**21%**
4km – 5km	**30**	**36%**
6km and Above	**22**	**26%**
Total	**84**	**100%**

Table 4.1.16: shows the distance of water supply outside the neighborhood which includes the following distances: less than 500m 6%, 501m – 1km 11%, 2km – 3km 21% 4km – 5km 36%, 6km and Above 26%. From the analysis it shows that the average distance to water supply outside neighborhood is 4km – 3km representing 36%.

Source: Field survey, 2022

Table 4.1.17: Showing Analysis of Water Supply Regularity in the Building by Respondents in the Study Area

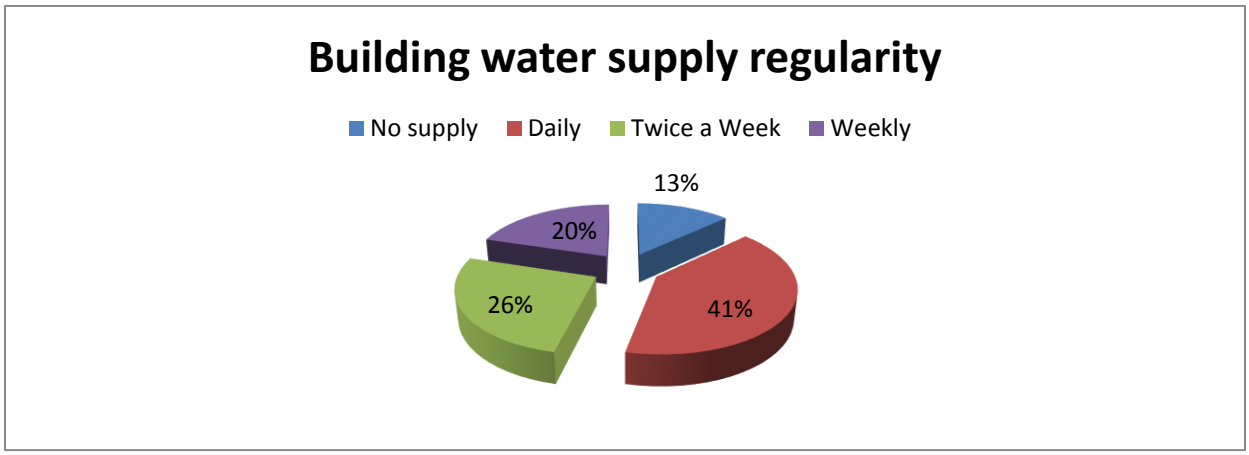


Table 4.1.17: Analyzes how regular the water supply to the building is, it displays the following variables to ascertain the its regularity which includes: No supply 13%, Daily supply 41%, Twice a week 26%, weekly 20%.

Source: Field survey, 2022

Table 4.1.18: Analyzing the Source of water Sufficiency by Respondents in the Study Area

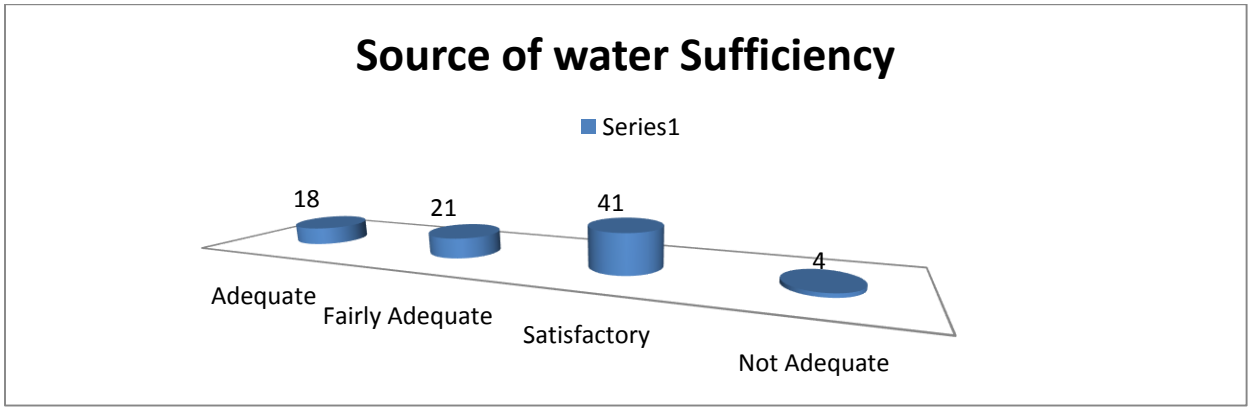


Table 4.1.18:Analyzing the source of water sufficiency which show in details the following: Adequate,18 responses from respondent's representing 21.4%, Fairly Adequate, 21 responses from respondents representing 25%, Satisfactory, 41 responses from respondents represent48.8%, Not Adequate, 4 responses from respondents representing 4.7%. From the analysis it tells that the source of water sufficiency is satisfactory.

Source: Field survey, 2022

Table 4.1.19: Showing the Analysis of water quality (portability) by Respondents in the Study Area

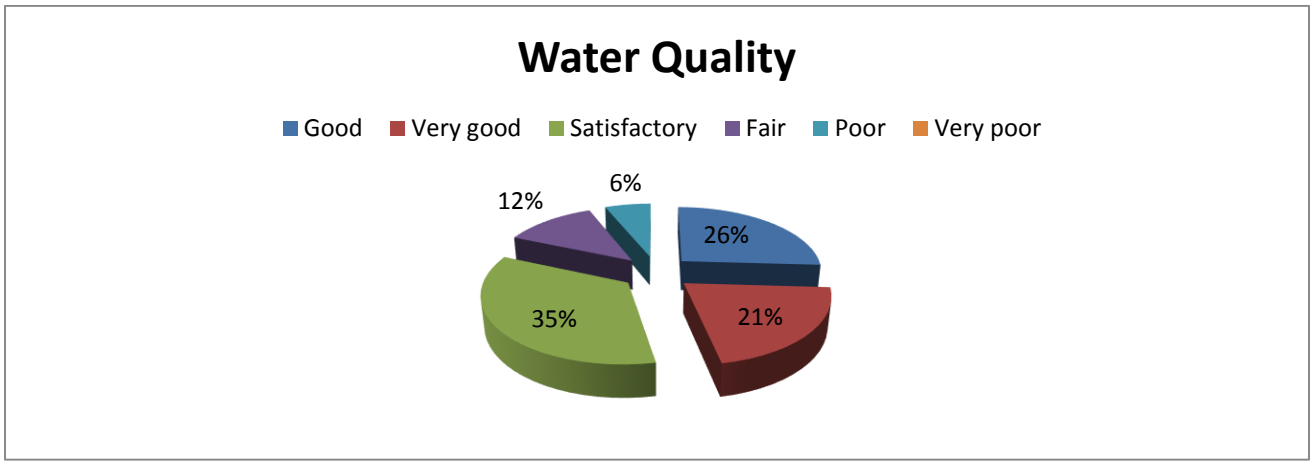


Table.4.1.19: shows the analysis of water quality within the study area. The following responses were gotten from respondent during the field survey which includes the following water quality: Good 26%, Very Good 21%, Satisfactory35%, Fair12%, Poor 6%, Very Poor 21%. From the analysis, it shows that the water quality is satisfactory, to residents within the study area.

Source: Field survey, 2022

Table 4.1.20 Showing Analysis of buildings with water supply in the study area by Respondents.

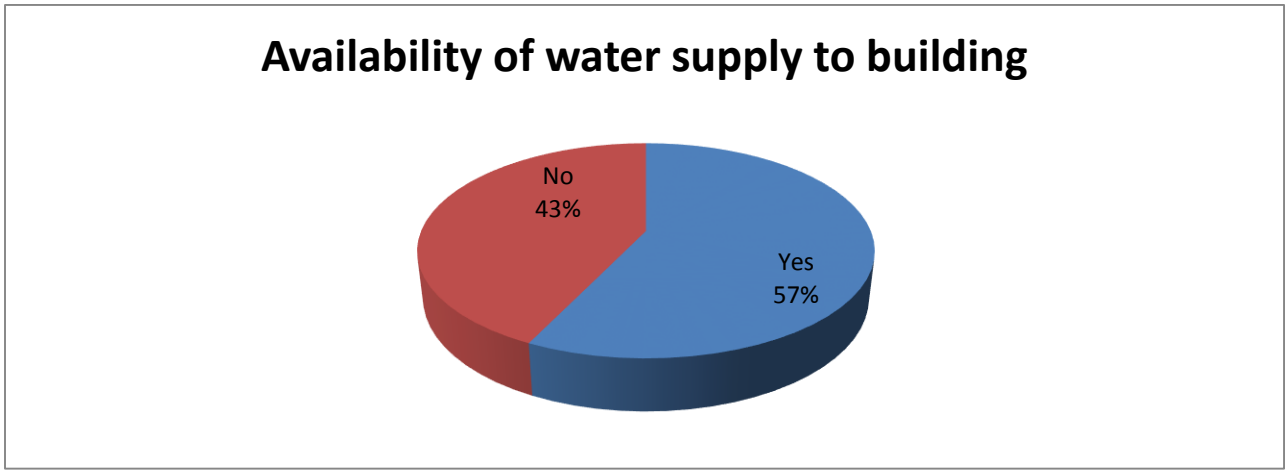


Table 4.1.20:From the survey carried out and responses from respondent it show that 43% said no to the availability of water supply to the building while, 57% said yes to the availability of water to the building. From the analysis it implies that water is available to most of the buildings within the study area.

Source: Field survey, 2022.

Table 4.1.21: (question 20, if yes) showing analysis of building that water runs through its water supply system: provided by respondents in the study area.

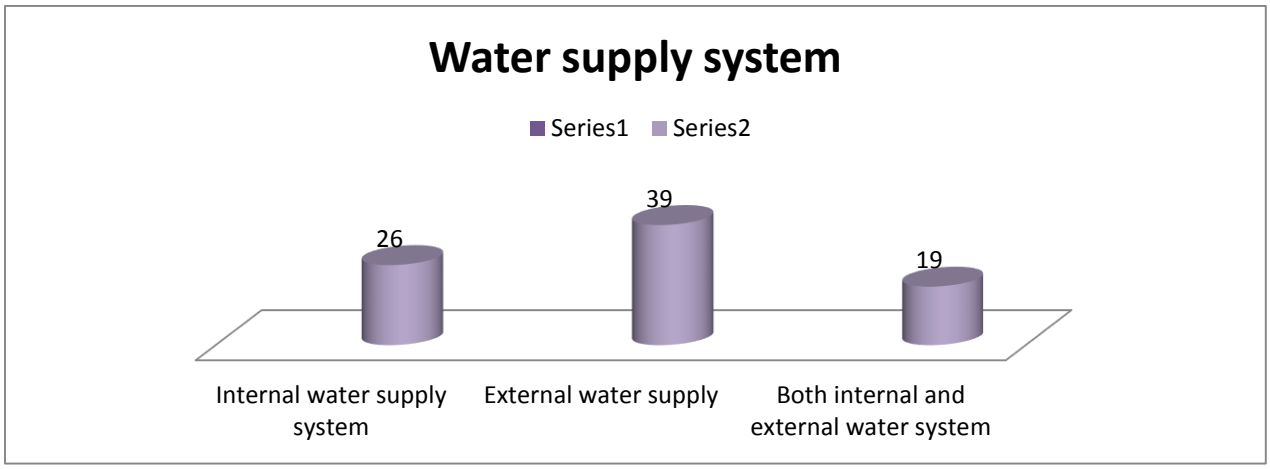


Table 4.1.21: shows the analysis of building with water running through its supply system the following system includes: internal water supply, 26 responses representing 25%, external water supply, 39 response representing 46.4%, both internal and external water system, 19 responses representing 26.6%. from the analysis, it shows that most in most of the building in the study area, external water supply system is more common.

Source: Field survey, 2022.

Table 4.1.22 Showing Water as a Consideration for Choice of Accommodation by Respondents in the Study Area

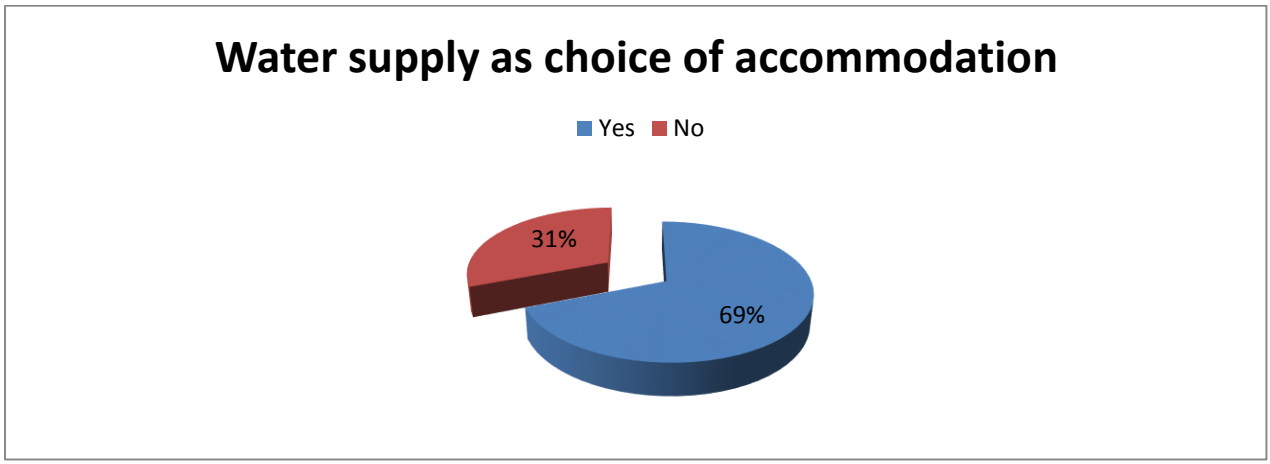


Table4.1.22: shows water availability as a choice of choosing an accommodation. 69% respondents sees water availability as a choice of consideration for accommodation while, 31% of respondents sees water availability as no consideration for accommodation (reasons best

known to them). From responses, observation and analysis it implies that most people sees what availability as a choice of accommodation.

Source: Field survey, 2022.

Table 4.1.23: showing the analysis of the preferred water supply source by respondents in the study area (in reference to question 22)

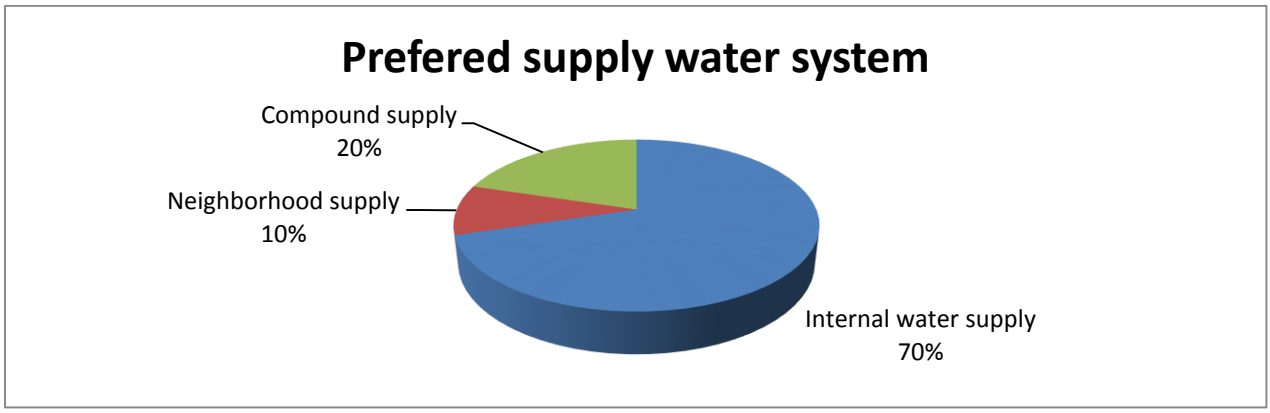


Table 4.1.23: shows the preferred source of water supply in the study area which includes: internal water supply 70%, compound supply 20%, Neighborhood supply 10%. From the analysis it implies that internal water supply which is 70% is more preferred when it come water supply to the building, by respondents.

Source: Field survey, 2022

Table 4.1.24: showing analysis of opinion that area with good water supply have more value than area without: by respondents in the study area.

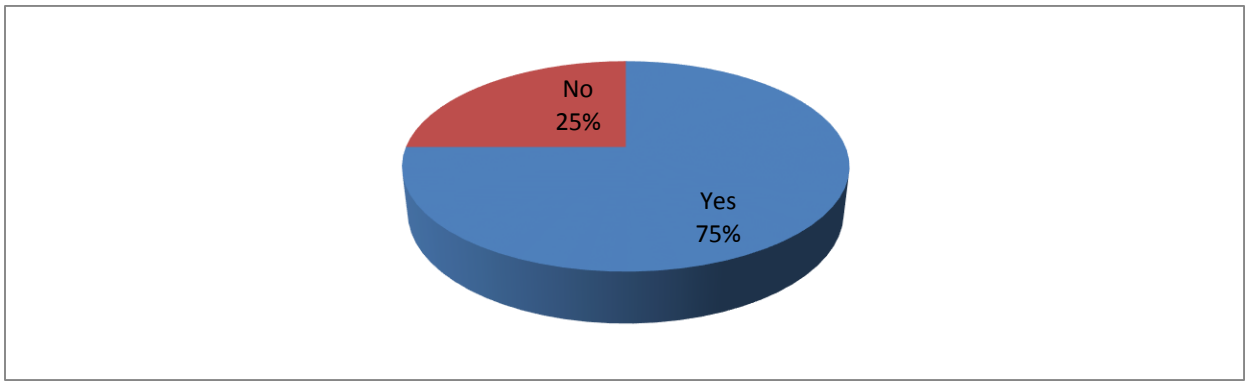


Table 4.1.24: shows the analysis of opinions that area with good water supply has more value compared with areas without water supply. Respondents, give responses based on their opinions.75% said yes that areas with good water supply have more value, while 25% said no. from the analysis it shows that areas with good water supply have 75% responses from respondent, making it valid that areas with good water supply has more value than area without.

Source: Field survey, 2022

Table 4.1.25: showing the average amount payable for renting a bedroom self-contain with good water supply in the study area, by respondents.

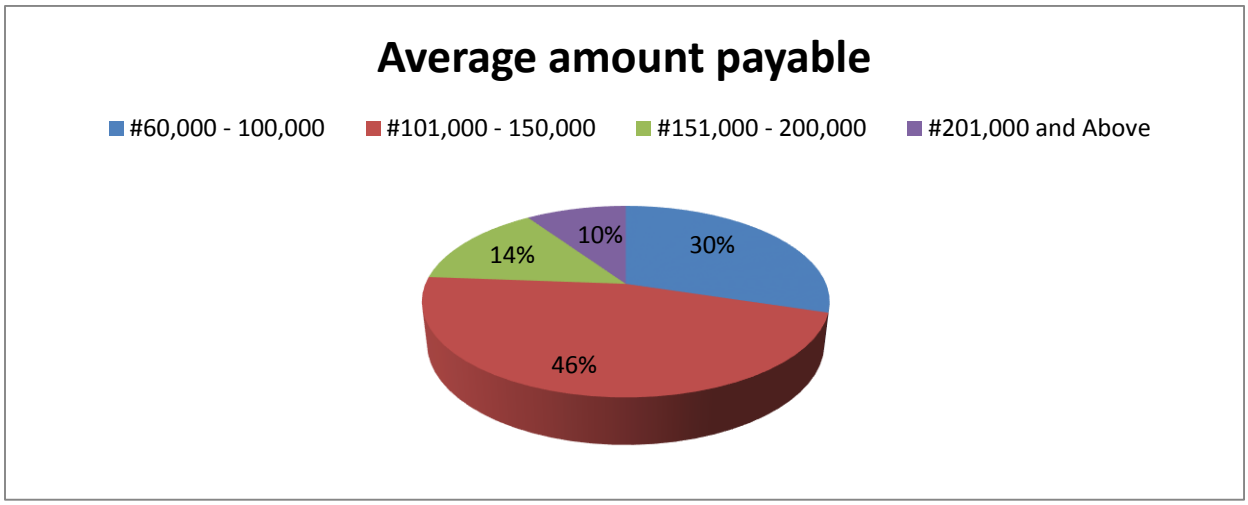


Table 4.1.26: shows analysis based on the average amount payable for a bedroom self-contain apartment with good water supply which includes the following average amount payable: #60,000 - #100,000 30%, #101,000 - #150,000 40%, #151,000 - #200,000 15%, #201,000 Above 10%. From the analysis it implies that the average amount payable for a bedroom self-contain apartment within the study area is between #101,000 - #150,000.

Source: Field survey, 2022.

Table 4.1.26: showing the average amount payable for renting a bedroom self-contain without water supply, by respondents in the study area.

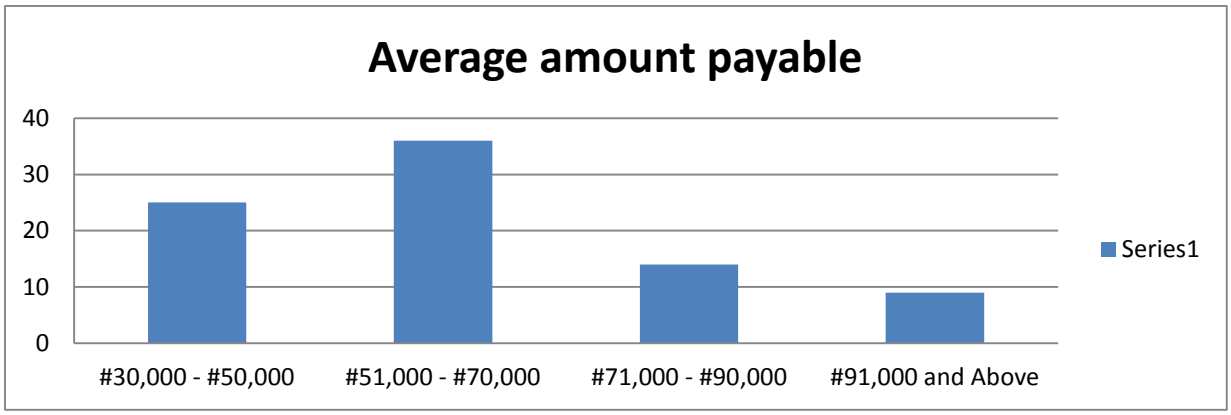


Table 4.1.26: shows analysis of the average amount payable for renting a bedroom self-contain apartment without water supply. The following includes the average amount payable: #30,000 - #50,000 with 25 responses from respondents, representing 29.7%, #51,000 - #70,000 with 36 responses from respondents representing 42.8%, #71,000 - #90,000 with 14 responses from respondents, representing 16.6%, and #91, and Above with 9 responses from respondents, representing 10.7%. From the analysis, it shows that #51,000 - #70,000 is the average amount payable for renting a bedroom self-contain apartment without water supply within the study area.

Source: Field survey, 2022.

Table 4.1.27: showing the rate of impact of water on property value in terms of positive and negative effect, by respondents in the study area.

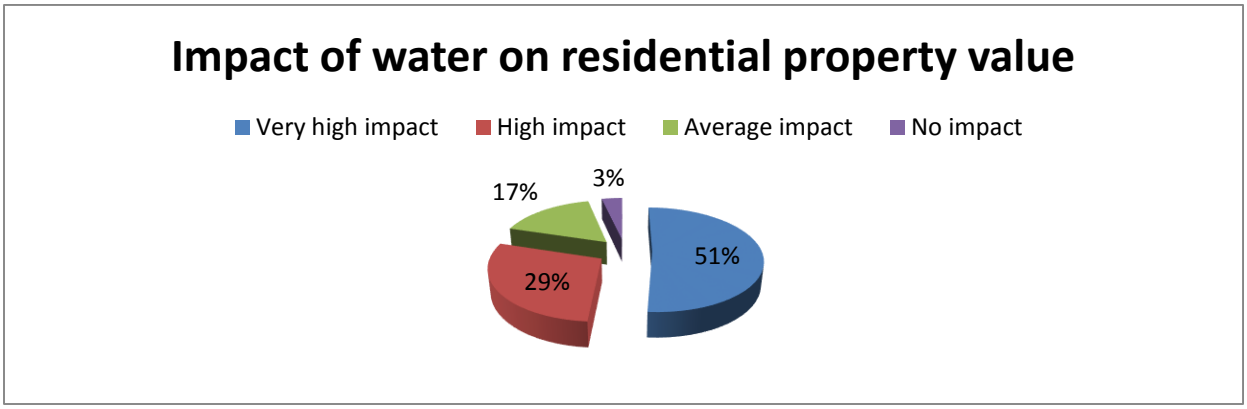


Table 4.1.27: analyses the impact of water on residential property value. The following impact where assessed through responses from respondents, and observation during the field survey: Very high impact 51%, High impact 29%, Average impact 17% No impact 3%. From the analysis, it shows that the impact of water on residential property is very high representing 51% of the study area.

Source: Field survey, 2022.

Table 4.1.28: describing the effect of water on residential property value in terms of positive and negative effect, by respondents in the study area.

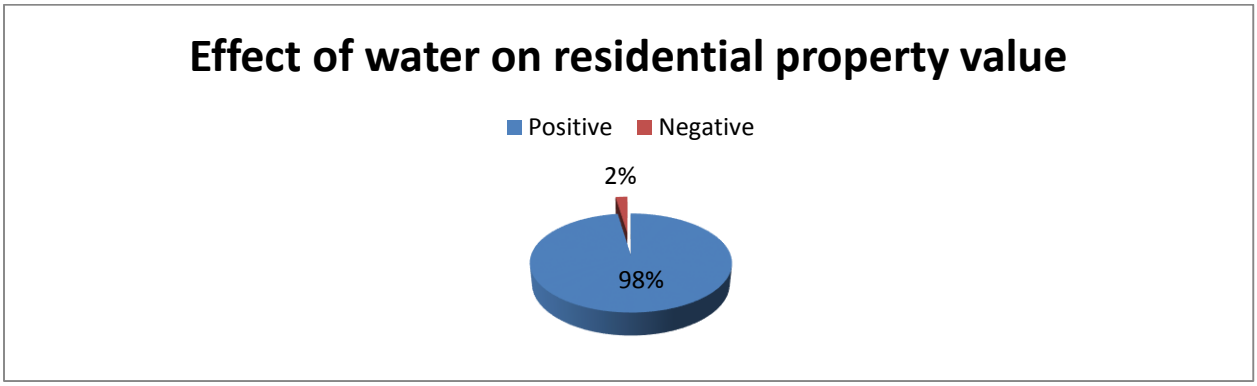


Table 4.1.28: shows analysis based on the effect of water on residential property value. From the survey carried out it shows that 98% of respondents in the study area said the effect of water on residential property was positive, while 2% said that it was negative. From the analysis, is show that 98%water has a positive effect on property value in the study area.

Source: Field survey, 2022.

Table 4.1.29: showing the affordability level of residential property value with good water supply compared with those without water supply, from respondents in the study area.

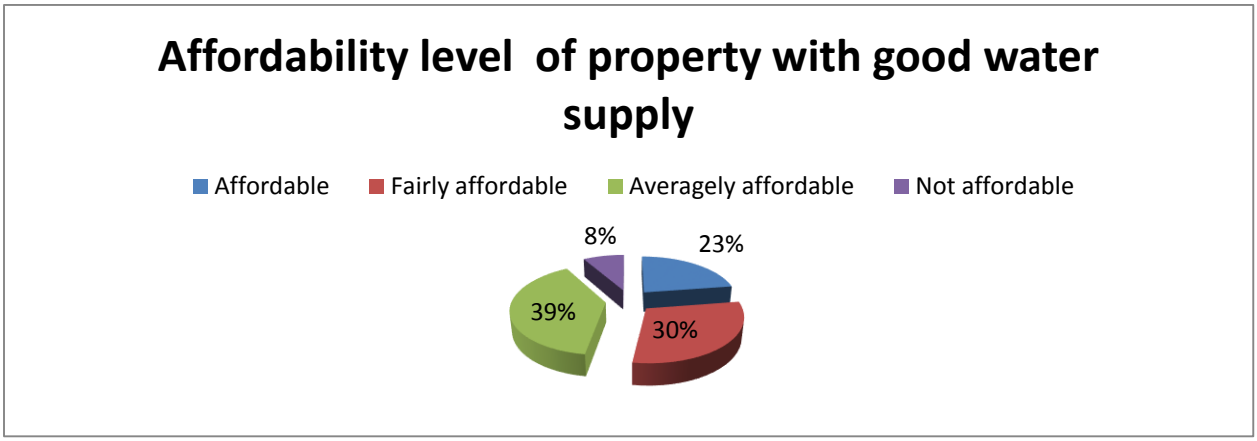


Table 4.1.29: from the survey carried out, it analyzes the affordability level of residential property with good water supply compared with residential property without water supply. The following was responses from respondents in the study area: 23% of respondents said it was affordable, 30% of respondents said it was fairly affordable, 39% of the respondents said it was averagely affordable, and 8% of respondents said it was not affordable. From the analysis, it implies that the affordability level of property with good water supply is averagely affordable which 39% higher in the study area.

Source: Field survey, 2022.

CHAPTER FIVE

5.0 Summary Of Findings, Conclusion And Recommendation

5.1 Summary of Findings

This research work focuses mainly on the problem of water scarcity on residential property value in Auchi, Etsako West Local Government Headquarter Edo State. This research aims at examining the effect of water availability to residential property value in Auchi, the analysis of findings was able to satisfy the am and objectives of the study. It identified and examined the sources and access to water supply by residents in the study area: examined the quality (potability), regularity of water supply to residential building in the study area. Assessed the socio-economic status of residents in the study area, examined the condition of water in the study area, examine how water availability to a property places value and demand on residential housing infrastructure. assessed the amount payable for renting a bedroom self-contain apartment with potable water supply with amount payable for renting a bedroom self-contain apartment without water supply, examine the quality (potability), regularity of water supply to residential building in the study area, assess the socio-economic status of residents in the study area, examined the condition of water in the study area, examine how water availability to a property places value and demand on residential housing infrastructure, assessed the amount payable for renting a bedroom self-contain apartment with potable water supply with amount payable for renting a bedroom self-contain apartment without water supply in the study area.

However, the following are the summary of findings in the study area was the problem of water shortage and scarcity was attributed to: lack of power supply (electricity) dry season, topographical nature of the area, mismanagement of available water infrastructure, inadequate fund from government. Furthermore, majority of the respondents depends on water supply from water vendor and water thankes sources which are mostly of low quality which are most not treated properly or might not be from a good source and that can affects the health of respondents in the area. Also the most accessible water Source is borehole and vended water sources of which majority are been controlled by individuals. Finally, people's opinions were asked on what should be done to enhance and maintain regular supply of water. Their response was that, the responsibility of water supply should not be let alone for the government, instead.

Both NGOs, co-operative societies, Individual Should put their resources together for the improvement of water supply in the Study area. In the analysis, the data acquired on the problem of water Supply in Auchi. Descriptive statistical techniques were employed to present the data, it was proved that relationship exist between the entire test that were carried out. Show that availability of water was one of the major considerations of respondents while looking for an apartment to rent,

5.2 Conclusion

The study has tried to assess the water needs of the people in Auchi Etsako Weat Local Government Headquarter; Results obtained have explicitly shown how most urban communities are being neglected in terms of the availability of water supplied for the inhabitants. It has also shown how urban population are not being given the opportunity to be involved in the decision making, planning, implementation and operating projects that are been executed within their localities. The scarcity water supply being experienced in the study area was as a result of some factors which emanated from Human, Nature and other forces. Other forces included the inability of the authorities to carry- out their outlined policies and programs which would have been beneficial to the communities especially in the area of water provisions. It will certainly cost less to constantly maintain the existing public water projects than abandoning them for the next regime to initiate another Continuity it has been the major problem. The major limitations of the water supply in the study area have been the poor approach to community participation. It is a situation of "provide water for yourself since they saw that water supply is no longer a social service but a commodity affected by demand and supply forces. Other factors are shortfall of water sources and supply, poor government intervention, poor power supply, improper awareness and poor maintenance of facilities. Failure of the public water provision had posed greater dependency of the people on the alternative water source especially the private water borehole source. The result shows that much should be done in water provision to alleviate the problems of the consumers in the study area. Recommendations were also made in this regard which included the involvement of the federal, state, local Government and other interest groups in the provision of water projects. This should include continuing financial support from all areas (private individuals, NGOs, CBOs and the government). The benefitting communities should be

fully involved in the planning, initiation, execution and management of the water supply projects to ensure continuity.

5.3 RECOMMENDATION

Based upon the findings of the study area, the following recommendations are offered to enhance and solve the problem of water in the study area. This research canvassed the need for government to recognize their role in water delivery and act fast in solving the problem of water supply in Auchi. Government should provide adequate fund for Water Corporation, this will enable them to upgrade water infrastructure in the area, laws and regulations should also be put place to help check illegal connections and vandilisation of water corporative properties. Also. More water reservoir should be constructed in the study area to help alleviate water shortage in the study area. There is need for training and re-raining ot managerial and operational staff for efficiency. More personnel and expert should also be recruited to facilitate efficient distribution of water supply to the populace. Over-exploitation of groundwater should be discouraged in the study area, so as not to face with groundwater depletion. the respondents towards the use of more water intensive products within the household is greatly required. People living in this area should be taught on how to cope with scarcity of water supply, this is by storage, how to manage the available water during the dry season and they should learn to contribute to the development of water supply in the study area Proper budgetary allocation from government and freewill donations to ensure capital intensive projects and unique delivery of water projects as at when due are required to construct public boreholes and privatize them for proper management and maintenance As alternative sources of water supply, government should construct rain water harvesting system stations and privatize it management and maintenance Standard. Also, regular training of water Agencies with proper orientation, grassroots education and awareness drives with stated policies, laws and regulations should be encouraged.

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APPENDIX I

AUCHI POLYTECHNIC, AUCHI

SCHOOL OF ENVIRONMENTAL STUDIES,

THE DEPARTMENT OF URBAN AND REGIONAL PLANNING.

TOPIC: EFFECTS OF WATER SCARCITY ON RESIDENTIAL PROPERTY VALUE: A CASE STUDY OF AUCHI, EDO STATE.

Dear respondents,

This is an academic research aimed at examine the effect of water scarcity on residential value a case study of Auchi Edo State.

I need your co-operation to respond to the research questions below which would enable me to accomplish the aim of my study as required by the above department. Your response will be treated confidentially and it will not have any implication as it's an academic research.

Thanks for your co-operation.

BIO DATA

1. Sex of Respondent: (Male) (Female

2. Marital status? (a) Married (b) Single

3. Household size: (a) 2-5 persons (b) 6-9 persons (c) 10-13 persons (d) 14 and above.

SOCIO-ECONOMIC DATA

4. Occupation? (a) Farmer (b) Teacher (c) Student (d) Trader (e) others specify

5. Educational background? (a) Primary school (b) secondary school (c) OND (d) HND (d) others specify

6. Monthly Income? (a) 10,000-50,000 (b) 51,000-100,000 (c) 101,000-150,000 (d) 151,000-200,000 (e) 201,000 and Above.

7. Location of Building? (a) Iyekhei (b) Igbei (c) Aibotse (d) Akpekpe (e) Osogun

8. Number of years of residing in the area? (a) 1-5years (b) 5-10years (c) 10-15years (d) 15-20 (e) 21 years and above

9. Ownership of building? (a) Owners occupier (b) Rent (c) Lease (d) Free hold

10. Age of Building? (a) 1-5years (b) 6-10years (c) 11-15years (d) 16 – 20years (e) 21 years and above

11. Uses of Building? (a) Commercial (b) Institutional (c) Residential (d) Mix uses (e) Industrial use

CONDITION OF WATER

12. What is your source of water supply? (a)Borehole (b) Stream (c) Water tanker (d) Water vendor.

13. Where is the location of the source of water supply? (a) Within the compound (b) in the neighborhood (c) outside the neighborhood

14. If inside the compound (to question 13), how long is the distance of water supply to your building? (a) Less than 500miters (b) 501miters - 1km (c) 2km - 3km (d) 4 – 5km (e) 6km and Above.

15. If in the Neighborhood (to question 13), how long is the distance of water supply to your building? (a) Less than 500miters (b) 501miters - 1km (c) 2km - 3km (d) 4 – 5km (e) 6km and Above.

16. If outside the Neighborhood (to question 13), how long is the distance of water supply to your building? (a) Less than 500miters (b) 501miters - 1km (c) 2km - 3km (d) 4 – 5km (e) 6km and Above.

17. How regular is the water supply in your building? (a) No supply (b) Daily (c) twice a week (d) weekly.

18. How sufficient is the source of water in your area? (a) Adequate (b) Fairly Adequate (c) satisfactory (d) Not Adequate.

19. How is the quality of the source of water in your building (a) Good (b) very good (c) satisfactory (d) Fair (e) poor (f) very poor.

20. Does your building have water supply? (a) Yes (b) No

21. If yes, in the above question (question 20), is the water running through its water supply system or a separate external source? (a) Water supply system (b) external water supply (c) Both water system and external system.

22. Is the water supply a consideration for your choice of accommodation or area of residence? (a) Yes (b) No

23. If Yes in the above question (question 22), what is your preferred water supply source and system? (a) Internal water supply (b) Neighborhood supply (c) compound water supply.

24. Are you of the opinion that areas with good water supply have value more than areas without no or good water supply? (a) Yes (b) No

25. If yes in the above question, what is the average amount payable for renting a bedroom self-contain apartment with good water supply in your area? (a) #60,000 - 100,000 (b) #101,000 – 150,000 (c) #151,000 – 200,000 (d) #201,000 and Above.

26. What about average amount payable for renting a bedroom self-contain apartment without water supply? (a) #30,000 - #50, 000 (b) #51,000 - #70,000 (c) #71,000 - #90,000 (d) #91,000 and Above.

27. How would you rate the impact of water on residential property value? (a)Very high impact (b)High impact (c) Average impacts (d) No impact.

28. How would you describe the effect of water on residential property value in terms of positive and negative effect? (a) Positive (b) Negative.

29. What is the affordability level of residential property value with good water supply compared to a property without water supply? (a) Affordable (b) Fairly affordable (c) Averagely affordable (d) Not affordable.

APPENDIX II

POPULATION PROJECTION

$$Pn = po \frac{(1 + r)n}{100}$$

Where pp = population projection

PO= present population

R= rate

N= number of projected years

PO 42610, R= 3.4%, N=31 years

$$Pn = \frac{42610(1+0.034)31}{100}$$

Pn=42610 (+0.034)31

= 42610 (1. 0.34)31

= 42610 x 2.8193

= 120,130