ASSESSMENT OF DOMESTIC WATER SUPPLY: A CASE STUDY OF DEI-DEI AND DAKWA AREAS OF THE FEDERAL CAPITAL TERRITORY, ABUJA, NIGERIA

BY

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ABSTRACT

Water is a basic human need; portable water supply is an issue of concern in both planned and areas in Nigeria. This study conducts an assessment of domestic water supply and the problems associated with it in order to reduce the immediate impact on health, economic productivity, the environment and physical domestic activities using data collection tools and methods such as Reconnaissance Survey, Organisational survey (FCT water board), Physical Observation and Questionnaire Administration (from 332 respondents to be precise). Residents from Dei-dei and Dakwa communities formed the 2 strata from which respondents were randomly selected. The result of the study shows that Dei-dei and Dakwa has not been captured in the water board master plan which has led residents to explore other water sources like wells, boreholes and water vendors. This is being complimented by donations from well-meaning politicians and also the Turkish government. These sources do not match the demand and the growing population of the areas and a vast majority of the water facilities are not in the best possible shape to supply portable water. Water is sold for as high as ₦1000 for 200 litres during dry season and it comes down to about ₦240 at the peak of rainy season since residents have the alternative of harvesting rain water. Recommendations were made to improve the water supply in the area some of these are: that the government through its water board (FCT chapter) should develop a new master plan that will expand their services and facilities to satellite towns around the FCT including Dei-dei and Dakwa to ensure proper management of water quality this will ensure proper Risk-assessment studies of the impact of water quality on human health is before it is supplied. Also, the condition of the existing facilities should be improved and should also be centrally placed so as to meet the need for the range of coverage. Again, private sector participation in water supply should be encouraged and this is to be complimented by supervision from relevant agencies and the government.

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CHAPTER ONE

INTRODUCTION

1.1   Background of the Study

Water is a basic human necessity, which means that humans cannot survive without it. Portable water supply is a worry in developing countries around the world, including Nigeria, resulting in a slew of issues, including health issues, epidemic transmission, and poor sanitation, all of which contribute to poor environmental quality in the long run. Residents are the ones who are most affected because they are in charge of delivering water to their homes (Adeleye, Medayese, & Okelola, 2014). Many individuals have dug boreholes as alternatives to pipe borne water and other domestic sources, a measure that has been kicked against by geologists because of its potential to expose the environment to hazards and degradation at large (Adeleye, Medayese, & Okelola, 2014). Some spend hours in public boreholes all in the name of getting water. The fact that human activities revolves around water, and water supply is one of the key drivers of domestic and industrial activity, a country's water supply problem is a major cause of other problems the country may be experiencing (UN, 2016). When there is a lack of or insufficient availability of water, it will affect not only health, domestic activities, sanitation, but also the environment. This is obvious as the UN attempts to address global issues such as insufficient water availability to meet human fundamental requirements and ever-increasing pressures on water resources around the world. This focuses on ensuring that there is an adequate supply of water as well as making sure that it is safe for use (potable), desirable, and cost-effective for individual consumers. The UNDP (2004), noted that the World Health Organization (WHO) recommends about "50 and 100 litres of water per individual daily" to provide the majority of essential necessities while minimizing health risks.

According to UNDP (2004), the issue of water supply has developed from a social concern to a fundamental human right since it is the obligation of governments to ensure that there is a

sufficient and drinkable supply of water in their various regions of authority. Water-related goals were included in the Sustainable Development Goals (SDGs) because of the importance of water to man in many aspects of life, including ensuring the availability and sustainable management of water and sanitation for all (Sustainable Development Goal 6). The United Nations in (2016) stated that "water drives employment creation and overall growth of the economy". Dei-dei and Dakwa communities have experience tremendous water scarcity over the years and this has posed different forms of challenges for the residents around the area.

1.2   Statement of Problem

Water shortages are a typical occurrence in most developing countries, including Nigeria. The factors of urbanization and migration have resulted in an influx of people into the Federal capital territory, putting strain on urban infrastructure. As a result, some locations, such as Dei-dei and Dakwa, have gradually become informal settlements, which are the case studies for this study. It is also common knowledge that people who receive water from other sources, such as wells and water vendors, are exposed to a range of toxins, and the majority of residents do not purify water prior to consumption or use. In search for alternatives to domestic water sources, individuals and groups resort to digging motorised, non-motorised and electric wells at large. The implications of using these alternative sources on health, domestic activities, sanitation and even the environment is given little or no consideration. This study therefore, attempts to evaluate the access to domestic water supply and the alternative sources. Because no community can function without access to drinkable water. Water supply-related issues must be addressed in order to reduce the direct impact on health, economic productivity, the environment, and physical domestic activities.

1.3.   Aim

The study is aimed at assessing domestic water supply, in Dei-dei and Dakwa areas of the Federal Capital Territory.

1.4   Objectives

  i.   To identify water supply sources in Dei-dei and Dakwa environs;

 ii.   To examine the challenges associated with the various water supply sources in the study areas;

iii.   To Propose sustainable supplementary ways of water supply.

1.5   The Study Area, Dei-dei and Dakwa, FCT Abuja

1.5.1   Location

The Federal Capital Territory of Nigeria, Abuja, positioned in the country's geographic center. It has an area of 8,000 kilometers square and is situated between latitudes 9^0 4' 20.1504" and longitude 7^0 29' 28.6872". The Gurara River and the Usman Dam, as well as several cities, villages, and communities spread over the municipality, make up the municipality. Kaduna borders Abuja on the north, Nassarawa on the east, Kogi on the south, and Niger State on the west.
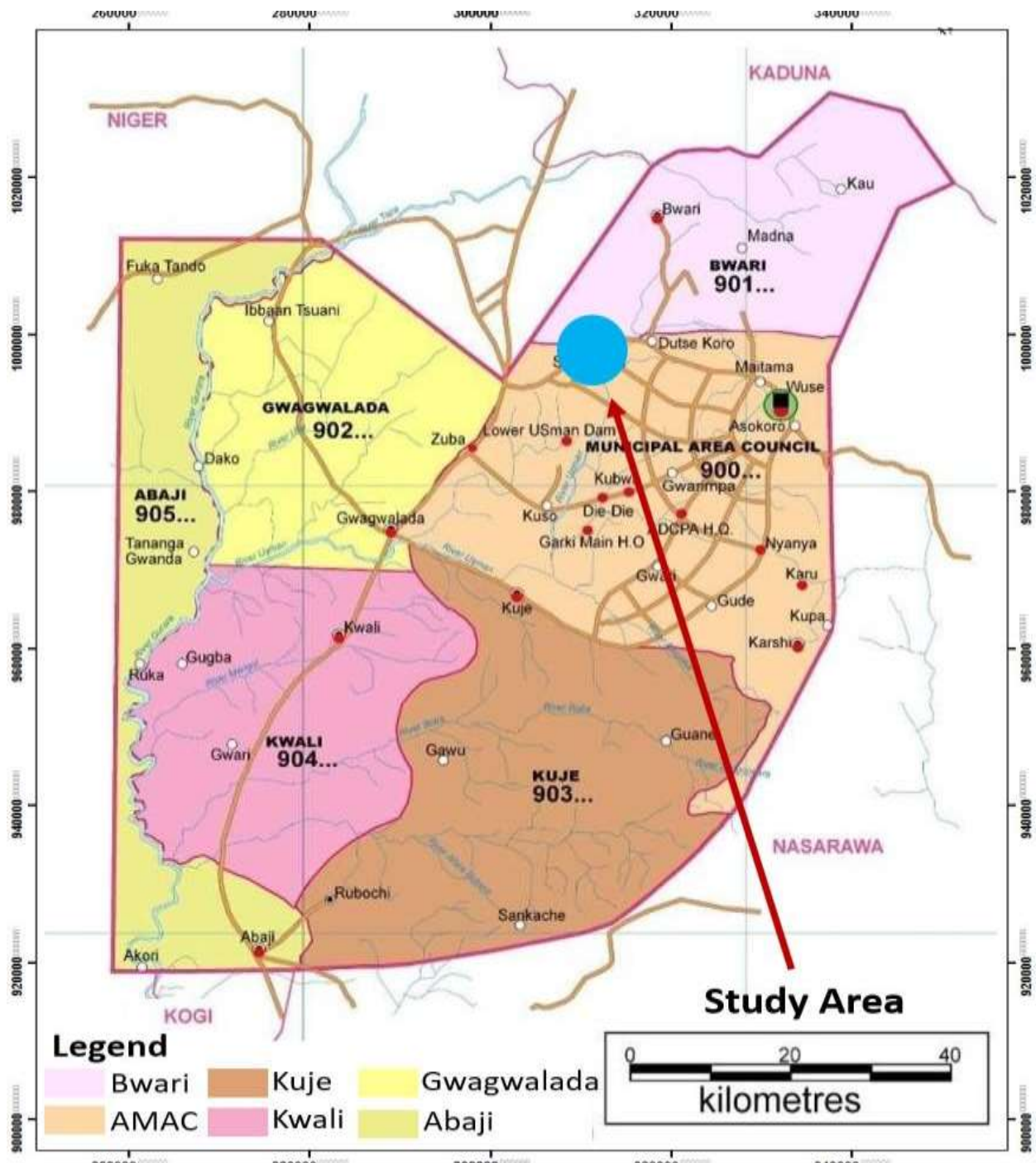
Figure 1: Dei-Dei and Dakwa in the Context of Abuja
Source: Adapted and modified by Author, 2020

Dei-dei and Dakwa are located on the North Eastern part of Abuja as shown in figures 1 above.

1.5.2   Vegetation

The vegetation in the zone is primarily guinea savannah with scattered shrubs and grasses and

a few trees.

1.5.3 Climate

The territory on the windward side of the Jos Plateau and the zone of rising air masses receives 1100mm to 1600mm of annual precipitation, which is similar to the teritory's region on the windward side of the Jos Plateau and the zone of rising air masses. September has the most notable mean month-to-month precipitation, with about 300 mm. The stormy season lasts between 190 and 200 days and begins in April and ends in August. The average monthly temperature is 30.5 degrees Celsius in March and 22 degrees Celsius in August (Olawale, 2010).

1.5.4 Historical Background of Abuja

Preparations had been made since the country's independence to locate its capital in a site that would be neutral to all parties due to Nigeria's ethnic and religious conflicts. In the early 1970s, the position was finally assigned in the country's center as a symbol of neutrality and national unity. Another motivation for Abuja was the population increase in Lagos, which resulted in overcrowding and poor living conditions. The reasoning was similar to that employed in the construction of Brazil's capital, Braslia (which happened at around the same time).

Construction began in the late 1970s and was dedicated in 1978, but the city's early stages were not completed until the late 1980s due to economic and political turmoil.

On December 12, 1991, Abuja was designated as Nigeria's capital. IPA (International Planning Associates), a team made up of three American firms: PRC Corporation, Wallace, McHarg, Roberts and Todd, and Archisystems, a division of the Hughes Organization, designed the Master Plan for Abuja and the Federal Capital Territory. The Master Plan for Abuja outlined the city's broad shape and major design aspects; however, Kenzo Tange, a renowned Japanese

architect, and his team of city planners at the Kenzo Tange and Urtec business refined this concept.

The city's crescent form reflects infrastructure concerns and the geology of the site, but some believe it also symbolizes the will of the Muslim devout, who approved the design. The majority of countries relocated their embassies to Abuja and kept their larger old embassies as consulates in Lagos, Nigeria's commercial metropolis.

Abuja is the headquarters of the Economic Community of West African States (ECOWAS) and its military branch, ECOMOG, in addition to being a major political hub. It also houses OPEC's regional headquarters.

Aso Rock, a 400-meter monolith left by water erosion, is a prominent feature in Abuja. To the south of the rock, the Presidential Complex, National Assembly, Supreme Court, and much of the town are located. In the language of the (now displaced) Asokoro, "Aso" means "victorious" ("the people of victory").

The Nigerian National Mosque and the National Ecumenical Centre church are also worth seeing. The Nnamdi Azikiwe International Airport serves the city, and Zuma Rock is nearby. Many structures have yet to be completed, and much of the city has yet to be created according to plan.

1.6   Scope of Study

This study is focused on domestic water supply in Dei-dei and Dakwa. It covers topical issues like the alternative sources of water Dei-dei and Dakwa, efficiency or opportunity in the two alternatives, problems and challenges as well as to Propose sustainable alternative ways of water supply.This assessment shall be limited to these two areas from which samples will be selected for the study.

1.7   Justification

In light of the aforementioned issue of water scarcity and poor sanitation in Dei-dei and Dakwa, it is necessary to conduct a study on analyzing residential water supply in the Dei-dei and Dakwa areas in order to learn about the various water sources, water supply challenges, and alternatives in the study area.

<center>**CHAPTER TWO**</center>

<center>**LITERATURE REVIEW**</center>

2.0 Conceptual Framework

2.1 Water Safety Plan (WSP)

The Water Safety Plan (WSP) is the conceptual frame work employed for this study; WSP explains the management of water sources, this has to do with improving the present water supplies as an alternative of investing in creating a fresh water supply source to meet the water demand of the now and the future. This is because the problem of supplying water for domestic use does not just end at the provision of adequate supply but ensuring that water is fit for the people to consume. The WSP framework is aimed at ensuring that the existing water supply for domestic use is supplied at their full capacity in terms of quantity and pressure; this implies that, instead of investing on laying new channels for the supply of a new water such investment should be directed at ensuring that present water utilities function at their expected capacities with the required quality of water supplied (NCEH, 2012). The WSP also help in assessing and managing threats to potable water supply from generation, distribution to the point at which it is supplied to the final consumer.

This applies to the study area Dakwa and Dei-dei areas of Abuja, instead of investing on a new water supply, based on this cocept, a better option is appraising the existing water supply in terms of quantity, pressure and quality of water supply and invest in rehabilitating and improving existing water supply problems in the study area.
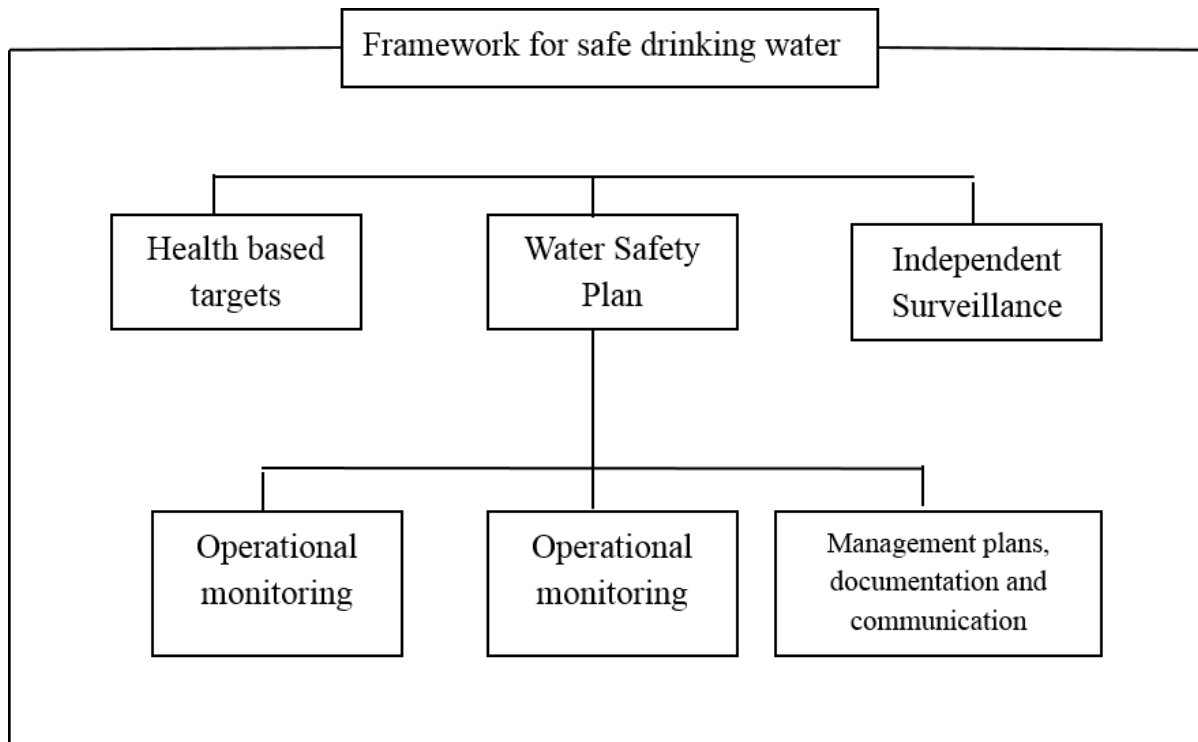
Fig 2.1 Water Safety Plan framework for drinking water Adopted from WHO (2005)

The framework aids in the implementation of contamination prevention and control, as well as recontamination prevention, during the distribution, storage, handling, and maintenance of water distribution water supply (NCEH 2012). It is vital to highlight that the WSP aims to ensure adequate water supply as well as improved health through water quality assurance. Health improvements, adequate water supply, operational changes through improved infrastructure and implementation of improved water treatment procedures, the Water Safety Plan also has financial implications, such as cost savings by lowering or eliminating the cost of water treatment for consumers. The foundations of a Water Safety Plan are identifying the catchment area in which the plan will be executed, knowing the accessible water source that is safe, regulating the treatment procedure, as well as protecting the delivery of water to the final consumers. If these are followed, adequate risk management and the providing safe water for drinking and additional human uses of water will be achieved.
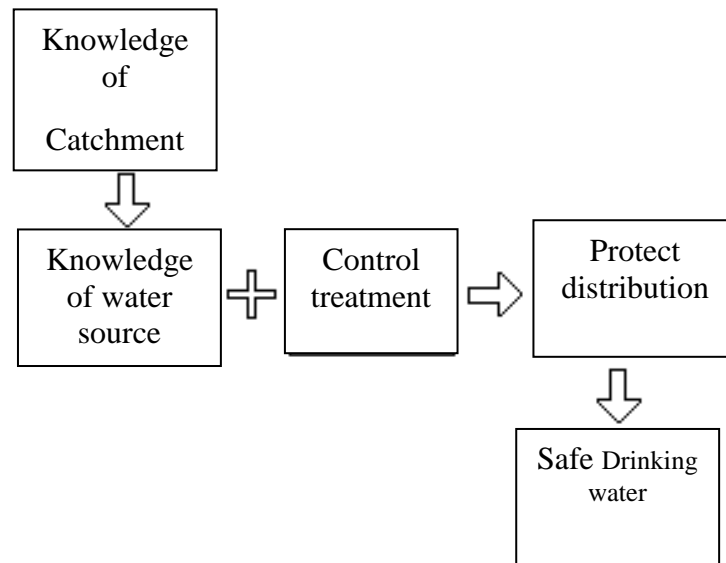
Fig 2.2 Water Safety Plan, Adopted from World Health Organization (2005)

To accomplish the Water Safety Plan, significant capital and technological developments are required; this capital will be necessary to conduct studies, educate water providers, and improve water facilities; however, this will be challenging because government policies are usually more concerned with economic advancement rather than improving or providing water for citizens. Residents are to be taught how to maintain potable water after collection in order to avoid contamination, as well as the benefits of the Water Safety Plan in order to attract public financial benefactors to the initiative.

2.2   Water supply in Nigeria

Water supply is a responsibility jointly held among the federal, state, and local governments. Water resources management is the responsibility of the federal government; urban water supply is the responsibility of state governments; and rural water supply is the responsibility of local governments and communities. There is no clear description of who is in charge of keeping the place clean.

Nigerian water production facilities, according to the World Bank in 2010, were "hardly ever operated at capacity" as broken equipment, or a shortage of electricity or fuel for pumping due

to power supply discrepancies, water agencies' running costs are exacerbated by the need to rely on diesel generators or even build their own power plants. Intermittent delivery and significant amounts of non-revenue water are the result of poorly maintained equipment and pipes. Over 80% of all government-owned water systems in small towns were non-operational in 2012, according to the World Bank. The lower Usuma dam provides some of Abuja's drinking water. The capacity of the plant that filters surface water from the dam's reservoir was doubled in 2012 to suit the capital's rising population. The Guara dam, which was designed to increase Abuja's water supply while simultaneously lowering drought risks. The wastewater treatment plant in Wupa, was opened in 2007, has a daily capacity of 131,200 cubic meters (Daily Trust, 2012).

2.2.1 Policies and Initiatives at the National Level

The National Water Supply and Sanitation Policy of Nigeria, which was enacted in 2000, encourages private sector participation and pushes for state-level institutional and policy reforms. In all cases, though, very little has changed. Only four of the 36 states had begun to use PPPs in the form of service contracts by 2007, namely Lagos, Cross River, Kaduna, and Ogun. A sort of public-private partnership in which the private sector's involvement is limited to infrastructure maintenance and there are no performance incentives (USAID, 2007). Although the government has a decentralization policy, there has been very little decentralization in practice. Despite efforts to improve capacity, local governments' ability to proposal and implement investments, as well as manage and maintain systems, remains poor. Furthermore, government policy prioritizes water supply while ignoring sanitation.

In 2011, the administration backed a UN resolution declaring water and sanitation to be human rights. It has not, however, passed laws enshrining the human right to water and sanitation in

national law. In terms of water and sanitation, the country is not on track to meet the Millennium Development Goals.

2.2.2   Responsibilities

The delivery of water services is collective among government agencies at the three different levels. Although the duty of sanitation is not always obvious, state governments are in charge of urban sanitation.

1. **Federal Government**

   The Federal Ministry of Water Resources, which was originally part of the Ministry of Agriculture until 2010, is responsible for the large water development projects and interprovincial water allocation. The Ministry is responsible for planning and developing water resources, irrigation operations, and the collecting of hydrological and hydro-geological data through 12 River Basin Development Authorities. Dams benefit cities by supplying large amounts of water. In 1992, the Utilities Charges Commission, which includes State Water Agencies, was established to oversee and regulate utility charges (World Bank, 2012).

2. **State Governments**

   In each of Nigeria's 36 states, State Water Agencies (SWAs) or state water departments are in charge of distributing potable water. State governments, which are frequently represented by a State Ministry of Water Resources, are responsible for SWAs. SWAs are in charge of both urban and rural water delivery in various states. In the year 2000, 22 states had their own rural water and sanitation organizations, with the majority of them being set up to carry out UNICEF initiatives (World Bank, 2012).

3. **Local Governments**

   Despite the fact that just a few of the 774 Local Government Authorities (LGAs) have the means and capabilities to deal with the problem, they are responsible for providing rural supply and sanitation of water in their districts. Only a few LGAs have rural water supply divisions.

4. **Communities**

   According to the World Bank's 2012 report on Water Supply and Sanitation Interim Strategy, water and sanitation committees (WASCOs) have been formed in some rural areas to operate and maintain water facilities. In a strategy statement published in 1993, the administration committed to enhance community engagement in rural water distribution. The notion had not yet been widely disseminated or implemented in all government or donor-funded projects as of the year 2000.

5. **Civil Society**

The water and sanitation sector in Nigeria has a thriving civil society that is working on a number of initiatives to address the sector's problems. The Water and Sanitation Media Network (www.wash-jn.net) is a group of journalists covering the water and sanitation industry. The Society for Water and Sanitation (NEWSAN) is an umbrella group for non-governmental organizations working in the field of water and sanitation.

2.2.3 Financial Aspects

Unmetered connections have flat prices; most Nigerian water supply connections are not metered. The metering ratio in 2007 varied from 7% in Katsina to 16% in Kaduna and 24% in Lagos. Non-metered customers are charged a flat cost regardless of usage**.**(Banerjee, Foster, Ying, Skilling, & Wodon, 2008).

Tariffs for connections that are metered; Customers who are metered, like in Lagos and Katsina, must pay a linear or increasing-block charge. The price per cubic meter grows in increments under increasing-block pricing, with monthly usage starting at 30m and a total of three to six blocks (Banerjee et al, 2008).

Vendor costs; According to research conducted in Lagos, Kaduna, and Katsina, street vendors charge up to 20 times more than State Water Agencies. For a very little volume of water, private water suppliers can charge four to ten times the price of a month's worth of substantially larger tap water (World Bank, 2012).

2.3   Review of Past Work

The problem of water supply is alarming in developing countries of the world; this case is not different with what is happening in Nigeria as domestic activities are affected a result of poor water supply. Water is a necessity for life, domestic activites, development and environmental functioning (Niyi and Felix 2007).

So many research works have been conducted on the adequacy of water supply alongside the quality of water for domestic use. The health and productivity of citizens are linked to the quality of water available (Agbaeze, 2003; Dewole, 2012). Water is mostly obtained through self-effort in Nigeria, with 78.5 percent obtained through self-effort, 6.3 percent through private institutions, 13.2 percent through government granting mechanisms, and 1.0 percent through public-private collaboration (Akpabio 2012). As a result of this, many individuals and businesses have encountered water scarcity, which has had a significant impact on their everyday operations.

A good number of the Nigerians have no access to safe drinking water and for consumption and other domestic activities (Lawal &Basorun 2015). Jong-wook& Bellany, (2004) opined that high mortality, hunger and gender inequality are resultant effects of poor access to potable. Water is required for home, industrial, and environmental purposes. Basorun and Lawal (2015).

In order to achieve their goal, Lawal and Basorun (2015) undertook a survey to estimate the quantity of access to safe water among Akure inhabitants. Lawal and Basorun (2015) set out to accomplish a number of goals, including identifying the various sources of water supply in Akure and assessing the quality of safe water supply to see if it met the demands of the locals. Lawal and Basorun (2015) employed the primary technique of data collection in their study, in which questionnaires were delivered to a married woman in every family at an interval of every tenth building (using systematic random sampling), and the data was analyzed using descriptive statistics (frequency counts and percentages).

Lawal and Basorun (2015) revealed that wells appear to be the most common source of water in Akure; they also noted that the lack of water supply in Akure is due to low government funding. According to Lawal and Basorun (2015), inhabitants of Akure have an unalienable right to safe (potable) drinking water.

Similarly, water is a crucial component of urban liveability and is one of the most important variables in a nation's development. Ogunyemi and Olugbamila (2015).

"According to Olugbamila and Ogunyemi, "Assessment of water supply status in Owo, Ondo State, Nigeria: Implications for 2030 Agenda For sustainable development" (2015). Water does have power to alter everything from germs to humans, according to Olugbamila and Ogunyemi (2015). According to Olugbamila and Ogunyemi (2015), 300 million Africans lack access to safe drinking water, which leads to people drinking polluted water and a child dying every eight seconds (Ushman, 2003).

Olugbamila and Ogunyemi (2015) used both primary and secondary data gathering approaches to analyze the state of water supply in Owo, Ondo state. Residents of Owo, Ondo state, were given well-structured questionnaires utilizing a systematic random selection technique similar to that employed by Lawal and Basorun (2015), These questionnaires were mailed to every

tenth building's residents, using the same data collection approach as Lawal and Basorun (2015). The ondo state water agency provided secondary data. Olugbamila and Ogunyemi claim that (2015), wells are the primary source of water in OwoOndo state, and many locals drink this water without proper treatment, resulting in a variety of illnesses.

Despite finding that wells are the water source in Owo Ondo state, Olugbamila and Ogunyemi (2015) were unable to determine whether these wells were dug either by government, the local community, or by self-effort.

Adeoye et al (2013) noted in their research report "appraisal of rural water supply: case study of Kwara, North central Nigeria" that policymakers ought to prioritize providing potable water both for urban and rural communities. Majum et al. (2011) claim that 65 million Nigerians do not have access to drinkable water, with 24 percent of those living in rural areas having access to safe water. In their study, According to Adeoye et al (2013), streams and shallow wells offer the bulk of water in Kwara state because of their accessibility to housing units and low cost, however the taps and boreholes were favoured by the majority.

Physical observation suggested that such streams should be substituted with adequate sources of water including boreholes or line wells, according to Adeoye et al (2013). The majority of rural residents in Kwara state do not purify their water (stream and well water) before drinking it, and those who do use alum to purify it but not to kill pathogens, according to the study. This is owing to weak water supply sources.

Adeoye et al (2013) used the primary technique of data collection, which involved delivering questionnaires to inhabitants in rural parts of Kwara state. Rural people are not regarded in water supply plans by the government or non-governmental organizations, according to Adeoye, Adeolu, and Ibrahim (2013). Even when water supply programs are geared toward rural dwellers, there are always difficulties of inadequate execution.

People's health, economic productivity, and quality of life are all influenced by their access to safe water (Ishaku, Majid, & Johar, 2012). According to the research "water supply challenge in Nigeria rural communities: looking to the skies for an answer" by Ishaku et al (2011), 70% of rural households in Nigeria lack access to safe drinking water. In rural Nigeria, Ishaku et al. (2011) looked into the impact of water supply on health, social, and cultural development (2011). A secondary technique was used to collect data on household water access, cholera causes, and case studies on Nigeria's water supply issue.

Furthermore, Adeleye et al (2014) stated that the population of Kpakungu are at danger of developing water-borne diseases due to a scarcity of drinkable water. The challenge of insufficient water supply in Kpakungu frequently results in residents standing in huge lines for extended periods of time, with many who are unable to wait forced to travel large distances in search of water. According to Adeleye et al. (2014), Sixty percent of residents have access to piped water but do not have a consistent supply, while the remaining residents do not have piped water. Water scarcity, according to Adeleye et al (2014), has a major impact on the academic performance of children under the age of 15 since they are involved in water fetching, which limits their potential in school. Water scarcity has an impact on inhabitants' academic performance in addition to its economic, health, and home needs.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1   Research Design

The survey research design was used for this study, which is a cross-sectional data collection method. This is due to the fact that the survey design is effective in advancing the study objectives. The research design is further demonstrated in Table 3.1.

Table 3.1 Research Design

Objectives	Data Item Required	Technique for Data Collection
1. To identify water supply sources in Dei-dei and Dakwa environs;	• Types of water sources • Comparison of the provision of water infrastructure and Standards • Level of efficiency of water supply facilities	• Interviews • Questionnaires
2. To examine the challenges associated with the various water supply sources in the study areas;	• Physical state of the existing facilities. • The various challenges facing water supply facilities in the study area. • Factors or issues of concern to water supply.	• Interviews • Questionnaires • Physical observation
3. To Propose sustainable supplementary ways of water supply	• Residence's views and suggestions for improvement. • Preference on public water supply.	• Interviews • Questionnaires • Journals

Source: Author, 2020

3.2   Data Sources

This study gathered data from two different sources that is; primary sources and secondary sources.

3.2.2 Primary Data

Examination of the alternative sources of water Dei-dei and Dakwa; examination of efficiency or opportunity in the two alternatives; identification of problems and challenges; proposing sustainable alternative ways of water supply make up the primary data to be collected.

3.2.2 Secondary Data

These are a collection of facts and information acquired via early research. They include study-related literature, official ministry records, including Dei-dei and Dakwa maps.

3.2.3. Method of Data Collection

i. **Field survey/physical observation:** Examining the various existing water sources, photographing the existing water sources, and determining the level of accessibility of dwelling units to the primary public water source, its availability, sufficiency, and frequency of flow are all part of this data gathering approach.

ii. **Oral interview:** This will entail physically visiting with residents of Dei-dei and Dakwa to ask questions and obtain their perspectives on the water situation and water supply issues. Residents will be interviewed about their water supply sources, as well as alternate sources they use when their chosen source of water fails. The interview will be used to make deductions about their daily water consumption and the many alternative sources of water they use. In addition, an interview guide will be utilized to direct the discussion with the water board in order to learn more about the situation and challenges with water delivery in Dei-dei and Dakwa.

iii. **Questionnaire administration:** This will be accomplished by distributing written questionnaires to household family heads (or members engaged in water sourcing) to understand more about current water situation, each home's water needs, household size, method of obtaining/collecting water, daily water usage, alternative water supply sources, and distances between sources of water and households

iv. **Water board authority:** data on the amount of water delivered to Dei-dei and Dakwa, as well as a record of their responses to water bills, will be collected. This information may directly or indirectly affect the supply of water to the study region.

v. **Journals:** prior studies identical to this one will be studied in order to learn about water supply issues in other parts of the country and trends in water supply development.

vi. **National Population Commission:** data on the most recent population of Dei-dei and Dakwa will be obtained from the National Population Commission and used for projections and decision-making in this study.

3.3. Instruments for Data Collection

The tools used in this project's data collecting are data specific, in that those used for primary data are distinct from those used for secondary data. Primary data was collected using a questionnaire, and a digital camera. Secondary data was gathered from involved institutions via text and journal articles, media and images, and maps.

3.4 Sampling Technique

3.4.1 Sample Frame

The study's sample frame will be derived from the overall population; the sample frame will be determined by dividing the estimated population of Dei-dei and Dakwa by the standard number of households in Nigeria (which is 6).

The population of Dakwaas at 2021 according Getamap.net, 2021 projected to be 171,672 and Dei-dei is 196,412 which amounts to a total of 368,084.

3.4.2 Sampling Size

Slovin's formula is used to calculate the study's sample size from the sample frame,

$n = {}^N\!/\!_{(1+Ne^2)};$

Where; N = the sample frame households, n = sample size and e = is the degree of freedom or the margin of error

The sample size from the 368,084 population was therefore found to be 384 respondents.

3.4.3 Sampling Procedure

The stratified random sample procedures will be utilized to administer the questionnaire, in which Dei-dei and Dakwa will be treated as individual groups or strata, and copies of questionnaire will be distributed to randomly selected household dwellings within the neighbourhoods.

3.5 Technique of Data Analysis

The statistical Package for social sciences (SPSS) will be used to examine the data acquired through surveys. Descriptive Statistics will be adopted in analysing responses. The software will generate frequencies, percentages, histograms, and bar charts, which will be used in the data analysis.

3.6 Method of Data Presentation

This study's data will be presented using descriptive statistics, which means using precise and accurate charts such as pie charts, bar charts, and histograms, among other things. This will be used since data analyzed in tabular and chart formats presents clear information and ensures easy and faster comprehension, as well as unequivocally elucidating the facts.

CHAPTER FOUR

DATA ANALYSIS AND PRESENTATION

4.1   Socio-Economic Characteristics of Respondent

The analysis of various data acquired for the aim of this study endeavour is discussed in this chapter. This information includes both the respondent's socioeconomic factors as well as an assessment of the water supply in the research location. The data acquired for this study, particularly those collected through the distribution of questionnaires among people of the study region, was evaluated and presented by means of descriptive statistics such as frequency tables, charts, and diagrams. 332 copies of questionnaire were uses to get responses from field survey and site visits.

Gender, age, respondent's highest level of education, respondent's employment, respondent's indigenous status, and number of years spent by non-indigenes of the research region are among the socio-economic characteristics of respondents stated here.

Dei-dei and Dakwa both have four districts each (Apiya way, Unguwan Masalachi, Unguwan Malaina and Anguwan Kutare in Dei-dei while Dakwa has Dakwa kasa, Dakwa Sama, Unguwan Gwari and Ungwan Fulani) comprising mostly of Hausa and Kanuri speaking residence and the native language in the area is Gwari.

Table 4.1 Respondents' Gender

Gender	Frequency	Percentage %
Female	183	55.1
Male	149	44.9
Total	**332**	**100.0**

Source: Author's Field Survey, 2021

The table above depicts respondent gender. Males account for 44.9 percent of respondents, while females account for 55.1 percent. The result shows that females from the study region made up the majority of the responders.
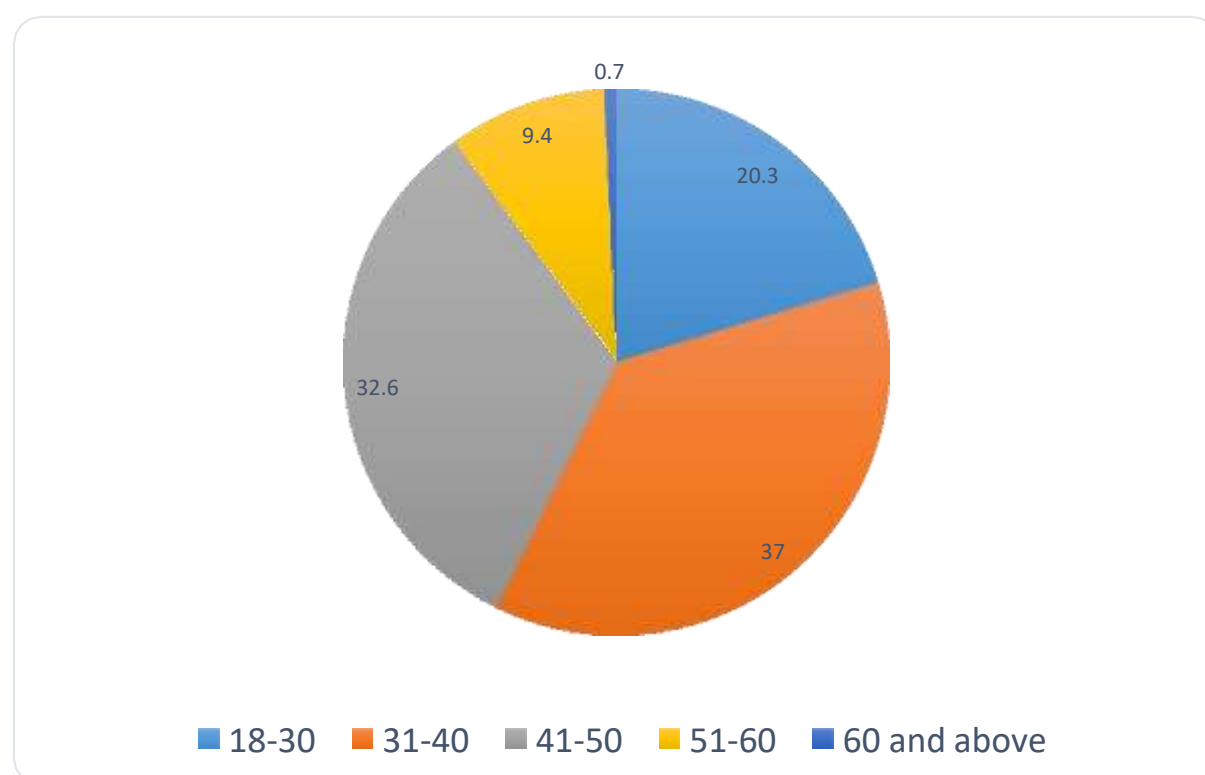

Figure 4.1: Age of respondents

Source: Author's Field Survey, 2021

The age distribution of the respondents is shown in the pie chart above. 37.0 percent of the respondents are between the ages of 31 and 40 years, 33.0 percent are between the ages of 41

and 50 years, 20.0 percent are between the ages of 18 and 30, 9.0 percent are between the ages of 51 and 60 years, and 1.0 percent are between the ages of 60 years. This indicates that the bulk of the respondents are between the ages of 31 and 40.

Table 4.2 Marital Status of Respondent

Status	Frequency	Percentage
Single	130	39.1
Married	147	44.2
Widowed	24	7.2
Divorced	12	3.6
Separated	19	5.8
Total	**332**	**100.0**

Source: Author's Field Survey, 2021

In the table above, the respondents' marital status is shown: 44.2 percent are married, 39.1 percent are single, 7.2 percent are widowed, 5.8 percent are separated, and 3.6 percent are divorced, according to the survey. According to the findings of the aforementioned analysis, married people account for 44.2 percent of the total responder population in the study areas.

Table 4.3 Highest Level of Education

Education	Frequency	Percent
Primary	22	6.7
Secondary	120	36.1
Tertiary	180	54.2
Islamic	10	3.0
Total	**332**	**100.0**

Source: Author's Field Survey, 2021

The Table 4.3 illustrates the respondent's highest educational attainment: 54.2 percent had tertiary level of education, 36.1 percent had secondary level of education, 6.7 percent had primary level of education, and 3.0 percent had qur'anic level of education. As a result, the vast majority of respondents in the research area have finished their post - secondary education.
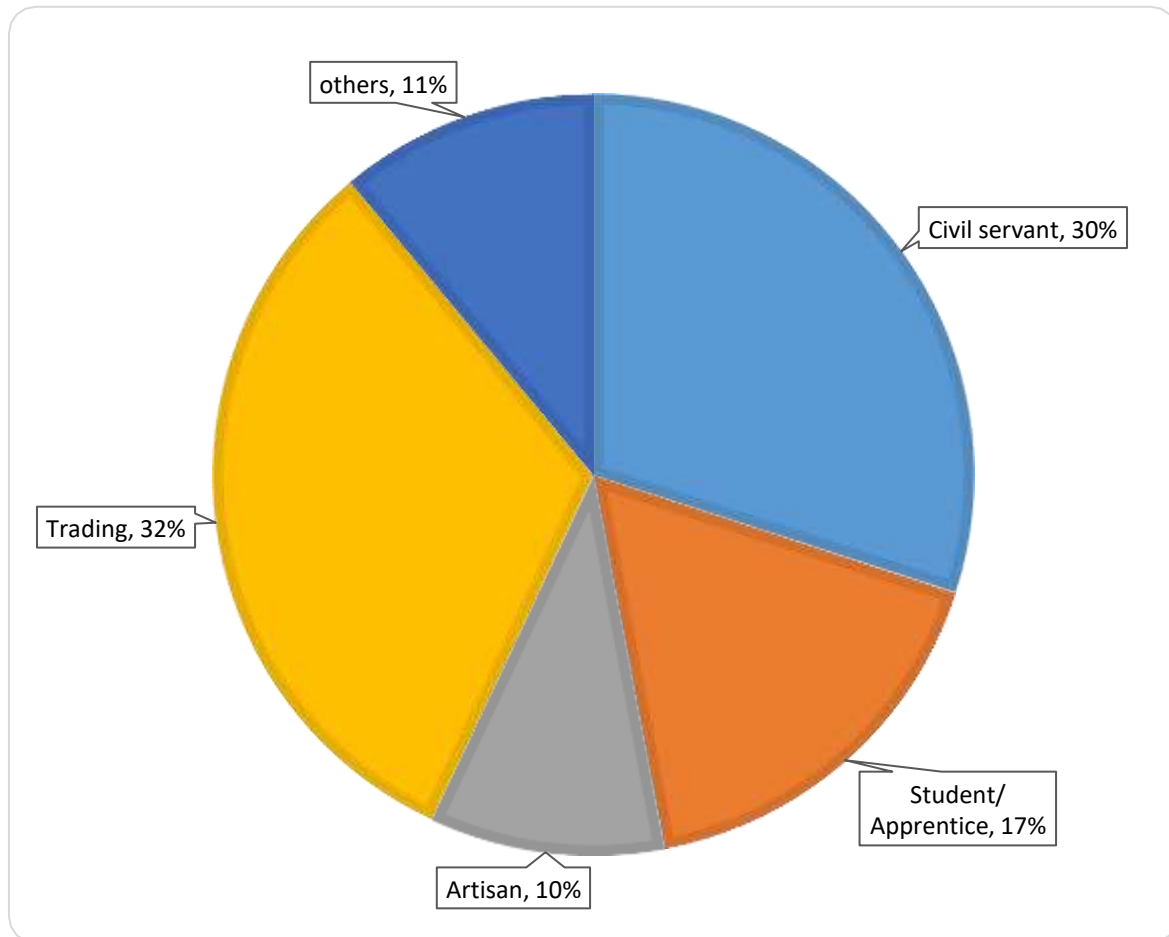
**Figure 4.2: Respondents' Occupation**
Source: Author's Field Survey, 2021

The occupations of the respondents are shown in the pie chat above: 32.0 percent are traders, 30.0 percent are civil servants, 17.0 percent are students and apprentices, 11.0 percent have other occupations, and 10.0 percent are artisans. This indicates that the majority of respondents in the research area are traders.

Table4.4: Total years spent by residents in study area

Years spent	Frequency	Percentage
less than 1 years	-	-
1	11	3.4
2	27	8.2
3	17	5.1
4	23	6.9
5	46	13.8
Above 5	208	62.6
Total	**332**	**100.0**

Source: Author's Field Survey, 2021

According to the table above, 62.6 percent of respondents have lived in the study area for more than 5 years, 13.8 percent have spent up to 5 years in the study area, 6.9 percent have spent 4 years, 5.1 percent have spent between 3 years, and 8.2 percent have spent less than 3 years. According to this analysis, the majority of the respondents have lived in the study area for more than 5 years.

4.2   Existing Water Sources

The existing domestic water supply sources in the FCT's Dei-dei and Dakwa areas comprise the categories of water facilities existing in the area, as well as the water facilities' responsibility status, as shown in the chart below.
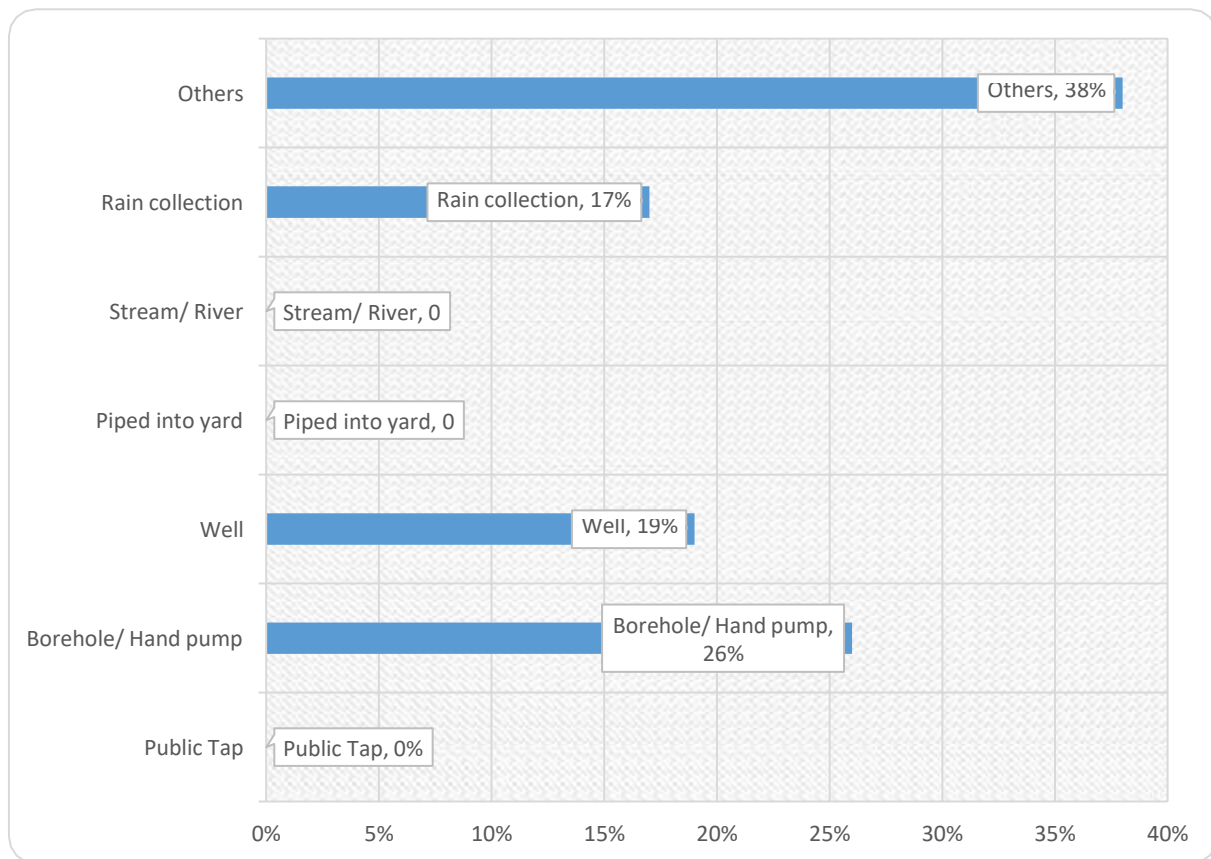
Figure4.3: Types of water supply facility present in study area

Source: Author's Field Survey, 2021

The chart depicts the types and percentages of water supply facilities in the research region for the public; alternative water sources are used by 38% of the population such as mairuwa and other water vendors due to the gross scarcity of water experienced in the area in the past few years. 17%, 19%, and 26% represent water sources from rain, wells and boreholes. This is largely due to the fact that the study area has never been captured by the water board authority hence the need for residents to resort to alternative water sources.

To cushion the effect of water scarcity over the years, efforts have been made by different individuals and bodies. This can be seen from the privately owned boreholes, commercial boreholes and donation from government officials/ politicians (by Sen. Philip Tanimu Aduda and the Chairman Bwari Area Council) including a donation by the government of Turkey at the Dei-dei Emir's Palace in 2020.

Plate 1: Water Facility Donated by the government of Turkey
Source: Author's Field Survey, 2021

Plate 2: Water Facility Donated by Sen. Philip Tanimu Aduda
Source: Author's Field Survey, 2021

Plate 3: Water Facility Donated by the Chairman Bwari Area Council
Source: Author's Field Survey, 2021

Plate 4: Borehole Donated by the Chairman Bwari Area Council at Dei-dei Market
Source: Author's Field Survey, 2021

Plate 5: Commercial Borehole and Public Convenience
Source: Author's Field Survey, 2021

Plate 6: Commercial Water Vendors (Mai Ruwa) Sourcing for Water
Source: Author's Field Survey, 2021

Plate 7: Neighbourhood Borehole (Hand pump)
Source: Author's Field Survey, 2021

Plate 8: Commercial water selling Point
Source: Author's Field Survey, 2021

Table4.5: Who is in charge of providing water supply facilities?

Responsibility status	Frequency	Percentage
Government	-	-
Private	156	47.0
Community	118	35.5
Neighbour	58	7.5
Others	-	-
Total	**332**	**100.0**

Source: Author's Field Survey, 2021

In the research region, 47.0 percent of water facilities are provided by private individuals through hand dug wells, private boreholes, and a substantial number pay water vendors for their services, as shown in the table above. The community provides 35.5 percent of the water facilities through donations in the form of public boreholes in strategic places, while 7.5 percent of residents rely on their neighbors for water sources such as wells and privately owned boreholes. This result shows that individuals have to privately provide the water facilities in the study area.

4.3 Challenges of Domestic Water Supply

This section covers topics such as how often water is delivered, the duration of water supply in the research area, seasonal variations in water supply, distance traveled to water facilities, water facility characteristics, nature of the water supplied, and water quality.

Table4.6: Frequency of supply

Frequency of supply	Frequency	Percentage
More than once a day	17	5.0
Once a day	39	11.8
Once in 2 days	52	15.7
Once in 3 days	61	18.3
Once a week	164	49.3
Total	**332**	**100.0**

Source: Author's Field Survey, 2021

The above table shows how often residence source for water. Since no formal water supply scheme exist in the study area, this frequency illustrates how regular the residents' source for their own water depending on the storage capacities available in their homes. Water supply in terms of frequency against days of the week, as seen in the table above, demonstrates that most residents prefer to get water once a week. This therefore implies that they have made provisions for water storage that can go for as long as seven days before a refill a required.

4.3.1 Distance and time travelled

Distance travelled to water source was influenced by the fact that most residents have to travel a short distance to either access their water source or access water vendors since they have the responsibility to provide water themselves. Time spent on each trip is influenced by the number of users at the water source. Overall, the distance travelled by residents is summarized below;
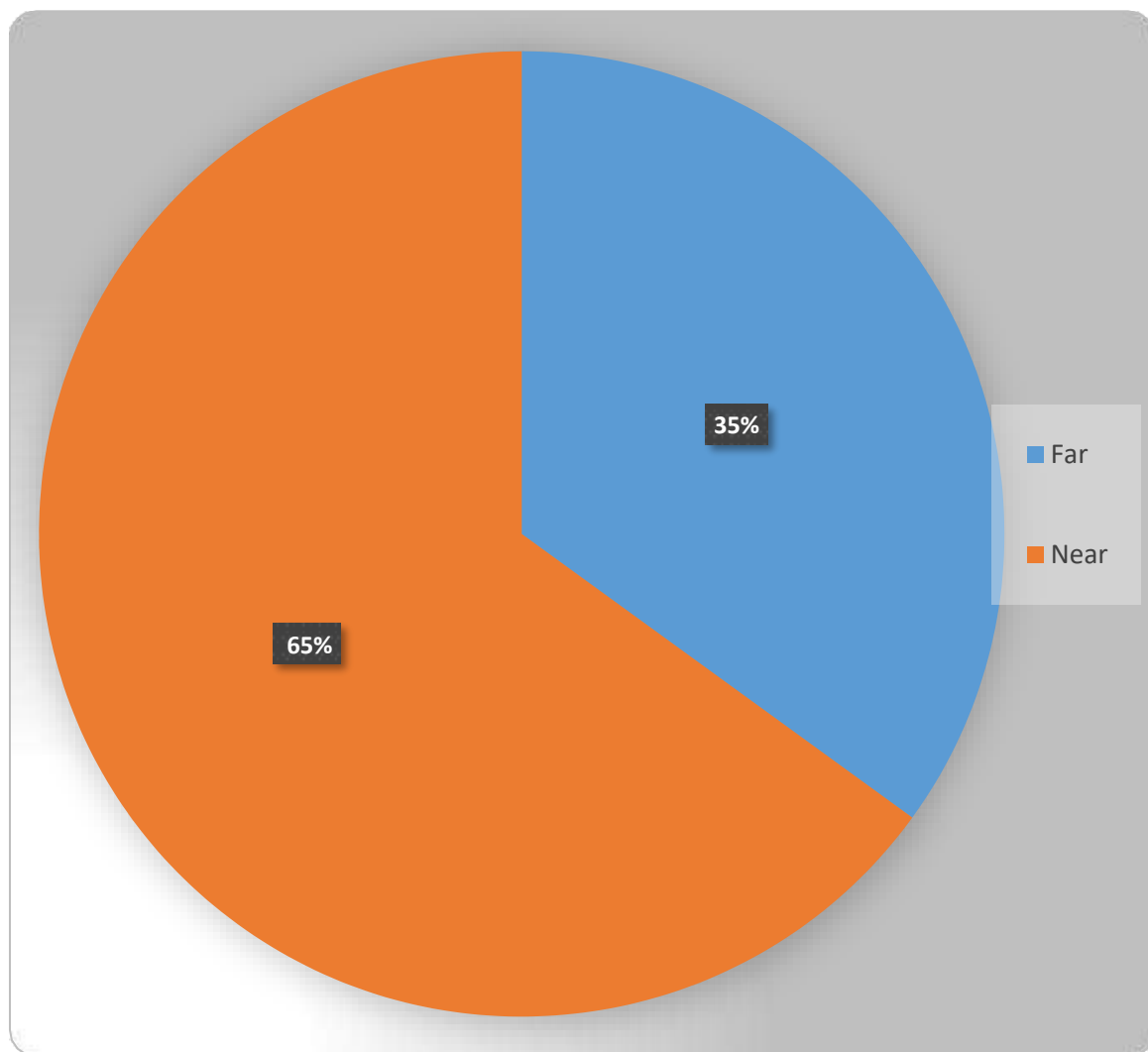
Figure4.4: Distance to water facilities
Source: Author's Field Survey, 2021

The distance travelled by respondents to water facilities in the study area is depicted in the pie chart above. 65.0 percent of respondents said the distance to the water supply facilities is short (below 200 meters), while 35.0 percent said the distance is long (above 200 meters).

4.3.2 Condition of water facility
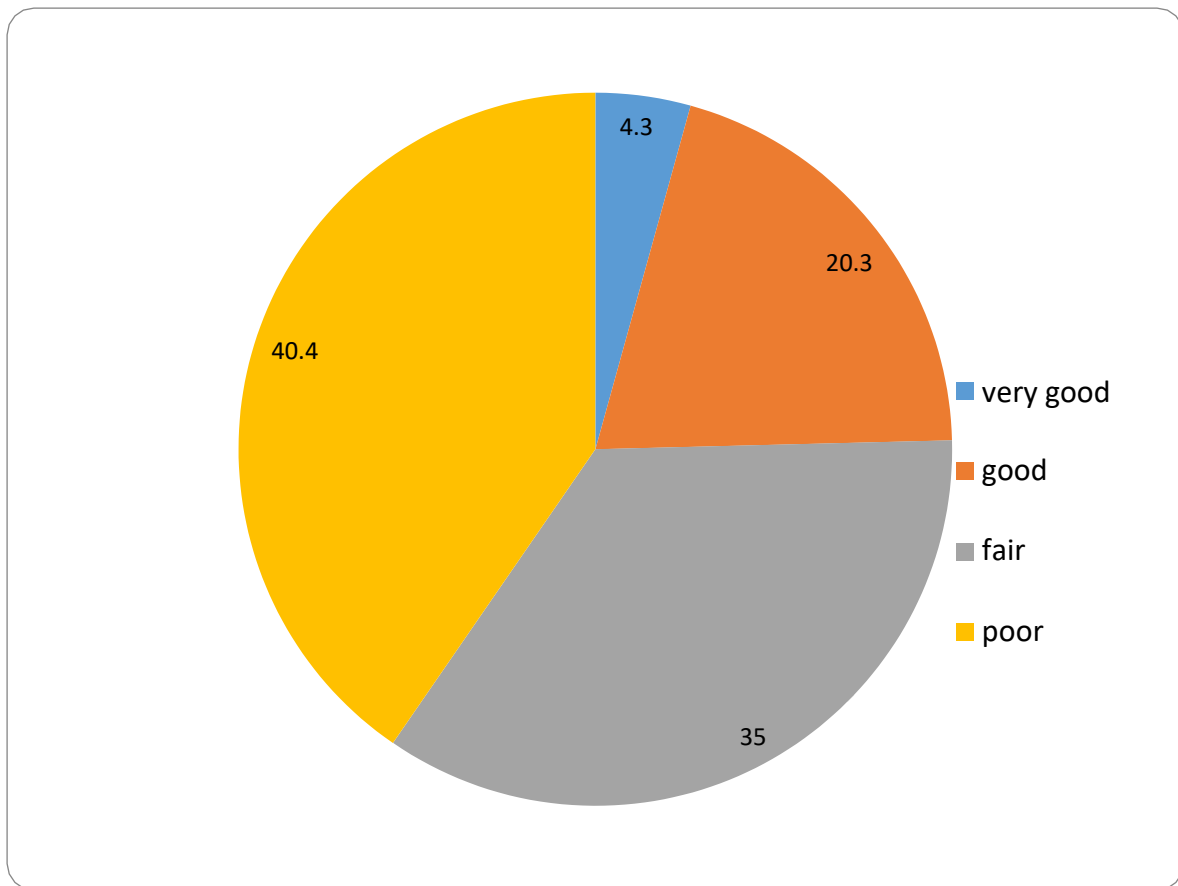
Figure 4.5: Condition of water facility
Source: Author's Field Survey, 2021.

The chart above depicts the various states of the research area's water supply facilities. A total of 40 percent of the facilities were in poor condition, 35.0 percent were in fair condition, 20% were in good condition, and 4% were in perfect usable conditions. This demonstrates that the majority of water supply infrastructure in the research region, as well as the state of water vendor containers, are in poor shape.

Plate 9: Deteriorating Commercial Borehole and Public Convenience
Source: Author's Field Survey, 2021

Plate 10: Typical Water Tank for a Commercial Borehole
Source: Author's Field Survey, 2021

4.3.2 Physical Nature (Colour) of water supplied

Table4.7: Nature of water supplied

Nature	Frequency	Percentage
Cloudy/ dirty	72	21.6
Clear	260	78.4
Total	**332**	**100.0**

Source: Author's Field Survey, 2021

The nature of the water provided to the respondents is shown in the table above. It shows that 78.4 percent of respondents believe the water supplied within the area is relatively clean, while 21.6 percent believe that water supplied is not particularly clean but acceptable for usage. As a result of the investigation, it appears that the water provided to the research region is generally pure, coming from wells, boreholes, water vendors, and other sources.

4.3.3   Drinking   Water   Quality

Table4.8Satisfaction with Drinking Water Quality

	Frequency	Percentage
Satisfied	52	3.6
Partially satisfied	81	27.7
Dissatisfied	199	68.7
Total	**332**	**100.0**

Source: Author's Field Survey, 2021

The table above depicts inhabitants' satisfaction with the drinking water quality in the research region. It shows that 68.7% of respondents believe the water supplied is of sufficient quality, 27.7% believe it is fair, and 3.6 percent believe it is of good quality. This indicates that the majority of respondents believe the quality of the water supplied to the area is inadequate.

4.4   Cost of Water Services

Individuals who patronize water vendors pay ₦60 for a 20 litres keg and between ₦240 - ₦1000 for a full truck containing 10 kegs depending on the season of the year. Prices are mostly higher in the dry season months due to scarcity.

CHAPTER FIVE

SUMMARY OF FINDINGS, RECOMMENDATIONS AND CONCLUSIONS

5.1 Summary of Findings

Findings from the thesis indicate a representative condition in many Nigerian cities in terms of low water facilities. Most Nigerian cities have been severely underserved with piped water for some time, and the situation in Dei-dei and Dakwa is no exception it is actually worse because as a satellite town to the FCT, it has not been captured in the water board Master Plan. This means that provision for pipe borne water has never been made in these areas. The rising engagement of private companies/individuals in urban water supply in order to increase service delivery efficiency has been a recent trend. Donations from well-intentioned politicians and the Turkish government have added to this. This chapter summarizes the study's main findings, which include an assessment of water supplies in Dei-dei and Dakwa. It also suggests some potential solutions for increasing water supply availability.

The study used participant observation, questionnaires, interviews, and surveys to determine the socio-economic features of those who took the survey of public water Dei-dei and Dakwarevealed, among other things, that females between the ages of 31 and 40 make up the majority of the respondents in the area, and that they are primarily responsible for fetching water for the hive. It also suggests that a higher percentage of respondents are married, with university education being the highest degree of educational achievement, with a large percentage of traders. The majority of these people have resided in the study region for at least 5 years, and others have lived there for most of their lives.

While the assessment of water facilities in Dei-dei and Dakwa reveals that the types of water sources present in the study area are primarily wells, boreholes, and water vendors, the

identification of water sources as a result of the field survey reveals that the number of sources does not match the demand or the growing population of the areas.

Furthermore, private persons provide the majority of water facilities in the research area, and also the quality and performance of the water facilities and sources are not in the greatest possible condition to deliver portable water. Water is sold for as high as ₦1000 for 10 kegs (i.e., 200 litres) during dry season and it comes down to about ₦240 at the peak of rainy season since residents have the of harvesting rain water during that period.

Finally, the investigation reveals that the type of water that is provided to people is moderately portable, and that the quality of the water supplied for house hold uses such as drinking and cooking is generally acceptable because it is tasteless and odourless. Although, the water sometimes has a cloudy/ dirty look which may be attributed to the hardness of the water underground from wells and boreholes.

5.2   Recommendations

The following recommendations, grounded on the numerous findings from the study on the assessment of residential water supply, a case study of Dei-dei and Dakwa area of the FCT, are believed to alleviate the identified difficulties if appropriately implemented.

1. The majority of people in the studied areas rely on well water, boreholes, and water sellers as their primary source of water, which is not the safest method of obtaining water. These sources may not meet the requirements for portable water supply like odourless, colourless and tasteless. This is an issue of concern owing to the health implications involved. Therefore, it is suggested that the government through its Water Board (FCT chapter) develop a new Master Plan that will expand their services and facilities to satellite towns around the FCT including Dei-dei and Dakwa to ensure an

improved and safe means of water supply for the residents. This is because making water supply services accessible is as one target of the MDGs and SDGs.

2. The findings also suggest that individuals have set up unregulated private businesses aimed at providing water in the study area, raising concerns about water quality. Local needs and risk assessments are critical to understanding specific challenges in water quality and developing suitable responses, even if they are supposed to be the duty of the government or other relevant entities. Interventions to guarantee that drinking water is clean and safe is necessary because water supply and sanitation are inextricably linked. Risk assessments of water quality on human health are recommended.

3. It is also advised that the state of several public facilities be improved, as it has been seen that some of them are in poor condition. The facilities should also be located in a central location to meet the requirement for a wide range of coverage.

4. Finally, since the government has been under increasing pressure from issues in the water sector, private sector participation in the research area has been recommended. This will be supplemented by government and necessary agency supervision.

5.3   Conclusion

Water supply is a major issue in the majority of Nigerian cities. Private sector engagement has become essential as the government faces increasing pressure from water-related challenges, and it has improved performance in a few developing countries where it has been implemented. The MDG goal of providing adequate and safe drinking water to urban and rural people by 2015 is one of the policy trusts of the National Water Supply and Sanitation (NPWSS), 2000. This goal has yet to be accomplished.

Because the Millennium Development Goals (MDGs) for water and sanitation were not met by 2015, the Sustainable Development Goals (SDGs) will necessitate a major increase in effort, both in terms of the scope of action necessary and the speed with which these measures must

be implemented. Commercialization and private sector participation have also been suggested as solutions to these challenges by the National Water Supply and Sanitation (NPWSS) policy and World Bank programs. The Public Private Partnership (PPP) option for water supply is one of the approaches to solve our city's urban water concerns while also achieving the SDGs. Improvement will be documented without the need for further government financing once it has been promoted and the proper work allocation for the selected partners has been established. As a result, the National Water Supply and Sanitation (NPWSS) strategy and World Bank programs has recognized commercialization and private sector involvement as two options for addressing these issues.

This summary of findings has given a lot of important understanding into the future of water delivery in the FCT's Dei-dei and Dakwa communities, as well as Nigeria as a whole. Each municipality or community must create a structure that is best suited to its surroundings. Finally, this study of water supply in Dei-dei and Dakwa can serves as a springboard for developing a variety of potential solutions to the water supply problem, particularly through Public Private Partnerships.

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CENTRE FOR HUMAN SETTLEMENTS AND URBAN DEVELOPMENT
FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA

QUESTIONNAIRE ON THE ASSESSMENT OF DOMESTIC WATER SUPPLY, A CASE STUDY OF DEI-DEI AND DAKWA AREA OF THE FCT

Dear Respondent,
This research field work is part of requirement leading to the award of Master in Sustainable Urban Development (M.SUD). All information supplied will be used purely for this academic purpose and shall be treated with utmost confidentiality. You are therefore kindly requested to tick from the options provided or fill in the spaces provided.

Thank You Sir/ Ma for Your Time.

QUESTIONNAIRE FOR RESIDENTS

SECTION A - PERSONAL DATA

1. Neighbourhood/ Street of Residence	
2. Age of respondent (in years)	18-30 [ ] 31-40 [ ] 41-50 [ ] 51-60 [ ] 61-70 [ ] Above 70 [ ]
3. Gender	Male [ ] Female [ ]
4. Marital status	Single [ ] Married [ ] Separated/Divorce [ ] Widowed [ ]
5. Occupation of respondent	Student/Apprentice [ ] Civil servant [ ] Trader [ ] Artisan [ ] Unemployed [ ] Retired [ ] Others specify……………………
6. Highest level of education	Primary [ ] Secondary [ ] OND/NCE [ ] HND/B.Sc. [ ] Higher Degree (Masters/PHD) [ ] No formal education [ ] Qur'anic school [ ]
7. Years of living in the street/ neighbourhood	Less than 1 [ ] 1 [ ] 2 [ ] 3 [ ] 4 [ ] 5 [ ] Above 5 [ ]

SECTION B – EXISITING WATER SOURCES AND CHALLENGES FOR HOUSEHOLDS

1. How many people usually live in your household?...
2. Does your household have access to safe water sources for drinking?
   (a) Yes_____   (b) No_____
3. What is the main water s source for drinking and cooking for members of your household?
   (a) Stream/River/Pond
   (b) well
   (c) Rainwater collection
   (d) Borehole with hand pump
   (e) Public taps
   (f) Piped into yard
   (g) Piped into house
   (h) Others ………………………...

4. Whose property is the main water source which your household usually uses?

   (a) Own property
   (b) Neighbour
   (c) Community
   (d) Government
   (e) Others ……………………

ELECTRIC BOREHOLE, OPEN WELLS AND HAND PUMPS

5. How far (in meters) is the electric borehole, well or hand pump that you use? ………………………………..
6. How long (in minutes) does it take to fetch water and return home? …………………………………………
7. Who fetches water most often?
   (a) Adult male
   (b) Adult female
   (c) Male child
   (d) Female child
8. Has the electric borehole, well or hand pump broken down in the past one year?
   (a) Yes
   (b) No
9. How frequently has the bore well/ hand pump broken down during the past one year?
   (a) Once a week
   (b) Once a fortnight
   (c) Once a quarter
   (d) Once in six months
   (e) Once a year
10. Is the bore well/ hand pump fixed promptly when it breaks down?
    (a) Yes
    (b) No
11. If you use wells as your major water source, what is the frequency of cleaning the well?
    (a) Once in a quarter
    (b) Once in six months
    (c) Once a year
    (d) Not cleaned in the last year

PUBLIC TAP

12. How far (in meters) is the tap that you use? …………………………………..
13. How long (in minutes) does it take to fetch water and return home? …………………………………………
14. Who fetches water most often?
    (e) Adult male
    (f) Adult female
    (g) Male child
    (h) Female child
    …………………………………………

15. What is the frequency of water supply?
    (a) More than once a day
    (b) Once a day
    (c) Once in two days
    (d) Once in three days
    (e) Once a week
    (f) Others……………………………
16. Is the frequency adequate for your needs?
    (a) Yes
    (b) No

17. How often would you like to get water?

18. On the days that you get water, how many hours do you usually get water for?..
19. Has the public tap broken down in the past one year?
    (a) Yes
    (b) No

20. How frequently has the bore well/ hand pump broken down during the past one year?
    (a) Once a week
    (b) Once a fortnight
    (c) Once a quarter
    (d) Once in six months
    (e) Once a year

21. Is the public tap fixed promptly when it breaks down?
    (c) Yes
    (d) No

PIPED INTO YARD/ HOUSE
22. What is the frequency of water supply?
    (a) 24-hour supply
    (b) More than once a day
    (c) Once a day
    (d) Once in two days
    (e) Once in three days
    (f) Once a week
    (g) Others……………………………

23. Is the frequency adequate for your needs?
    (a) Yes

(b) No

24. How would you like to get water?

………………………………..

25. On the days that you get water, how many hours do you usually get water for?..

WATER QUALITY/ QUANTITY

26. Is the quantity of water that you receive (from your main source of water) adequate?

(a) Yes
(b) No

27. Is water available (from your main source) throughout the year?

(a) Yes
(b) No

28. Which months do you face scarcity the most?

(a) January
(b) February
(c) March
(d) April
(e) May
(f) June
(g) July
(h) August
(i) September
(j) October
(k) November
(l) December

29. Generally, how does the water smell?
(a) No smell
(b) Foul smell

30. Generally, does the water have a taste?
(a) Yes
(b) No (tasteless)

31. Generally, what does the water look like?
(a) Clear
(b) Cloudy/ dirty

32. What kind of water treatment do you use?
(a) None
(b) Boiling
(c) Use of water filter or purifier
(d) Others …………………………….

33. Do you pay for water?
(a) Yes
(b) No

34. How much do you pay a month?

₦………………….

35. Overall, are you satisfied with your drinking water service?
(a) Satisfied
(b) Partially satisfied
(c) Dissatisfied

36. If you see the need for the present water supply to improve, which option is most desirable to address domestic water shortage?
(a) Rehabilitating existing boreholes, shallow wells with hand pumps
(b) Rehabilitating existing piped scheme with communal taps
(c) Constructing communal boreholes with hand pumps or motor pumps
(d) Constructing piped scheme with communal taps
(e) Others
……………………………………
……………………………………

37. would you be willing to pay a fee for improved water supply?
(a) Yes
(b) No