# ASSESSMENT OF IMPROVED WATER AND SANITATION COVERAGE IN KADUNA SOUTH LOCAL GOVERNMENT AREA OF KADUNA STATE, NIGERIA

**BY**

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**DEPARTMENT OF GEOGRAPHY,**
**FACULTY OF SCIENCE,**
**AHMADU BELLO UNIVERSITY,**
**ZARIA - NIGERIA**

**NOVEMBER, 2016**

DECLARATION

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

_____ _____

Dawah, Joseph John Date

CERTIFICATION

This dissertation entitled An Assessment of Improved Water and Sanitation Coverage in Kaduna South Local Government Area, Kaduna State, Nigeria by Dawah, Joseph John meets the requirement for the award of the Degree of Master of Science (Environmental Management) of Ahmadu Bellow University Zaria and is approved for it contribution to knowledge and literary presentation.

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## DEDICATION

This research is dedicated to God almighty who is the source of my inspiration and to my late Dad ( Mr John Damishi Dawah) who has taught me the virtue of hard work.

# ABSTRACT

The study is an assessment of improved water and sanitation coverage in Kaduna South, Nigeria. Due to rapid urban and population growth, sanitary conditions of urban areas have deteriorated over time. The objective of the study is to identify the sources of water, assess the role of household members in improved water and sanitation, determine the time taken to access water by household members, identify the number of households using improved water and sanitation facility and to identify key players in providing improved water and sanitation in the study area. The study utilized primary data by means of questionnaire instrumentation. A total of 382 copies of the questionnaire were used for the survey. Six (6) out of the thirteen (13) wards in Kaduna South Local Government Area were selected for the research which are Barnawa, Kakuri Gwari, Kurmin Mashi, Television, Tudun Wada and Ungwa Muazu. Data analysis was carried out by Chi-Squares statistical analytical method. Based on the objectives of the study, about 65% of the interviewed households use protected well as their main source of water, 60 % the role played by household members in providing improved water and sanitation is performed by adult women, while 25% of the role is carried out by adult male. Sixty percent (60%) of the respondents reported that the average time to access water by households is 30mins which meets WHO standard for distance to water sources. Also, sixty percent (60%) of respondents showed that an average of 5 households shared a toilet facility in the study area which is unacceptable. Adult women are key players in providing improved sanitation to household with 60%, the adult male 25% while children less than 15years were 15%. The overall result shows that there is no significant difference in improved water and sanitation coverage in Kaduna south Local Government Area. The Chi-Square value (p-value) is greater than 0.05% in the area showing a no significant difference in improved water and sanitation coverage amongst households. Based

on these findings, the study recommends that government should intensify effort in encouraging and providing improved water and sanitation, proper enlightenment should be carried out by both the Government and private partners, more households should be connected to pipe water to reduce the burden experience, priority should be given to water and sanitation; this would on the long run reduces disease caused by poor access to potable water and proper sanitation, policies like connection of household to pipe water, regular house to house inspection, imposition of penalty, monthly sanitation and design for minimum standard for household sanitation facility that would enhance better water and sanitation improvement should be implemented.

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## ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| CDR: | Crude Death Rate |
| HDI: | Human Development Index |
| HPI: | Human Poverty Index |
| JMP: | Joint Monitoring Programme |
| MDGs: | Millennium Development Goal |
| NGO: | Non-Governmental Organization |
| NBS: | National Bureau for Statistics |
| NPC: | National Population Commission |
| NV: | Nigeria Vision 20: 2020 |
| SDGs: | Sustainable Development Goals |
| UN: | United Nations |
| UNDP: | United Nations Development Programme |
| UNICEF: | United Nations Children's Fund |
| UNPF: | United Nations Population Fund |
| VIP: | Ventilated Improved Pit latrine |
| WHO: | World Health Organization |
| WPI: | Water Poverty Index |
| WSH: | Water, Sanitation and Hygiene |
| WSMP: | Water and Sanitation Monitoring Platform |
| WASH: | Water, Sanitation and Hygiene |
| WSS: | Water Supply and Sanitation |
| WSSS: | Water and Sanitation Summary Sheet |

# CHAPTER ONE

# INTRODUCTION

## 1.1 Background of the Study

Water, sanitation and hygiene are said to be the basic primary drivers of public health (Muta'aHellandendu, 2012). Access to them ensures good state of health and most importantly, human dignity. However, in both rural and urban areas of developing countries, a bulk majority of the population lack access to standard water and sanitation service which accounts for most of the health complications in developing countries (Water Aid, 2008).

An improved drinking water source is defined as a source by nature as its construction is protected from outside contamination, in particular from contamination with faecal matter (WHO, 2010) while improved water supply is said to be the percentage of the population with reasonable access to an adequate amount of water from an improved source, such as a household connection, public standpipe, borehole, protected well or spring and rainwater collection (WHO, 2010). World Bank (2013) also defined improved water supply in term of the percentage of population using water from an improved drinking water source. Unimproved water sources include vendors, tanker trucks, and unprotected wells and springs. Reasonable access is defined as the availability of at least 20 liters a person a day from a source within one (1) kilometre of the dwelling.

Improved sanitation is defined as one that hygienically separates human excreta from human contact which include the use of flush or pour-flush toilet/latrine to piped sewer system, septic tank, pit latrine, Ventilated Improved Pit (VIP) latrine, Pit latrine with slab and Composting toilet (WHO and UNICEF, 2012). Lenton, Wright and Lewis (2005), also defined improved sanitation as a sanitation system in which excreta are disposed of in

such a way that they reduce the risk of fecal-oral transmission to its users and the environment.

Demographic and urban growths have resulted in significantly increased numbers of people living in unplanned and un-serviced slum and informal areas of cities in developing countries (Water Aid, 2008). The rapid urbanization of our planet dates back to the 19$^{th}$ century, and by 1950, 29% of the world's population lived in the cities. It has been estimated that 50% of the world population lived in cities, this figure will reach 61% by 2030 (UNPF, 2007)

Nsiah-Gyabaah (2004) highlighted that in Africa the dramatic effects of rapid urbanization are very clear in the cities and peri-urban areas. He noted that although, cities serve as engine of growth in most developing countries by providing opportunities for employment, education, knowledge and technology transfer and ready markets for crafts and agricultural products, high urban population places enormous stress and pressure on the environment. With this rapid population growth, the implication can as well be predicted in terms of the demand for food and raw materials or in inputs and generation of waste and pollution, or output and other environmental consequences.

Water and Sanitation Hygiene (WASH) efforts in the developing countries are often balkanized and not sufficiently integrated to ensure sustainable WASH services (Montgomery and Elimelech, 2007). Mtwalib (2009) highlighted that some 2.6 billion people worldwide (two in five ) do not have access to improved sanitation, and barely more than one-third of the population (36%) uses adequate sanitation facilities in West/Central Africa, 37% in Southern Asia and 38% in Eastern/Southern Africa. According to Mtwalib (2009), global sanitation coverage increased from 49% in 1990 to 59% in 2004, and about 1.2 billion people gained access to improved water and sanitation facilities over that period which shows a level of progress, yet the world is not making sufficient progress to meet the

Millennium Development Goal (MDG) target on improved water and sanitation sources (Mtwalib, 2009). However, efforts to providing safe water and sanitation on a global basis are challenging.

During the United Nation Summit in September 2000, 189 UN Member States adopted the Millennium Declaration, from which emerged the Millennium Development Goals (MDGs). The MDGs form a set of eight (8) political commitments aimed at tackling the major development issues faced by the developing world, within a fixed deadline and these commitments include: Eradicate extreme poverty and hunger, Achieve Universal Primary Education, Promote gender equality and empower women, Reduce child mortality, Improve maternal health, Combat HIV/AIDS, malaria and other diseases, Ensure Environmental Sustainability and to Develop a global partnership for development (Machiwana, 2010).

While almost all the MDGs can be indirectly linked to water supply and sanitation (WSS) issues, Goal 7 on environmental sustainability addresses them directly: one of its targets, Target 10, is to "halve by 2015 the proportion of people without sustainable access to safe drinking water and basic sanitation". To achieve the MDG 7 Target 10, the WHO stated that the rate of improvement over the past years would have to double by 2015, and if the same trends continue, there will be 2.4 billion people in the world, partly as a result of population growth, without basic water and sanitation in 2015 (WHO, 2012).

Global trend on drinking water supply shows that at the end of 2011, 89% of the world population used improved drinking water source, including 55% with piped water supply on premises while 3% and 8% relied on surface water and other unimproved sources respectively. According to the report, global sanitation trend between 1990 and 2011 shows 1.9 billion people have gained access to improved sanitation facilities since 1990 and as at 2011, 64% of the world population relied on improved sanitation facilities,

with an estimated and alarming figure of 2.5 billion people still living without access to improved sanitation with Sub-Saharan Africa and Southern Asia are said to be having 30% and 41%, respectively with no access to improved sanitation at all (WHO and UNICEF, 2013). Though relative progress has been achieved but meeting MDG target seems a difficult challenge.

Many diseases endemic throughout the world are generally associated with unsatisfactory drinking water supplies, poor sanitation conditions and inadequate health education programs. Chiefly among them include diarrhea, dysentery, gastro-enteritis, infectious hepatitis, hookworm, guinea worm, and other parasitic infections. The major reason for the frequency and burden of diarrheal disease is the pronounced lack of water and sanitation in a majority of developing countries (Zwane and Kremer, 2007). The United Nations indicated that more than half of the population in developing countries still lacks access to the most improved water and basic form of sanitation and therefore exposed to danger of diseases (UN, 2007).

Water and Sanitation Summary Sheet (WSSS) shows that access to improved water and sanitation is a major challenge in Nigeria, and water and sanitation coverage rates in Nigeria are amongst the lowest in the world. The situation shows that some level of progress has been made in water provision to reach the MDG targets of 75% coverage for improved drinking water and 63% coverage for improved sanitation in 2015. Consequently, issues of urban water supply and sanitation will be very critical considering urban growth in Nigeria, and the situation which is compounded by lack of monitoring mechanism to check current situations (WSMP, 2008).

Development in Nigeria towards the MDG target on sustainable access to safe drinking water show that between 1990 and 2011, the proportion of Nigeria's population with improved sources of drinking water rose from 47- 61 %. On a national scale, the

report shows that by 2011 more than half of Nigerians rely on other improved sources of drinking water such as protected dug wells and springs, tube wells or boreholes, rainwater collection, and public taps or standpipes. Altogether an estimated 26% of the 2011 population of Nigeria gained access to improved drinking water sources since 1995 (WHO and UNICEF, 2013).

The above development shows that between 2000 and 2011, 66% and 69% of Nigeria's population uses unimproved sanitation. Open defecation declined in Nigeria by only 1% between 1990 and 2011. More than one-third of the urban populace (36 - 44%) relies on facilities that are shared (public facilities). Also, since 1995 only 6% of the 2011 population of Nigeria gained access to improved sanitation facilities. Consequently, Nigeria still remains one of the countries with large numbers of people without access to improved sanitation (WHO and UNICEF, 2013).

The report of Water and Sanitation Monitoring Platform (2008) also show regional variation in improved sanitation facilities in Nigeria. For example, the North-East has 20.7 million: 45% of the population use improved sanitation facilities, The North-West has 35.8 million people: 61% of the population use improved sanitation facilities, North-Central has 18.8 million: 46% of the population use improved sanitation facilities, South-East has 16.3 million: 69% of the population use improved sanitation facilities, South-West with 27.5 million: 62% use improved sanitation facilities, South-South has 21 million people: 55% of the population use improved sanitation facilities (WSMP,2008). The above figure shows that a large proportion of the population is still un-served and lacking access to improved water and sanitation facility.

National bureau for statistics multiple indicator housing survey 2011 shows 59% of Nigerian use improved Water source while 31% use improved Sanitation, a figure that shows a level of success on water but relatively low performance on sanitation (NBS,

2011). The above percentage shows that Nigeria is not close to MDG 2015 and If remarkable success must be achieved, effort must be double to meet MDG 2015 and beyond.

According to the Water and Sanitation Monitoring Platform report ( 2008), 70 million Nigerians use unsanitary or shared latrines; 32 million have no latrine at all and defecate in the open. The least proportion of the poorest is 10 times more likely to practice open defecation than the richest and the report further stated that open defecation costs Nigeria US$1 billion per year – yet eliminating the practice would require not less than 6.5 million latrines to be built and used. This is alarming and requires frantic effort to manage the present situation (WSMP, 2008).

## 1.2 Statement of the Research Problem

Not until 2009, Nigeria had no comprehensive strategy on Water and sanitation improvement which was a major and critical developmental issue. The vision 20:2020 which contains detailed strategy for implementing Water and Sanitation improvement in Nigeria came into existence in 2009 in order to ensure strategic approach to realization of the Nigeria Vision 20:2020, the timeline for the achievement of targets and goals has been defined as Short Term (2009 to 2011); Medium Term (2011 to 2015); and Long Term (2016 to 2020), but before 2009 only individual solutions was adopted at the household level; for example pit latrines, septic tanks and storage. This study falls within the short and medium term goal of the national policy.

There is very little sewerage in urban Nigeria regarding solid waste, while there is some level of public and private solid waste collection but the frequency of collection is poor (WSMP, 2008). The storm water drainage system is frequently a disposal point for solid waste. Moreover, disposal, when waste is collected, is by dumping rather than sanitary landfill and is a major cause of water pollution either through the storm water

drainage system or seepage into the groundwater. Wastewater disposal pollutes the surface water. Being in an embryonic stage, the sanitation sub-sector requires better-formulated policies and a massive injection of well-formulated investments, designed specifically for African conditions, combined with institutional reforms.

Few studies have explicitly analyzed the health benefits of sanitation infrastructure. The Independent Evaluation Group of the World Bank (2008) postulates in a review of impact evaluations on water supply and sanitation on the lack of evidence regarding water and sanitation improvement. There is a great need to engage in more of such studies to support the case – which appears to exist on the basis of limited evidence – for more investment and improvement in water and sanitation improvement.

Olawuni (2007) in his study of accessibility to water supply and sanitation practice in Osogbo, Osun State, Nigeria using questionnaire administration method. The household data obtained from the research shows an inadequacy in the household needs and accessibility to water supply and basic sanitation. However, the study only considered accessibility not improved conditions and situations. Also, Esrey, Potash, Roberts, and Shiff (1991) examined the effect of improved water supply and sanitation on six (6) diseases in the United State using secondary data, found a 17% reduction in diarrhea induced by improved water supply and a 22% reduction induced by improved sanitation infrastructure but their work was based on secondary data which limits their findings and results.

Waddington, *et al*, (2009) in a synthetic review of impact evaluations, examining effectiveness of water, sanitation and hygiene (WSH) interventions in reducing childhood diarrhea. The report show no significant impact on diarrhea morbidity for water supply and a 37 % relative reduction in diarrhea incidence for sanitation infrastructure but with low precision due to the small number of relevant studies and sample taken from laboratories.

Akintaro (2013) conducted a study of the knowledge of correlation between disease occurrence and environmental sanitation among motor-park operators in Osogbo local government area of Osun State, Nigeria using questionnaire administration method. The result shows a significant knowledge of correlation between diseases and environmental Sanitation among motor park operators in Osogbo but the study was only limited to motor park operators.

Also, Mohammed, Zungu and Hoque (2013), in their study of access to safe drinking water and availability of environmental sanitation facility among dukem town household in Ethiopia using questionnaire administration method. Their finding show that majority of the household had access to an improved sources of drinking water within reasonable time and distance, but access to private piped water was low. The large proportion of household had improved private toilet. However, majority of the facilities were traditional type of pit latrine which falls short of standard.

To the best knowledge of the researcher, there are no known studies that have assessed the level of improve water and sanitation coverage in Kaduna South Local Government Area of Kaduna State. Also, the regular movements of water vendors, water tankers, presence of unprotected wells in some houses, cases of open defecation, over-crowding and poverty level in the area as observed by the researcher, causes great concern and hence, the need for this study. Therefore, the potential negative impacts of declining improved water supply and sanitation scenarios on the well being and productivity of a community is of great importance to her well being. On this premises, the study would address the following research questions:

i. What are the sources of water in the study area?

ii. What are the roles of household members in improved water and sanitation in the study area?

iii. What is the time taken to access water by the households in the study area?

iv. What is the number of household using improved water and sanitation in the study area?

v. Who are key players in providing improve water and sanitation in the study area?

## 1.3 Aim and Objectives

The aim of this study is to assess the level of improved water and sanitation coverage in Kaduna South Local Government Area. This aim will be achieved through the following objectives, which are to;

i. identify the sources of water in the study area,

ii. assess the roles of household members in improved water and sanitation in the study area,

iii. determine the time taken to access water by household members in the study area.

iv. examine the number of household using improved water and sanitation facility in the study area.

v. characterize key players in providing improve water and sanitation in the study area.

## 1.4 Hypothesis

The research hypothesis which will be tested at 0.05 significant levels is as follow: There is no significant difference in improved water and sanitation among households in the study area.

## 1.5 Scope of the Study

Kaduna South Local Government Area consists of 13 wards which are all urban areas. However, the study would focus six (6) selected wards (Barnawa, Kakuri Gwari, Kurmin Mashi, Television, Tudun Wada North, Ungwan Muazu) in the area. A period of fifteen (15) years (2001-2015) was selected for the study. The selected time frame is for the purpose of the research work and to help the researcher assess if the MDG 7 which has a lifetime of fifteen years has been achieved.

Selection of wards was carried out based on density since population is strongly associated with water and sanitation situation. For a fair representation of the sampled population of the study area, six (6) wards were selected. Purposive sampling method was employed by drawing a list of the thirteen (13) wards and wards with high population were selected but for fair representation, six (6) wards were selected. The study will focus on improved water and sanitation coverage in the study area (Kaduna South Local Government Area) and also look at compliance to MDG 7 Target 10. The study will also assess the relevance of improved water and sanitation coverage and its effect on human existence and sustainable development.

## 1.6 Justification of the Study

Every year, some 2 million people die from diarrheal diseases (Lakshminarayanan and Jayalakshmy, 2015). Much of this disease burden is caused by contaminated drinking water and inadequate sanitation. Although the vital role of safe water and sanitation in maintaining health has been recognized for centuries, many families especially those in the developing world still lack adequate services. Increasing coverage is a key development priority (WHO, 2011).

Water and sanitation improvements, in association with hygiene behaviour change, can have significant effects on population and health by reducing a variety of disease

conditions such as diarrhea, intestinal helminths, guinea worm, and skin diseases. These improvements in health can in turn lead to reduced morbidity and mortality and improved nutritional status. Having safe drinking water is usually defined as having an "improved" water supply that is protected from contamination by pathogens and other illness causing contaminants. Given the known importance of water, sanitation, and hygiene, a key question is which interventions in these areas work best to bring about sustainable improvements in health and sustainable development.

Lack of adequate sanitation is a major threat to human health and to the environment which includes the degradation of the urban environment by the indiscriminate disposal of solid and liquid waste and the pollution of fresh water and lakes by untreated human waste, the result being in measureable. Aremu (2012) stated that proper sanitation is a key development intervention as having access to it increases health, well-being and economic productivity; however, the sanitation situation of some countries especially in the developing world has raised alarming concerns. The direct consequences of lack of access to safe drinking water and sanitation services are enormous (WHO, 2010).

Despite the successes recorded in the provision of improved water and sanitation, there are many gaps or challenges that have been identified in providing improved water and sanitation. One of the challenges according to Montgomery and Elimelech has been urbanization and water scarcity, which mostly takes place in developing countries (Montgomery and Elimelech, 2007).

Therefore, it is important to undertake a research of this nature to ensure conformity to WHO goals for improved water and sanitation, and to also assess if Nigeria and Kaduna State has made progress in attaining the Millennium Development Goal (MDG 7). Also data generated would be useful in formulating government policies and programmes towards achieving the Sustainable Development Goal (SDG) for the achievement of the

Millennium Development Goal (MDG). The result would be useful to students and institutions as source of data for further research work.

# CHAPTER TWO : CONCEPTUAL FRAMEWORK AND LITERATURE REVIEW

## 2. 1 Introduction

This chapter considers the conceptual framework, a review of relevant literatures on improved water and sanitation coverage which would form the basis for the analysis in this study.

## 2.2 Conceptual Framework

### 2.2.1 Improved Drinking Water and Sanitation

Access to improved drinking water and sanitation is critical to sustainable development, with profound implications for economic growth, human rights, public health and the environment which are key index to sustainable development (Moe and Rheingans 2006). Lack of access to improved drinking water and sanitation and the disparities can have a bigger influence on the health and well-being of vulnerable groups, especially children who are from poor families.(UNICEF, 2013). Without good health and physical well-being of the community, sustainable development cannot be achieved. As water and sanitation are related to poverty-related phenomenon, sustainable development cannot be possible in an atmosphere of poverty which translates to poor living and healthy condition (Sarmento, 2015).

Water is one of the most important natural resources and is the essence of life on earth. The availability of safe water critical not merely for health reasons, but also for economic development (WHO and UNICEF, 2006). Also, access to improved drinking water means that the source is less than one (1) kilometer away from its place of use, within 30 minutes duration and that it is possible to reliably obtain at least 20 liters per member of a household per day. Safe drinking water also is that water that is free from microbial, chemical and physical characteristics that meet WHO guidelines or national

standards for drinking water quality. Access to safe drinking water therefore is the proportion of people using improved drinking water sources: household connection, public standpipe, borehole, protected dug well, protected spring, rainwater (WHO, 2010).

The amount of water collected by or delivered to the household and used there for drinking, cooking, bathing, personal and household hygiene and sanitation by the inhabitants of the household is an important aspect of domestic water supplies which influences one's other productive, social or education and health (WHO, 2003). Overcoming a lack of basic access where the distances and time involved in water collection result in use of inadequate volumes is essential (WHO, 2004).

The World Health Organization (WHO) defines "improved sanitation" as access to personal sanitation facilities that are able to hygienically separate human waste from human contact (WHO, 2008). Coverage refers to the proportion of people using improver drinking water sources and sanitation facility. A basic level of service for water includes water used for drinking, cooking, bathing, personal and household hygiene and sanitation (Bendahmane *et al*., 1999) but access to this level is determined principally by distance, time, reliability and potential cost (Koskei *et al*, 2013a).

The lack of access to safe drinking water and basic sanitation impedes economic development, thwarts progress towards gender equality and puts the health in danger. The unsustainable exploitation of natural resources is often due to insufficient or inadequate water supply and sanitation. The arguments in support of expanding the access to water supply and sanitation services and promote environmental sustainability can be expressed in terms of human values, human rights as well as in health and economic terms. Also, time spent collecting water is substantial and is mostly a household chore borne by women. In most societies, women have primary responsibility for management household sanitation

and health. Time spent collecting water reinforces time-poverty, dis-empowers women, lowers income (Angko, 2013).

Urban poverty also contributes to the lack of adequate water and sanitation in poor households (Dungumaro, 2012). Lawrence *et al*. (2002) noted that socioeconomic status is a significant determinant of household access to water and basic sanitation in households. Other variables closely connected with the availability of water and adequate sanitation include, among others, household size and gender of the household head (Dungumaro, 2012).

The human development report by UNDP (2006) states that the exclusion from clean water and basic sanitation destroys more lives than any war or terrorist act. It also reinforces the deep inequalities in life chances that divide countries and people within countries on the basis of wealth, gender and other markers for deprivation. This unfortunate situation of water and sanitation deprivation, whether viewed from the perspective of human rights, social justice or economic common sense, inflicts a damage that is indefensible (UNDP, 2006).

Opponents of the two categories (improved and unimproved) based on Spencer, argue that governments and NGOs are restricted from supporting projects that would move populations up the ladder from open defecation to shared facilities, because this improvement is not reflected in the estimates of sanitation access (Spencer, 2012).

### 2.2.2 Standard for Drinking Water and Sanitation Sources

Life is possible on earth due to the presence of water. Nearly three-fourths of the earth's surface is covered with water. Water is also found below the earth's surface. It is present in air in the form of water vapor. About 70 per cent of the human body is water. The bodies of all plants and animals contain water. Various sources of water exist ranging

from Rainwater, oceans, rivers, lakes, streams, ponds and springs are natural sources of water, while Dams, wells, tube wells, hand-pumps, canals, etc, are man-made sources of water.

However, the UNICEF/ WHO Joint Monitoring Project (JMP) report of 2010 has established a standard for drinking water and sanitation categories that are used basically for monitoring progress towards the achievement of the MDG. Drinking water must be 'wholesome' and this is defined in law by standards for a wide range of substances, organisms and properties of water in regulations. The standards are set to be protective of public health and the definition of wholesome reflects the importance of ensuring that water quality is acceptable to consumers (DWI, 2010). These set include improved drinking water source and improved sanitation category which serve as a basis for assessment of quality of life. It important to note that water is considered safe if obtained from these sources and is free from microbial, chemical and physical characteristics that meet WHO guidelines or national standards for drinking water quality (UNICEF/WHO, 2010).

**Table 2.1: Improved and Unimproved Water Supply and Sanitation According to UNEP (2003) classification**

| WATER SUPPLY | | SANITATION | |
|---|---|---|---|
| **Improved** | **Unimproved** | **Improved** | **Unimproved** |
| Household connection | Unprotected well | Connection to a public sewer | Service or bucket latrines (where excreta are manually removed) |
| Public standpipe | Unprotected spring | Connection to septic System | Public latrines |
| Borehole | Vendor-provided water | Pour-flush latrine | Latrines with an open pits |
| Protected dug well | Bottled water* | Simple pit latrine | |
| Protected spring | Tanker truck-provided water | Ventilated improved pit latrine | |
| Rainwater collection | | | |

***Source:*** Machiwana, 2010

*2.2.2.1 Improved Sources of Drinking Water*

The various improved sources of drinking water were defined by the UNICEF/WHO Joint Monitoring Platform (2010) according to their types, nature of their construction and how they are accessible to household. These include:

*Pipe into dwelling (Household connection):* Is that water service pipe that is connected with in-house plumbing to one or more taps e.g. in the kitchen and bathroom.

*Pipe water to yard/plot (yard connection):* Is a pipe water connection to tap placed in the yard or in the plot outside the house in which all within the house can have access to.

*Public Tap or stand pipe:* Is a public water point from which people can collect water. This can have one or more taps with usually a brick work masonry or concrete.

*Tube well or borehole:* This is a deep hole that has been driven, bored or drilled with the purpose of reaching ground water supplies. Boreholes are constructed with casting or a pipe which prevent the small diameter hole from caving in and protects the water source from infiltration by run-off water. Water is delivered from a borehole through a pump which may be powered by human, animals, wind, electricity, diesel or solar means. They are usually protected by a concrete platform around the well which leads the spill water away from the borehole and prevent infiltration of run-off water at the well head.

*Protected Dug well:* This is a dug well that is protected from run-off water by a well lining or casting that is raised above ground level and a platform that diverts spilled water away from the well. A protected dug well is also covered so that bird droppings and animals cannot fall into the well.

*Protected springs:* Is a spring that is protected from run-off, bird's droppings and animals by a spring box which is constructed of brick, masonry or concrete and is build around the spring so that water flows directly out of the box into a pipe or cistern without being exposed to outside pollution.

*Rain Water:* Is that water that is collected or harvested from surfaces (by roof or ground catchment) and stored in a container, tank or cistern until used.

*2.2.2.2 Unprotected Sources of Drinking-Water*

These are sources of water that are considered as unhygienic, unacceptable and short of the UNICEF/WHO Joint Monitoring Platform (2010) prescribed standards. They include:

*Unprotected spring:* Is a spring that is subject to run-off, birds' droppings or the entry of animals. It does not have a spring box.

*Unprotected dug well:* This is a dug well for which one of following conditions is true; it is not protected from run-off water, the well is not protected from bird droppings and animals.

*Cart, Small tank or Drum water:* This refers to water sold by a provider who transports water into a community. The types of transportation used include donkey cart, motorized vehicles and other means.

*Tanker-truck water:* Is water that is trucked into a community and sold from the truck.

*Surface water:* This is water located above the ground and this water includes those found in rivers, dams, lakes, ponds, streams, canals and irrigation channels.

*Bottled water:* This is considered to be improved only when the household uses drinking-water from an improved source for cooking and personal hygiene. Where this information is not available, bottled water is considered on a case-by-case basis.

*2.2.2.3 Improved Sanitation category*

These are categories of sanitation facilities that have been prescribe and accepted by the UNICEF/WHO Joint Monitoring Platform (2010) as ideal and hygienic for human use in communities. These are:

*Flush Toilet:* This is a toilet facility that uses a cistern holding tank for flushing water and a water seal (which is a U shaped pipe below the seat or squatting pan) that prevents the passage of flies and odours.

*Pipe sewer system:* This is a system sewer pipes also called sewerage that is designed to collect human excreta (faeces and urine) and waste water and removed them from the household environment. It consists of facilities for collection, pumping, treating and disposing of human excreta and waste water.

*Septic tank:* This is an excreta collection devices consisting of a water-tight settling tank which is normally located underground away from the house or toilet. The treated effluent of a septic tank usually seeps into the ground through a leaching pit. It can also be discharge into a sewerage system.

*Flush/pour flush to pit latrine:* Refers to a system that flushes excreta to a hole in the ground or leaching pit (protected, covered).

*Ventilated improved pit latrine:* This is a dry pit latrine ventilated by a pipe that extends above the latrine roof. The open end of the vent pipe is covered with a gauze mesh or fly-proof netting and the inside of the superstructure is kept dark.

*Pit latrine with slab:* Is a dry pit latrine whereby the pits is fully covered by a slab or platform that is fitted either with a squatting hole or seat. The platform should be a solid and can be made of any type of material, as long as it adequately covers the pit without exposing the pit content other than through the squatting hole or seat.

*Composing toilet:* Is a dry toilet into which carbon-rich materials (vegetable waste, straw, grass, saw dust, ash) is added to the excreta and special conditions maintained to produce inoffensive compost. A composting latrine may or may not have a urine separation device.

*Special case:* A response of flush/pour flush to unknown place/not sure where it is taken to indicate that the household sanitation facility is improved as respondent might not know if their toilet is connected to a sewer or septic tank.

*2.2.2.4 Unimproved Sanitation Sources*

These are various latrine types that have been considered as unacceptable according to the UNICEF/WHO Join Monitoring Platform (2010) prescribed standard for improved sanitation. They include the following:

*Shot Put:* This refers to excreta being deposited in or nearby the household environment (not into a pit, septic tank or sewer). Excreta may be flushed to street, yard/plot, open sewer, a ditch, a drainage way or other location.

*Pit latrine without slab:* This is a pit latrine which uses hole in the ground for excreta collection and does not have a squatting slab, platform or seat.

*Bucket:* Refers to the use of a bucket or other container for the retention of faeces (sometimes urine and anal cleaning material), which are periodically being removed for treatment, disposal or use as fertilizer.

*Hanging toilet or hanging latrine:* Is a toilet built over the sea, river or other body of water into which excreta drops directly.

*Shared facility:* Refers to a sanitation facility although of an improved kind but shared between two or more household and all public facilities.

*No facilities/bush/field:* Include defecation in the bush or field or ditch; excreta deposited on the ground and covered with a layer of earth (cat method), excreta wrap and thrown into garbage and defecation into surface water (drainage channel, beach, river, stream or sea).

### 2.2.3 Water Supply and Sanitation Coverage

UNICEF JMP report in 2013 shows that by end of 2011, 89% of the world population had access to improved drinking-water source while 55% enjoyed the convenience and associated health benefits of a piped supply on premises and about 768 million people did not use an improved source for drinking-water in 2011 and 185 million relied on surface water to meet their daily drinking-water needs (UNICEF, 2013).

The proportion of global population using improved water, showing disparities across the world's geographical region is shown and illustrated in Figures2.1 below:

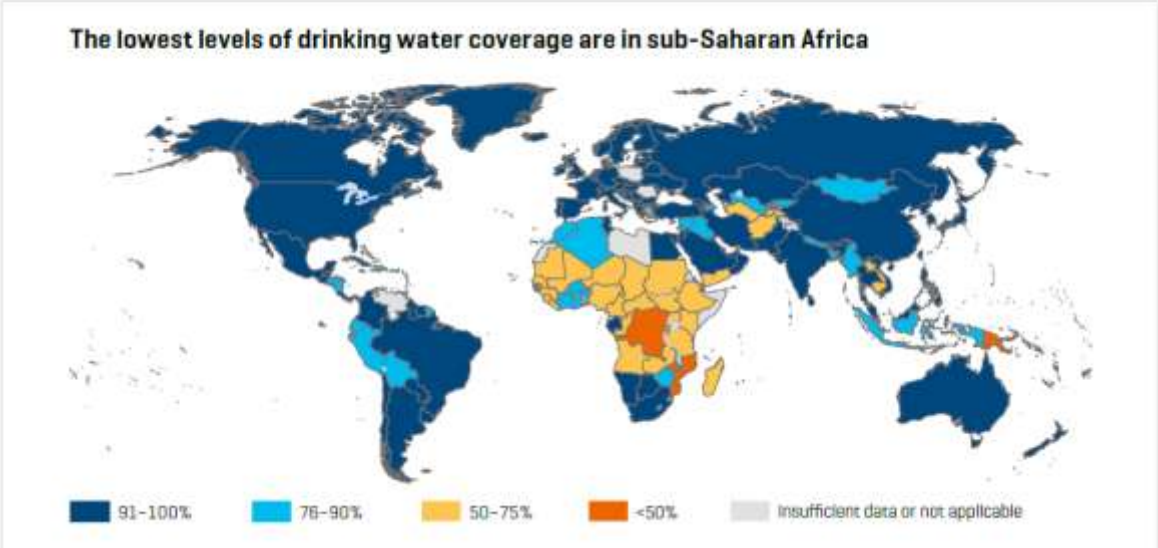


**Figure 2.1: Proportion of population using improved source of drinking water.**
**Source:** *Sarmento, 2015*

In spite of the enormous water resources in Nigeria, only about 65% (46.1 million) of the urban and 30% (22.1million) of the rural populations had access to improved drinking water sources, based on the population and water supply coverage of the country in the year 2006. The total water supply coverage was only 47% which implies that only about 68 million Nigerians had access to improved water supply source, leaving 77million without access. In fact, trend analysis of Nigerian water supply coverage from the year

1990 to 2006 reveals a declining total coverage, which if unchecked, will result in a total coverage of 42% by this Vision's target year of 2020 (Vision 20:2020).

Access to improved water sources stagnated at 47% from 1990 to 2006 but increased from to 54% in 2010. This will translate into about 58% or 112million Nigerians that would be denied access to improved water supply source by 2020 (Vision 20:2020). The World Bank group Nigeria also reported that the improved coverage rate is 68% (World Bank, 2014). The report further explained that water supply in Nigeria is characterized by low level of coverage and access rate. Significantly, the trend reveals that Nigeria is diverging rather than converging on the MDG target of 75% for improved water supply coverage in the year 2015.

As at 2011, almost two thirds (64%) of the world population relied on improved sanitation facilities, and from 1990 almost 1.9 billion people gained access to an improved sanitation facility. However, by end of 2011 2.5 billion people lacked access to an improved sanitation facility. Of these, 761 million use public or shared sanitation facilities and another 693 million use facilities that do not meet minimum standards of hygiene. As far as reaching the MDG sanitation target is concerned, which requires reducing the proportion of people without access from 51 percent to 25 per cent by 2015, the world is off track. 1 billion (15% of the world population) still practice open defecation. The majority (71%) of those without sanitation lives in rural areas and 90% of all open defecation takes place in rural areas (UNICEF, 2013).

The proportion of global population using improved sanitation showing disparities across the world's geographical region is illustrated in Figures 2.2.

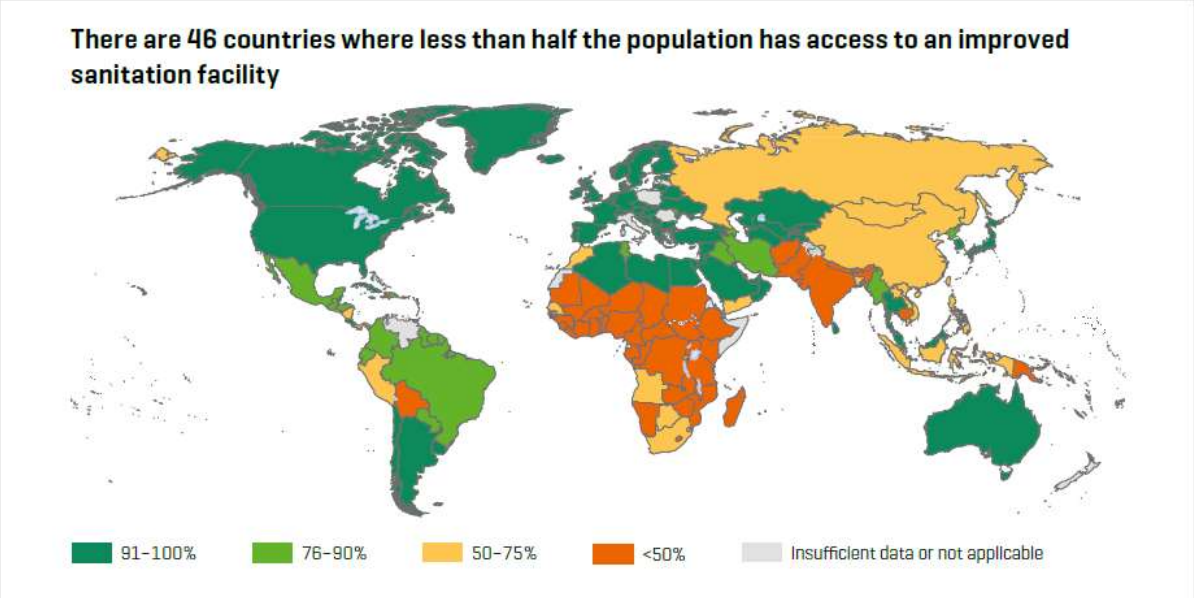


**Figure 2.2: Proportion of population using improved sanitation.**
**Source:** *Sermento, 2015.*

The improved sanitation coverage in Nigeria, as at the year 2010 stood at 35%. This imply that only about 18.45 million, 24.82 million and 43.42 million Nigerians within the rural, urban and national populations respectively, had access to Improved Sanitation facilities. Unfortunately, the trend analysis of Nigerian Sanitation coverage from the year 1990 to 2006 also revealed a declining total coverage, which if left unchecked, will result in a miserable total coverage of only 25% by this Vision's target year of 2020.

This suggests that a staggering 75% or 145 million Nigerians will be without access to improved sanitation facilities by the year 2020. However, the immediate concern on the declining trend is that Nigeria is accelerating away rather than towards the MDG target of 63% for improved sanitation coverage by the year 2015. It is therefore imperative for Nigeria to, as a matter of urgency, upgrade, develop and expand its sanitation facilities in order to meet its MDG target for improved sanitation coverage and, consequently mitigate poverty and eradicate water related diseases (Vision 20:2020).

The scope of the Water Supply and Sanitation in Nigeria based on the Nigeria Vision 20:2020 working documents covers the provision of adequate improved water supply and sanitation at the Federal, States and Local Government levels with particular focus on the following Sub-Sectors and Sub themes; **Water Supply:** Sources, Infrastructure, Coverage, Access, Quantity and Quality.

**Sanitation:** Access to, Coverage of Facilities, Types of Facility, Basic hygiene practice and related diseases.

The uni-dimensional definition of poverty as economic deprivation has since given way to a multi-dimensional understanding of poverty to encompass a lack of access to political participation because of social processes, class or ethnicity, or a lack of access to natural resources. Water problems profoundly affect the poor in their: livelihood (agricultural productivity, loss of natural resources), health (water quality, waterborne diseases, reduction of productive capabilities), and vulnerability (droughts, floods etc.).

According to the Nigeria Vision 20:2020, the Human Poverty Index (HPI) and Human Development Index (HDI) do not adequately accommodate water related poverty problems, hence the development of the Water Poverty Index (WPI). The Water Poverty Index (WPI) scores countries based on the following five criteria:

i. the size of a country's total water resources;

ii. how available those resources are to the population;

iii. how developed the country's water infrastructure and delivery systems are;

iv. how efficiently or wastefully a country uses its water; and

v. how well a country manages any environmental impact to its water.

The water supply and sanitation coverage of the top twenty countries in the world, based on the WPI ranking compared with those of Nigeria which is ranked 130 out of 147 countries. Except in the case of Equatorial Guinea which has a total improved water supply

and sanitation coverage of 43% and 51%, respectively, which are in the range of the corresponding values of 47% and 30% for Nigeria, the values for the remaining countries are significantly higher. Therefore, it is obvious that a lot of hard work is required for Nigeria to break into the top twenty water rich countries of the world (Vision 20:2020).

### 2.2.4 Hygiene Promotion and Education

Hygiene promotion encourages all the hygienic conditions and behaviors that can contribute towards good health. It aims to stimulate and facilitate the right behavior change. Research has shown that hygiene-related practices such as safe disposal of faeces and hand washing after contact with faecal material can reduce the rates of intestinal infection considerably (International Federation of Red Cross, 2007).

Improvements in water supply and sanitation conditions according to Billig *et al,* do not automatically result in improvements in health. However, hygiene education is often required to see that health impacts are actualized (Billig, Bendahmane and Swindale, 1999). Majority of people have an understanding of a link between hygiene and health, but there is a lack of connection with the need for change that may results from years of tolerance of unhygienic surroundings.

Beumer *et al* in a sample survey found that the majority of the surveyed population believed that personal hygiene, and to some extent household hygiene influence health but failed to see the possibility that environmental hygiene was also an important factor. Most people are unaware about the scientific aspects of personal, domestic and environmental hygiene and the risk of infection continues (Beumer *et al*, 2002).

### 2.2.5 Basic Interventions in Increasing Access to Improved Water and Sanitation Coverage

The Environmental Health Project report (2004), shows that there are basic interventions that must be adhere to or put in place in order to access quality water and improved sanitation facility. These interventions include:

*Improved basic sanitation:* blocks the pathways for the transmission of diseases. A simple latrine that is minimally maintained can also block the pathway between faeces and flies, either by keeping flies away from faeces or by keeping flies that have had contact with faeces away from people.

*Improved water quality:* makes water safe to drink and safe to use in all aspects of food preparation but only if that water stays clean and is not contaminated via other pathways.

*Increased water quantity:* allows the family to wash food more thoroughly during preparation, wash food preparation surfaces and utensils more thoroughly and frequently, and to bathe and wash hands more thoroughly. These activities can block a number of the paths to contamination, including most of those involving fingers and flies and most having to do with food, but if the water thus made available remains contaminated, then merely having more of it is not the answer.

*Increased hand washing:* if done correctly at critical times, blocks all the pathways that directly or indirectly involve the fingers.

These serve as a pathway to attaining the goal of improving water quality, effective sanitation and better personal hygiene among the poorest population of the world.

### 2.2.6 Sustainable Development

The concept of sustainable development can be interpreted in many different ways, but at its core is an approach to development that looks to balance different, and often competing, needs against an awareness of the environmental, social and economic

limitations face by the society. All too often, development is driven by one particular need, without fully considering the wider or future impacts. Sustainable development is about finding better ways of doing things, both for the future and the present. We might need to change the way we work and live now, but this doesn't mean our quality of life will be reduced. It's a collective responsibility. Small actions taken collectively, can add up to real change.

The World Bank defines sustainable development as a development that meets the needs of the present without compromising the ability of future generations to meet their own needs (World bank, 1987). Also, The Brundtland Commission's brief definition of sustainable development as "the ability to make development sustainable—to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs''. The core idea in the minds of the proponent of sustainable development is the present and the future needs of societies.

Ademiluyi and Odugbesan (2008) study an overview of sustainability and impacts of community water supply and sanitation in Nigeria using primary data. The study found out that the causes of breakdown or non sustainability of most water and sanitation programme in most developing countries of which are relevant in the context of Nigeria are numerous and they include the following;

- Communities or households may never have been convinced of the desirability of new water sources, or particularly new excreta disposal facilities, in the first place.
- The financial costs which communities are expected to raise as a contribution to capital or recurrent expenses may be unacceptable, unaffordable, or impracticable (e.g monthly or quarterly cash contributions may be impossible for households which only receive income at harvest or meager monthly pay).

- Communities may never have felt ownership of the new infrastructure, and Governments may have been overstretched and under-resourced, so that repairs and maintenance have not taken place.
- Benefits promised at the outset of projects (e.g dramatically improved health) have failed to materialize;
- Community education (e.g hygiene education) and the attitudinal and behavioural change expected to be achieved by it, take a long time to produce results, and yet it often ceases prematurely;
- Even where full community participation or management has been planned in from the start, community-level committees and caretakers have lost interest or trained individuals have moved away. This can be a particular risk if community-level organization is on a voluntary basis.

Therefore, the need to develop and maintain a workable water and sanitation system must be put in place to ensure an all inclusive participation and to maintain sustainability in the water and sanitation sector in Nigeria and developing countries as well.

### 2.2.7 Millennium Development Goal (MDG)

The millennium development goals are series of eight time-bound development goals that seek to address issues of poverty, education, equality, health and the environment, to be achieved by the year 2015.They were agreed by the International community at the United Nations Millennium Summit, held in New York in September 2000. To address these challenges, all member countries of the United Nations signed the Millennium Declaration in September 2000, which laid out quantified, targeted goals-the Millennium Development Goals (MDGs) – to halve extreme poverty in its many forms in 2015.

In January 2005, the UN Millennium Project, commissioned by the UN Secretary General, recommended an action plan detailing what needs to be done and how to achieve the MDGs. The report identified practical strategies to eradicate poverty by scaling up investments in infrastructure and human capital while promoting gender equality and environmental sustainability. Sub-saharan Africa is the region most off-track on the MDGs; the Millennium Project estimates that a typical country in sub-Saharan Africa will need to significantly increase public investments in order to meet the goals. The global response to the problem of sustainable access to safe drinking water and basic sanitation culminated in the inclusion of specific water-related targets in the Millennium Development Goal (MDG) number seven.

The scope of the MDG according to UNDP (2008) covers the eight goals through nine objectives which has a direct bearing on water and sanitation improvement as stated below:

**MDG 1: Poverty and Hunger:** Assuring the water supply for the household has significant consequences both in terms of time and monetary costs. At the same time, insufficient and inadequate water supply and sanitation result in increased health risks for the population and a higher morbidity and mortality due to water related diseases. Improving water supply and sanitation will have a positive impact on the individual income and poverty situation of the beneficiary household. Reducing the time and energy burden of water collection by providing safe water at a nearer distance will enable household members to engage in other activities, among them productive and income generating activities. Improved water quality will reduce the health risks and also the costs of preventing and treating ill family members. Furthermore, the reduction of working days lost to water-related diseases will also have a positive impact on the household's income situation.

**MDG 2: Primary Education:** Improved water supply and sanitation facilities exert their positive impact on primary education through several channels. Relieving girls from their water fetching duties can improve their school attendance as can the installation of separate sanitation facilities at the schools. Both boys' and girls' school attendance and educational achievements improve significantly with reduced health-risks and better nutritional status from improved water supply and sanitation as well as reduced injuries and strain from water carrying, in particular for girls. Chronic early childhood diarrhea can result in permanent effects on brain development with the resulting impact on a child's learning achievements.

**MDG 3: Gender Equality:** In most societies, ensuring the household's water supply falls under responsibility of the women. Considerable time and energy are being spent daily on collecting water and caring for family members suffering from water-related illnesses. Improving water supply and sanitation impacts positively on women's living conditions by giving them more time for productive endeavors, adult education, empowerment activities and leisure. At the same time, reducing the distance to the water supply and sanitation facilities will also improve the security and safety and reduce the risk of harassment. Improved water, sanitation and hygiene impacts on the socio-cultural position of women and has the potential to provide them with privacy and dignity as well as increased status within the family and wider community. Female representation on water boards and user committees strengthens the role of women in society and has far reaching socio-cultural impacts.

**MDG 4: Child Mortality:** Water-related diseases are the most common cause of death and illness among the poor population in developing countries and children under 5 years are particularly affected. Of the 1.8 Million deaths per year due to diarrhea, over 90% of children under 5 years. But also with regard to the other water-borne diseases caused by the

consumption of contaminated water (diarrhea, typhoid, cholera), water-washed diseases caused by insufficient water for personal hygiene (skin and eye diseases, diarrhea), water-based diseases such as guineaworm and schistosomiasis (caused through contact with infected water) as well as diseases transmitted by water-related insect vectors (malaria) children are disproportionally affected. Providing sustainable access to safe water supply and basic sanitation together with hygiene education can bring about a major reduction of water-related health risks and child morbidity and mortality.

**MDG 5: Maternal Mortality:** A reduction in maternal mortality depends strongly on the water supply and sanitation situation. A contributory factor to poor maternal health is contaminated water and poor hygiene, leading to infection and slow postnatal recovery. Good water supply facilities will support fewer miscarriages from heavy water transport and safer home birth. At the same time a better general health condition due to reduced health risks linked to insufficient water and sanitation will also have a positive impact on maternal mortality. However, reducing the health risk by improving water supply and sanitation needs to be linked to improving hygiene practices in order to bring about the desired impacts. This is particularly valid for postnatal hygiene practices, both concerning midwifes and the mothers.

**MDG 6: Other Diseases:** Insufficient water supply and sanitation as well as inappropriate hygiene practices are associated with number of different diseases, as described above. Arsenic contamination in drinking water has been recognized as a important health risk, in particular in Bangladesh. Increased levels of salt in the drinking water, in some cases associated with the salination of soil and water resources, can lead to kidney problems. Eliminating stagnant, standing water around the households and water points can contribute to reducing the incidence of malaria, in particular in dry areas with few natural mosquito breeding places. At the same time, reducing the incidence of water-borne, water-washed

and water based diseases through improved services and hygiene behaviors will have a positive impact on reducing the susceptibility to other illnesses. For people living with HIV/AIDS, water, sanitation and hygiene is extremely important in reducing the incidence of opportunistic infections.

**MDG 7: Environmental Sustainability:** Insufficient or inadequate water supply and sanitation is very often associated with an unsustainable exploitation of natural resources. Improved water management, including industrial pollution control and water conservation is a key factor for maintaining ecosystem integrity. Adequate treatment and disposal of excreta and both household and industrial wastewater contribute to less pressure on freshwater resources. Furthermore, improved sanitation reduces flows of human excreta into waterways and reducing the respective health and environmental risks. Furthermore, water, sanitation and hygiene is important for improving the lives of slum dwellers, by reducing the risks of contracting water-related illnesses, relieving the burden on women and opening opportunities for small-scale enterprises.

**MDG 8: Develop a global partnership for development**: improving water supply and sanitation would on the long run foster better partnership with other related organizations and communities to improve human conditions toward the realization of the set goals for human survival.

## 2.3 Literature Review

The importance of clean water and adequate sanitation is recognized at both local and global levels. Water and sanitation according to Aremu (2013) is among the topmost emerging issues that have local, national and global importance. According to WHO (2004) the health principles for ideal settlements in which people could live harmoniously include an environment free from local health hazards whether communicable diseases like water–

borne and food-borne diseases or those spread by poor environmental sanitation, such as, air pollution and the likes.

Akoteyon (2016) in a recent study examined the pattern of household access to water supply in sub-urban settlements in parts of Lagos State, Nigeria using social survey method. The results showed that, boreholes protected dug wells, vendors providing water, and rainwater harvesting were the main sources of water for households in the area.

Boone, Glick and Sahn (2011) undertook an assessment of household water supply choice and time allocated to water collection in Madagascar using household survey. The study revealed that with respect to gender, adult females and girl child less than 15years spend the most time gathering water for household needs. The study also found the well and public taps as the main source of water in the area with each having 40% and 32% respectively.

Also, Ashaolu and Onundi, (2014) investigated households water use behaviour in Irepodun Local Government Area of Kwara State, Nigeria using a modified water diary method. The study found that women are the principal actors at the centre of household water use and sanitation management. The result also shows that the main sources of water in the area are: piped borne water, borehole, shallow wells and stream.

Spencer (2012) in her study of sanitation practice and preference in peri-urban Ghana. Primary data was obtained using questionnaire which collected information on sanitation habits of the sampled population. Findings from the study show that majority of the respondent preferred open defecation followed by those preferring public toilet facilities which has attendant consequences on their heath but the study was on preference.

Also, Garba *et al* (2014) in their study of Prevalence of intestinal helminths among primary school children in Chikun and Kaduna South Local Government areas of Kaduna state. The research acquired primary data; stool samples from pupils. The study found

variability in the level of infection among the sampled population due to unhealthy habits among pupil which has great impact on their health.

Idogho, Olotu and Dagona (2013) did a modeling of water-sanitation relationship in Edo state, Nigeria. The study used both primary and secondary data, and finding from the study show a wide spread of water and sanitation related diseases in Edo state. The research also found out that socially water and sanitation had least allocation of resources which result in poor services by the water cooperation.

Hutton and Haller (2004) carried out an evaluation of the cost and benefits of Water and Sanitation improvement at the global level using secondary data. Their result shows both water and sanitation improvement to be cost beneficial and improvement reduce cost of medical treatment thereby saving cost.

Koskei *et al* (2013b) studied the Determinants of variation in households' level of access to improved water sources and basic sanitation in Bomet municipality, Kenya. The research made the use of questionnaire for data collection. Their findings reveal that levels of access to improved water and basic sanitation varied within amongst household in kenya. The study was however on variation among household

Olajuyigbe, *et.al*. (2012) undertook an assessment of vulnerable community to typhoid fever in Ejule LGA of Kogi State, Nigeria using Geospatial-Temporal analysis. Results from the study shows a high vulnerability of the community to typhoid fever due to contaminated water source. However, the study only focuses on typhoid fever leaving out other related water borne diseases.

Sarmento (2015) in a study analyze access to Improved Drinking Water and Sanitation and Distance to the Water Source in a Newly Independent Country, Timor-Leste using demographic health survey data. The result shows that access to safe drinking water

varies by geographical and socio-economic factors but the research was based secondary data which may not be entirely reliable.

Cosgrove and Rijsberman (1999), in another study of access to safe water near the home using secondary data. The study reveals that significant amounts of time for women and girls can be saved with access to water near the home. Their findings further show that time can be spent on productive activities and education, which lay the groundwork for economic growth. Forty billion working hours are lost each year in Africa according to their findings due to the need to carry water and improving domestic water supply services reduces female time poverty. The research was however carried only in Africa and may not be application to other countries in the developed world.

Odum and Ibem (2011) in a study of Securing land for low-income earners in Sub-Saharan Africa in Enugu State, Nigeria. Primary data was used, and their findings reveal that many of the workers live on borrowed land due to poverty, therefore difficult to access better water and sanitation condition. The research however focus on land ownership among low income earners and therefore bias.

Ajao, Obafemi and Ewumi (2011) study household sanitation and mortality in Nigeria using secondary data from hospital. Their research showed high significant relationship between Crude Death Rate (CDR) and Bad Refuse Disposal Method, while the time series plot exposes the upward trends in CDR for most state in Nigeria studied but the study focus only on relationship between sanitation and mortality and not coverage. Also the study relied so much on secondary data from hospital which might have been faulted at the collection and collation level, therefore unreliable.

Mulenga, Manase and Fawcett (2004) in their study of building links for improved sanitation in poor urban settlements in southern Africa using Primary data. The research found that communities are reluctant to invest in improved water and sanitation services

when they lack security. The research also found that many tenants fear that if they install a toilet, their landlord may increase the rent or object.

Schoub-jones (2005), in a regional study of Sanitation partnership in Mozanbique, Kenya and Lesotho using questionnaire. The study show a poor state of water and Sanitation situation within the sampled population due to poverty situation of tenant and the lack of cordial relationship amongst landlords and tenants. The study also reveals that the fear of transferred burden compels tenants not to improve on their sanitary conditions even when they can. However, the research was a regional study and may not apply to all regions.

Also, Ghuncha (2012) in a study of Urbanization, emerging slums and increasing health problems in India using questioneer. Primary data obtained from 10 major slums shows that rapid and unplanned simultaneous growth of urban poverty has been increasing and resulting in poor wellbeing of slum dwellers. The research was however concerned with slums dwellers only and therefore bias.

Saidou and Devi (2013) studied the evolution of access to drinking water and sanitation coverage in urban centres of selected African countries using secondary data. Their outcome reveal that urban centre's of countries with abundant physical water supply but poor water policies achieve low level of access to drinking water and sanitation coverage compare to countries with limited water resources but sound water and sanitation policies. The result further confirm that bad policies are a bottle necks to providing effective Water and Sanitation, while in some countries the policies do not have a direct link with the felt needs of the population. The research however was based on selected countries Africa and therefore may not be applicable to other countries in other continents.

In another study, Alkali *et al* (2014) studied the provision of sustainable water supply system in Wennune, Benue state, Nigeria using existing system assessment and

provisional design. The study further reveal a total collapse of the water supply system due to poor operation and maintenance system which result in the dependence of water from unprotected sources and causing increasing and undue hardship on the populace. Therefore, Schwartz (2007) pointed out that public utilities have not excelled at being customer oriented because of the way they have been funded over the years and a large number of utilities received most of their funds from government which has been a great constrain to effective provisions of service. However, the research was based on secondary data, thus not reliable.

WaterAid (2009), also in their study of socio-cultural barriers and triggers to total sanitation in West Africa using primary data. The research reveal socio-cultural factors as impediment to improve sanitation; Shame of living with human excreta being unacceptable, latrine being considered as the exclusive rights of the rich, tradition such as defecating in the farm of one's host, the fear of being posses by evil powers or total loss of spiritual powers and the believe that latrine shortens lifespan, amongst many are major challenges in West Africa. The research cut across four countries of Ghana, Nigeria, Togo and Mali and therefore not universal.

Koskei *et al* (2013a) undertook an assessment of *the* Effect of Socio-economic Factors on Access to Improved Water Sources and Basic Sanitation in Bomet Municipality, Kenya. Data was collected using questionnaire. Findings from the research show that households' characteristics such as occupation and education level of the household head have a strong impact on the type of water source used by household. The study also confirms that the type of toilet facility used by household was significantly influenced by the marital status of household head. However, the study focuses on effect of socio-economic factors.

Toma *et al* (2012) in their study of sanitary facility in primary schools in Jos, Plateau State, Nigeria using cross-sectional survey. The study reveals the prevalence of poor sanitary conditions in public primary schools in Jos-North Local Government. The research suggested an increase priority on major component of school health programme. However, the study focuses on sanitary facility in Primary schools only and not generalizes.

Ndiyo, Okon and Olumide (2013) in their study bridging domestic water supply and basic sanitation gap in Local Government Areas in Cross River state. The study was carried out using secondary data from Cross River state water supply and sanitation department. Findings from the research reveal about 2,387 improved water points in the state but functionality favored urban centres. The research was based on existing data which has proven unreliable.

Arokoyo and Ukpere (2014) also studied Access to safe water supply and sanitation in lower Orashi River Basin, Rivers State using spatial analysis and questionnaire administration. The study found that the major constrain to accessing water supply and basic sanitation were environmental and water pollution, water quality failure and lack of proper environmental audit. The study however focus on constrain and not coverage.

Alkali *et al* (2014) studied provision of sustainable water supply system in Wamnune, Benue State, Nigeria using existing system assessment and provisional design of water supply system. The study reveals a total collapse of the water supply system due to poor operations and maintenance resulting in undue hardship but the study only considers water supply leaving out sanitation a major twin of water.

# CHAPTER THREE: STUDY AREA AND METHODOLOGY

## 3.1 Introduction

This chapter considers the physical environment (Location, Climate, Geology and Drainage, Soil and Vegetation), Economic activity of the study area and the methodology used in carrying out the research, from the reconnaissance survey to the detailed field work and consequent data analysis.

## 3.2 Study Area

### 3.2.1 Location and Size

Kaduna South Local Government Area is located within the Central part of Kaduna metropolis lying between latitude $10^{o}$ 26' to $10^{o}$ 34' N and longitude $7^{o}$ 22' to $7^{o}$ 27' E of the Greenwich Meridian as shown in Fig 3.1. It is one of the 23 local government areas (LGAs) in Kaduna State. Bounded by Kaduna North to the north and east, Igabi LGA to the west and Chikun LGA to the south. Kaduna South Local Government Area has an area of 59$km^2$ and a projected population of 517,463 through 2015 (NPC, 2001).

### 3.2.2 Climate

Kaduna South local government area (LGA) experiences a tropical continental climate type (Aw) with distinct seasonal variation (Usman, 2012). The two (Dry and Wet) seasons in the area show a clear reflection of tropical continental and maritime air masses, which exert a great influence over the entire country (Gbuyiro, 1998). The dry season is pronounced between late November and April and always cold, dry and hazy accompanied by strong wind blowing from north-eastern Sahara region. The maritime air masses that blows from the Atlantic Ocean brings rainfall which varies in distribution due to the various location of place from north to south and this exert a great influence over the area

from May to early October. Temperature also varies within the area, with the hottest months in March and April while December and January being the coldest (Joseph, 2013). Humidity during the raining season is constantly more than 60% at mid-day and reaches 100% at night. Spatio-temporal distribution of rainfall varies between 1530mm and 1015mm within the study area. Temperatures within the area are at minimum and maximum of 15.9$^0$C and 35.4$^0$C respectively with a range of about 19.45$^0$C (Usman, 2012).

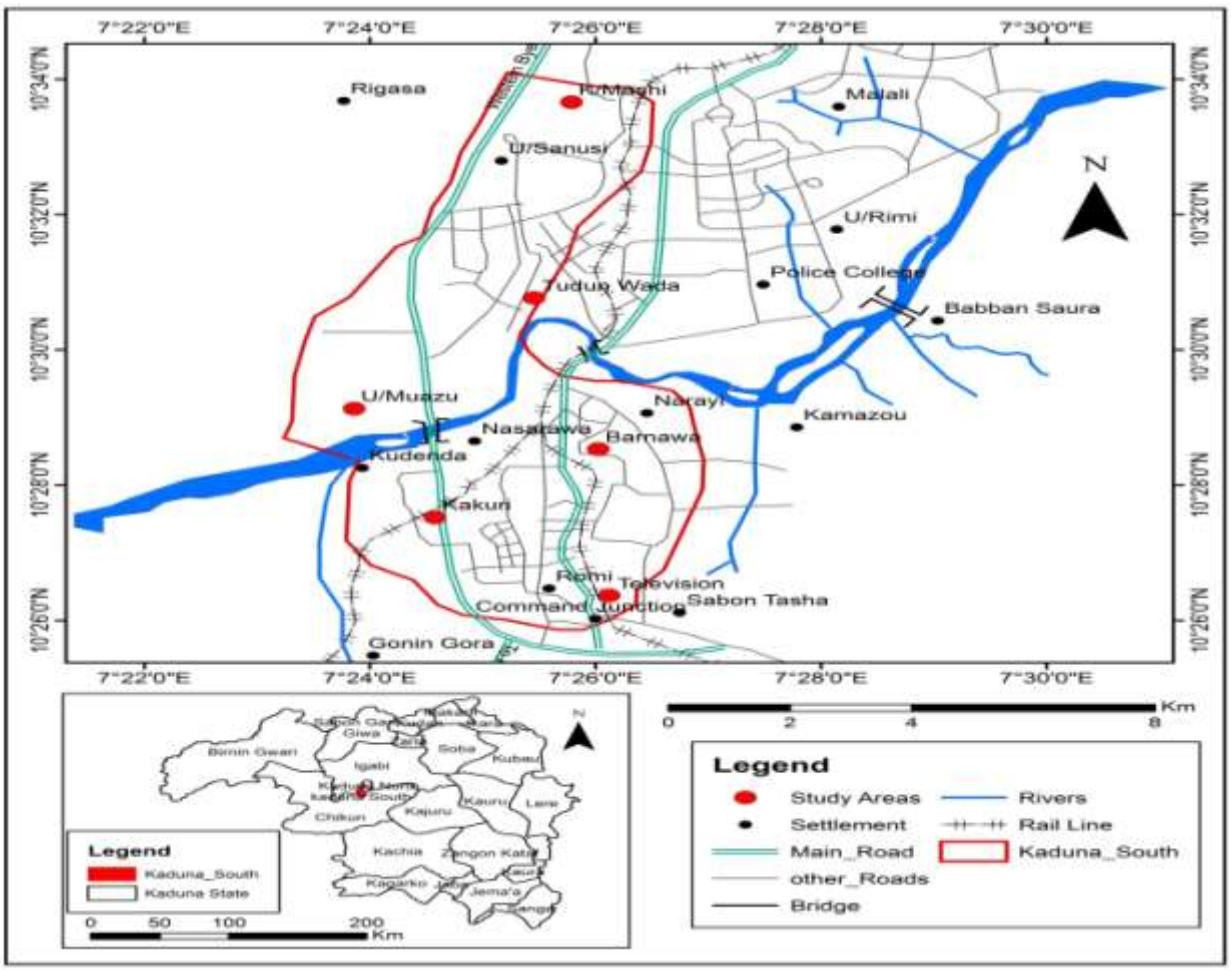


**Figure 3.1: The Study Area**
**Source:** Quick bird Imagery, 2013

3.2.3 Geology and Drainage

The geology of the study area is part of the basement complex geology of Central Nigeria. It is composed of metamorphosed gneiss interspersed by a belt of younger meta-

sediment of mainly quartzite and schist. The region is underlain by older granitic crystalline, metamorphic rocks of Precambrian to low Paleozoic age (Richard, 2014). Sedimentary rocks in the study area occur as loose sediments or superficial deposits of clay, laterite and alluvium restricted within floodplain or stream courses. These units of formation which are widespread within the study area are found to be useful for agricultural purposes (Ali, 2014).

Kaduna South Local Government is drain by River Kaduna with its source from the highlands of Jos Plateau. The River Kaduna takes the form of the NNE-SSW trend of the major fault plan, while numerous subsequent streams takes the form of the basement fractures. Other river that flows into River Kaduna in the study area are River Barnawa-Narayi, River Kakuri, River Makera and River Rafin Mallam. (Daniel, 2014). The drainage network of the study area is essentially dendritic implying the absence of structural control (Richard, 2014).

### 3.2.4 Soils and Vegetation

The commonest soil type in the Study area is the red-brown to red-yellow ferruginous tropical soil which has developed over the basement complex rocks of the study area. They are highly resistant to weathering and therefore have shallow profile, low organic matter content (just above 1%) which is attributed to the sparse vegetation cover within the study area (Daniel, 2014). Its total nutrient content is low due to leaching, run off and soil erosion. The soil is also susceptible to erosion and slightly acidic in some areas with a PH of 5-6. It is characterized by high content of Iron oxides (FeO), Aluminium oxides ($AlO_3$), kaolinite clay (between 30-40%) and Sandy Loam (Richard, 2014).

The natural vegetation of the study area is that of the Northern Guinea Savannah with grasses being dominant and scattered trees hardly higher than 15ft with broad leaves (Iloeje, 2001). The vegetation cover during the raining season is green and fresh with tall

grasses. Exotic varieties can be observed, orchards mostly along the Kaduna River, ornamental vegetation common along residential and administrative areas. The forest vegetation has been reduced to scanty trees and shrubs due to increasing population pressure (Yohanna, 2011).

Dominants tree species found in the study area include the locust bean (*parkia biglobosa*), shear butter (*vitellaria paradosa),* silk cotton (*ceiba pentadra),* mangoes (*magnifera indica*), doka (*Isobalina doka)* and *Isobalina tomentosa* with an average hight of about 6-10 meters. Other less frequent shrubs species are *vitex spp, piliostigma spp, butyrospermum spp* and *Dachrostachys spp* (Folorunsho, 2012).

### 3.2.5 Economic Activities

Human activities in the study area are very enormous and this is due to the myriad of potential within the area which supports human survival. These activities include commercial, industrial, construction, agricultural and the likes. The inhabitants of the area are mainly civil servants while others are involved in buying and selling (trading). Agriculture also contributes to the economic activities of the study area. Many residents of the area are subsistence farmers with few commercial farmers cultivating edible crops along the bank of river Kaduna (Joseph, 2013).

Industrial activities have not been very viable in recent times but have contributed greatly to the development of the area in the past. The industries mainly Textiles, Automobiles, Fabrication and Furniture have over the years been the major source of employment and revenue in the study area but suffered serious challenges in recent years which have resulted in the total collapse of some of them turning the study area into a public work area (Yohanna, 2011).

## 3.3 Methodology

### 3.3.1 Reconnaissance Survey

A reconnaissance survey was carried out which help to acquaint the researcher with the study area and to enable him adopt the most appropriate data collection techniques. The exercise also helps in delineating the study area properly and conveniently. It also enables the researcher to meet with community groups for interaction and focus discussions. However, the reconnaissance survey was preceded by a pre-field preparation where the research was conceived, literatures, maps and other materials were gathered.

### 3.3.2 Types and Sources of Data

*3.3.2. 1 Types of data*

Primary data from field survey using questionnaire and oral interview conducted was acquired. Basic information about water and sanitation was obtained from houses. Questions include socio-demographic characteristics of the respondent, source of water, frequency of used of the source of water, availability of sanitation facility, frequency of use of facility, types of toilet facilities in a house, sharing of facility by the household.

Secondary data on improved water and sanitation globally and Nigeria was also sourced from published and unpublished printed documents such as textbooks, Journals and past research work as well as the internet. Current trends on water and sanitation relevant to the study were also obtained.

*3.3.2.2 Source (s)*

For the purpose of this research both primary and secondary was obtained. Data from household on basic water and sanitation needs by the use of a structured questionnaire as well as from published textbooks, past research work, Journals and the internet was sourced. Field observation was also carried out at the course of the study.

### 3.3.3 Sampling Techniques

The population of the study area as at 2006 was 402,390 (NPC, 2009) but due to the absence of a locality (ward by ward) population figure for the period of the study and for the purpose of this research a projected figure of 517,463 for 2015 based on locality (ward by ward) was adopted. Therefore, the sampling size was adopted based on Krejcie and Morgan (1970) method of sampling prescription which recommend for an area with population between 75,000-999,999, the sampling size should be 382. The population of the study area falls within the range of the population sizes prescribed by Krejcie and Morgan, therefore, their recommendation applies to the study area.

For this study, six (6) of the thirteen (13) wards in the study area were selected for in-depth research through the administration of copies of questionnaires. Purposive sampling method was employed by drawing a list of the thirteen wards and the wards with high population were selected but for fair representation, six wards were selected (See Table 3.1)

**Table 3.1: Sample Wards in Kaduna South Local Government Area**

| S/No. | Wards | Selected wards |
|---|---|---|
| 1. | Badiko | |
| 2. | Barnawa | Barnawa |
| 3. | Kabala West | |
| 4. | Kakuri Gwari | Kakuri Gwari |
| 5. | Kakuri Hausa | |
| 6. | Kurmin Mashi | Kurmin Mashi |
| 7. | Makera | |
| 8. | Television | Television |
| 9. | Tudun Nupawa | |
| 10. | Tudun wada North | Tudun Wada North |
| 11. | Tudun Wada South | |
| 12. | Ungwan Mu'azu | Ungwan Muazu |
| 13. | Ungwan Sanusi | |

**Source: KADSIEC, 2002.**
**Adapted from KADSIEC list of wards in Kaduna state.**

The selected wards were assigned a number of questionnaires proportionate to their population size based on ranking from the highest to the lowest. This is done according to the projected population through 2013. Locality lists and figures of Kaduna South Local Government Area as presented in Table 3.2. The projection was because the 2001 projected population figure is the only available population data to the researcher based on locality (ward by ward). Other available data did not present the locality (ward) population of the study area based on ward which is of interest to the researcher.

The selection of houses for the administration of questionnaire was based on systematic sampling method. Odd number house were selected on a street starting from the first to the last, until the last house was selected. Respondents are household heads or in his/her absence any senior house member of the selected household available and willing to provide valid information. Where more than one household exist in a selected house, the household with the most senior member in the selected house was picked for administration of questionnaire.

**Table 3.2: Selected Wards and Proportion of Respondents**

| S/No | Selected Wards | Population Of The Study Area in 2001 * | Projected population through 2015 | Number of Questionnaire |
|---|---|---|---|---|
| 1. | Barnawa | 44,787 | 67,745 | 50 |
| 2. | Kakuri Gwari | 106,025 | 147,321 | 109 |
| 3. | Kurmin Mashi | 27,442 | 41,509 | 30 |
| 4. | Television | 38,839 | 57,758 | 42 |
| 5. | Tudun Wada North | 82,626 | 124,979 | 93 |
| 6. | Ungwan Mu'azu | 51,677 | 78,151 | 58 |
| | **Total** | | **517,463** | **382** |

**Source: NPC 200**1

**Adapted from NPC 2001 projected population list for Kaduna.**

### 3.3.4 Techniques of Data Analysis

**Objective i. Identify the sources of water in the study area.** This objective would be achieved by the use of questionnaire to obtain data on the various sources of water in the study area. The data will be presented on frequency table for analysis.

**Objective ii. Assess the role of household members in improved water and sanitation in the study area.** The objective would be achieved by the use questionnaire to obtain data on the role of household members. The data would be cross tabulated to show and discuss the roles of household members.

**Objective iii. Determine the time taken to access water by household members in the study area.** Questionnaire would be used to obtain data on the time taken by households to access safe water and the data would be presented on frequency table.

**Objective iv. Identify the number of household using improved water and sanitation facility in the study area.** This would be achieved by the use of questionnaire to obtain the above data and then cross tabulated to identify the number of household using improved water and sanitation sources.

**Objective v. Identify key players in providing improve water and sanitation in the study area.** Questionnaire would be used to collect data on key players providing safe water to household and above data would be cross tabulated for analysis.

Chi-square would be used to establish the relationship of improve water and sanitation coverage among household in the study area.

# CHAPTER FOUR: RESULTS AND DISCUSSION

## 4.1 Introduction

This chapter presents the demographic and socioeconomic characteristics of the respondents which includes: location of household, age and sex distribution, marital status of respondent, educational attainment, sources of household water, major players in providing house water and sanitation, duration and time to access water by household, shared facility by households as well as frequency of inspection of household facility by sanitation officers. A total of 382 copies of the questionnaire was taken to the field but only 375 questionnaires was return completed. while 7 where uncompleted or partially filled and therefore not relevant.

## 4.2 Demographic and Socio-Economic Characteristics of Respondents

### 4.2.1 Distribution of the Respondents

Table 4.1 shows the location of the respondent where the questionnaire was administered for the purpose of obtaining data for the research work within the study area. A total of 382 copies of the questionnaire were taken to the field for administration but only 375 were returned. Seven were partially completed or not completed and therefore not relevant.

**Table 4.1: Location of respondent**

| Location of respondents | Frequency | Percentage |
|---|---|---|
| Barnawa | 49 | 13.0 |
| Kakuri Gwari | 109 | 29.1 |
| Kurmin Mashi | 29 | 7.7 |
| Television | 42 | 11.2 |
| Tudun Wada | 88 | 23.5 |
| Ungwa Muazu | 58 | 15.5 |
| Total | 375 | 100.0 |

**Source: Field Survey (2015)**

From table 4.1, most of the respondents are from Kakuri Gwari representing 29.1% which reflects the population size of the area, while Barnawa having 13.0%. 7.7 % from Kurmin Mashi, 11.2 % from Television, 23.5% from Tudun Wada and 15.5 % from Ungwan Muazu. The above distribution affirms the fact that high density residential areas have more concentration of population and less organized than lower density residential areas.

### 4.2.2 Age Distribution of Respondents

Table 4.2 shows the distribution of respondents by age. Majority of the respondents 15.7 % are in the age group 55-59, those in the age group 54-55 and 60-64 years having 12.0 % respectively. The age groups 40-44 and 44-99 have 9.6 and 9.9 % respectively. While age group 30-34 and 35-39 years have 8.5 and 8.3 %. Also age group 15-19, 20-24, 25-39 and 65 years and above have 2.9, 6.9, 7.5 and 6.1 % respectively. The least is the respondent age group less than 15 years

**Table 4.2: Age distribution of Respondents**

| Range of ages | Frequency | Percentage |
|---|---|---|
| Less than | 15 | 2.5 |
| 15-19 | 11 | 2.9 |
| 20-24 | 26 | 6.9 |
| 25-29 | 28 | 7.5 |
| 30-34 | 32 | 8.5 |
| 35-39 | 31 | 8.3 |
| 40-44 | 36 | 9.6 |
| 45-49 | 37 | 9.9 |
| 50-54 | 45 | 12.0 |
| 55-59 | 59 | 15.7 |
| 60-64 | 45 | 12.0 |
| 65 and above | 23 | 6.1 |
| Total | 375 | 100.0 |

Source: Field Survey (2015)

with 0.5 %. This shows that majority of the household heads falls within the productive class of the population and summarizes the age composition of the respondents.

4.2.3 Distribution of Respondent by Sex

From a total of 375 administered, 64.3 % are male while 35.5 % were female. This shows that most (64.3%) of the household heads were men, affirming the findings of Angko (2013) and Mohammed, Zungu and Hoque (2013) which shows that most household heads in developing countries are men.

**Table 4.3 Sex distribution of respondents**

| Sex | Frequency | Percentage |
|---|---|---|
| Male | 241 | 64.3 |
| Female | 133 | 35.5 |
| Total | 375 | 100.0 |

Source: Field Survey (2015)

4.2.4 Marital Status and Marital Union of Respondents

Table 4.4 shows majority of the respondents were the married which represents 66.1%. The unmarried form 20.1% while the widows and the separated made up 10.1 and 2.1% respectively. The least is the divorced respondent who forms 0.8%. This implies that most of the household are headed by married men and a number of unmarried living independently, few widows heading some homes and is in consonant with the findings of Mohammed, Zungu and Hoque (2013) which confirms that majority of the household heads in developing countries were married people.

**Table 4.4: Marital Status**

| Marital Status | Frequency | Percentage |
|---|---|---|
| Single | 78 | 20.8 |
| Married | 248 | 66.1 |
| Widowed | 38 | 10.1 |
| Separated | 8 | 2.1 |
| Divorced | 3 | .8 |
| Total | 375 | 100.0 |

Source: Field Survey (2015)

### 4.2.5 Distribution of Respondents by Educational Attainment

Education levels varied by household as shown in Table 4.5. Most of the respondents have attended tertiary education with 37.6% and secondary education with 36.6% respectively. Those with Primary/Quaranic Education represent 18.4% of the respondents while the respondents with other educational attainment and those with no educational attainment represents 5.3 and 0.5% of the respondents respectively. From the above distribution, it can be said that majority household heads are educated with a minimum of secondary school certificate. Also it implies that type of water sources used has a great relationship with level of education thereby confirming the findings of Koskei *et al* (2013b).

**Table 4.5: Educational Attainment of Respondents**

| Educational level | | Frequency | Percentage |
|---|---|---|---|
| | Tertiary | 141 | 37.6 |
| | Secondary | 138 | 36.8 |
| | Primary/Quranic | 69 | 18.4 |
| | None | 20 | 5.3 |
| | Others | 2 | 0.5 |
| | Total | 370 | 98.7 |
| Missing | System | 5 | 1.3 |
| Total | | 375 | 100.0 |

Source: Field Survey (2015)

## 4.3 Water and Sanitation Related Issues

This section discusses basic water and sanitation issues. It shows the distribution of household sources of water, key providers of households water and sanitation, distribution of duration or times to water source, households using shared toilet facility and frequency of sanitary inspection of household toilet facility.

### 4.3.1 Distribution of household Sources of water

From Table 4.6, most respondents from Barnawa have access to pipe borne water in their homes with 44.9% and those using protected wells form 38.8% of the respondent. Household using bottled water and unprotected well have 10.2 and 6.1 % respectively. Most respondent from Kakuri Gwari use protected well which represents 59.2 % and those with pipe borne water represent 24.8% of the respondents. Household using unprotected well represents 8.5 % of the respondent and those using the public tap represent 4.8% while those using bottle water and other water sources represents 1.8 and 0.9 % respectively. The least proportion is those using bottled water and other sources with each having 1.8% and 0.9% respectively. This implies that most of the households in Barnawa have better housing and economic status, hence enjoying the available social amenities compare to Kakuri Gwari which lacks the basic services.

Most of the respondent in Kurmin Mashi from table 4.6 use protected well and public tap as their main source of water with each source of water having 31.0%. Those using bottled water and other sources of water represent 10.4% and 20.7% of the respondent, while the least is 6.9% for those using pipe into dwelling. Also, 28.6 % of the respondent from Television have access to public tap as well as protected well, 26.2% have pipe borne water in their homes, 14.3% use bottled water while 2.4% use unprotected well. 28.4% of the respondent in Tudun Wada uses unprotected well, 42.1% use protected well, 21.0% use public tap while pipe into dwelling and bottled water users represents 4.5 and 3.5% respectively of the respondent in Tudun Wada. The table also shows that 69.0% of respondent in Ungwan Muazu are using protected well, 22.4% are using unprotected well, users of public tap and other water sources have 6.9 and 1.7% respectively.

**Table 4.6: Household Sources of water**

| Location of Respondent | Sources of Water | Frequency | Percentage |
|---|---|---|---|
| Barnawa | Unprotected well | 3 | 6.1 |
| | Protected well | 19 | 38.8 |
| | Pipe into dwelling | 22 | 44.9 |
| | Bottle water | 5 | 10.2 |
| | Total | 49 | 100.0 |
| Kakuri Gwari | Unprotected well | 9 | 8.5 |
| | Protected well | 65 | 59.2 |
| | Pipe into dwelling | 27 | 24.8 |
| | Bottle water | 2 | 1.8 |
| | Public tap | 5 | 4.8 |
| | Others | 1 | 0.9 |
| | Total | 109 | 100.0 |
| Kurmin Mashi | Protected well | 9 | 31.0 |
| | Pipe into dwelling | 2 | 6.9 |
| | Bottle water | 3 | 10.4 |
| | Public tap | 9 | 31.0 |
| | Others | 6 | 20.7 |
| | Total | 29 | 100.0 |
| Television | Unprotected well | 1 | 2.4 |
| | Protected well | 12 | 28.6 |
| | Pipe into dwelling | 11 | 26.2 |
| | Bottle water | 6 | 14.3 |
| | Public tap | 12 | 28.6 |
| | Total | 42 | 100.0 |
| Tudun Wada | Unprotected well | 25 | 28.4 |
| | Protected well | 38 | 42.1 |
| | Pipe into dwelling | 4 | 4.5 |
| | Bottle water | 3 | 3.5 |
| | Public tap | 19 | 21.5 |
| | Total | 88 | 100.0 |
| Ungwa Muazu | Unprotected well | 13 | 22.4 |
| | Protected well | 40 | 69.0 |
| | Public tap | 4 | 6.9 |
| | Others | 10 | 1.7 |
| | Total | 58 | 100.0 |

Source: Field Survey (2015)

The overall result suggests that the variation in their sources of water may be attributed to the economic status of the various households upholding the findings of

Satterthwaite that inadequate provision of piped water and proper sanitation are identified as serious problems affecting poor urban dwellers in developing countries (Satterthwaite, 2003).

More reason for the low private connections might be attributed to the poor spatial layout, which might have caused neglect by authorities to provide such services. The spaces required for these extensions might have been heavily built upon by dwellers and reasons for households using alternative sources of water could be due to lack of consistency on the part of the water board (Angko, 2013). Therefore, with respect to MDG 7 target 2015, the study area has achieved the target by over 80% coverage level.

### 4.3.2 Providers of Improved Water and Sanitation

Key players in handling most household water needs as shown in table 4.7 are adult male and female, with few others where male and female children less than 15 years of age are involved. Over 50% response from the area favored the adult female. A bulk of the female children less than 15 years of age in Kakuri Gwari are involve in fetching water to meet the family water needs of the households in that area are the ones involve in fetching water. Generally, the assertion that females are responsible for water fetching was firmed up based on the revelation of the study from table 4.7 and this certainly re-affirms the social and cultural setting of a traditional African community where women are major actors in domestic activities (Angko, 2013) and confirm the traditional role of women as domestic managers in an African society.

| Location of Respondent | Providers of improved Water | Frequency | Percentage |
|---|---|---|---|
| Barnawa | Adult Male | 17 | 34.7 |
| | Adult Female | 15 | 30.6 |
| | Female Child less than 15 years | 7 | 14.3 |
| | Male Child less than 15 years | 10 | 20.4 |
| | Total | 49 | 100.0 |

**Table 4.7: Key players in providing improved water and sanitation**

| | | | |
|---|---|---|---|
| Kakuri Gwari | Adult Male | 14 | 12.8 |
| | Adult Female | 45 | 41.3 |
| | Female Child less than 15 years | 36 | 33.0 |
| | Male Child less than 15 years | 12 | 11.1 |
| | Total | 107 | 98.2 |
| | Missing System | 2 | 1.8 |
| | Total | 109 | 100.0 |
| Kurmin Mashi | Adult Male | 10 | 34.5 |
| | Adult Female | 3 | 10.3 |
| | Female Child less than 15 years | 6 | 20.7 |
| | Male Child less than 15 years | 10 | 34.5 |
| | Total | 29 | 100.0 |
| Television | Adult Male | 5 | 11.9 |
| | Adult Female | 32 | 76.2 |
| | Female Child less than 15years | 5 | 11.9 |
| | Total | 42 | 100.0 |
| Tudun Wada | Adult Male | 32 | 36.4 |
| | Adult Female | 3 | 3.4 |
| | Female Child less than 15 years | 11 | 12.5 |
| | Male Child less than 15 years | 42 | 47.7 |
| | Total | 88 | 100.0 |
| Ungwan Muazu | Adult Male | 18 | 31.0 |
| | Adult Female | 25 | 43.1 |
| | Female Child less than 15years | 8 | 13.8 |
| | Male Child less than 15 years | 7 | 12.1 |
| | Total | 58 | 100.0 |

Source: Field Survey (2015)

### 4.3.3 Distribution of Duration/Time to Access Water by Household

Table 4.8 shows that 55.1% of the respondent in Barnawa takes 30mins to access water, 10.2% takes 1 hour, 6.1% takes 2 hours and 28.6% takes 5 hours to access water. Majority of the respondent in Kakuri Gwari 59.6% takes 5 hours to access water which is in real time due to the population of the area and lack of access to adequate sources of water thereby creating overcrowding and unnecessary waste of time, 21.1% takes 30mins and 13.8% were uncertain about the timing or duration while 5.5% decline any respond to the question. Another 39.3% of respondent from Kurmin Mashi takes 30 minutes to access water, majority 46.4% do not have idea on the duration, 7.1 % takes 1 hour to access water

while 3.6% takes 3 and 5hours to access water respectively in the area. Most of household takes 1hour to get water, and 4.8% takes 2 hours while 23.8% do not know the time it takes them to access water. 38.6% in Tudun Wada take 30 minutes to access water, 45.5% takes 1hour to access water, 6.8% 2 hours, 1.1% takes 5 hours and 8.0% do not have idea on the duration it takes to access water. Large proportion (58.6%) of the respondent in Ungwan muazu takes 30 minutes to access water, 36.2% takes 1hour while 3.4% do not know how long it takes to access water in Ungwan Muazu.

Majority of the respondent have access to water within reasonable distance from their dwelling with the exception of kakuri Gwari who's most respondents takes a longer time to access water which may be due to population concentration in the area, poverty level and failure of the public utility as observed by the researcher in the area. The WHO/UNICEF minimum standard distance for access to water from dwelling is one (1) kilometer and time frame of 30 minutes. The implication of this is that, water supply sources are within the minimum distance established by the WHO/UNICEF in the area.

**Table 4.8 Duration/Time to Access Water by Household**

| Location of Respondent | Duration | Frequency | Percentage |
|---|---|---|---|
| Barnawa | 30mins | 27 | 55.1 |
| | 1hr | 5 | 10.2 |
| | 2hrs | 3 | 6.1 |
| | 5hrs | 14 | 28.6 |
| | Total | 49 | 100.0 |
| Kakuri Gwari | 30mins | 23 | 21.1 |
| | 5hrs | 65 | 59.6 |
| | I don't know | 15 | 13.8 |
| | Total | 103 | 94.5 |
| | Missing System | 6 | 5.5 |
| | Total | 109 | 100.0 |
| Kurmin Mashi | 30mins | 11 | 39.3 |
| | 1hr | 2 | 7.1 |
| | 2hrs | 1 | 3.6 |
| | 5hrs | 1 | 3.6 |
| | I don't know | 13 | 46.4 |
| | Total | 28 | 100.0 |
| Television | 30mins | 25 | 59.5 |
| | 1hr | 5 | 11.9 |
| | 2hrs | 2 | 4.8 |
| | I don't know | 10 | 23.8 |
| | Total | 42 | 100.0 |
| Tudun Wada | 30mins | 34 | 38.6 |
| | 1hr | 40 | 45.5 |
| | 2hrs | 6 | 6.8 |
| | 5hrs | 1 | 1.1 |
| | I don't know | 7 | 8.0 |
| | Total | 88 | 100.0 |
| Ungwa Muazu | 30mins | 34 | 58.6 |
| | 1hr | 21 | 36.2 |
| | I don't know | 2 | 3.4 |
| | Total | 57 | 98.3 |
| | Missing system | 1 | 1.7 |
| | Total | 58 | 100.0 |

Source: Field Survey (2015)

Longer distance to water source might affect the quantity of water available for household use and consequently loss of productive hours but respondents in Kakuri Gwari

have difficulty in accessing water which requires much effort to meet up with WHO/UNICEF standard for access time to water source due to population size of the area that has stretched available water sources. It can be inferred that a larger proportion of household have access to water sources within reasonable time, confirming the findings of Akoteyon (2016) in the whole of the study area.

### 4.3.4 Distribution of Household using Shared Toilet Facility

Table 4.9 shows the distribution of household using shared facility. From the table, 51.0% of the household in Barnawa agree that 5 household share their facility, 16.3% said 10 household share their facility, 2. 1% said 20 household share their facility while 4.1% are not certain of the number of household sharing their toilet facility in Barnawa. The table also reveals that in Kakuri Gwari, 32.1% of the respondent said 5 household share their toilet facility, 12.8% said 10 household share their facility, 13.8% said 20 household share their toilet facility and 11.0% were not certain on the number of household sharing their facility. 11.9% decline to respond to the number of household sharing their facility. In Kurmin Mashi, 57.1% reported that 5 household share their toilet facility, 25.0% reported 10 household. The result in television shows that 23.8% reported 5 household shares their toilet facility, 16.7% reported that 10 and 20 household share their toilet facility respectively. This implies that most of the household had their facility being shared and according to the UN-Millennium projects (2005), all shared sanitation facilities are considered unimproved, therefore most of the respondents had access to unimproved sanitation facility.

**Table 4.9: Household using Shared Toilet Facility**

| Location of Respondent | Number of household | Frequency | Percentage |
|---|---|---|---|
| Barnawa | 5 | 25 | 51.0 |
| | 10 | 8 | 16.3 |
| | 20 | 1 | 2.1 |
| | I don't know | 2 | 4.1 |
| | 6.00 | 13 | 26.5 |
| | Total | 49 | 100.0 |
| Kakuri Gwari | 5 | 35 | 32.1 |
| | 10 | 14 | 12.8 |
| | 20 | 15 | 13.8 |
| | I don't know | 12 | 11.0 |
| | 6.00 | 13 | 11.9 |
| | Total | 89 | 81.6 |
| | Missing System | 20 | 18.4 |
| | Total | 109 | 100.0 |
| Kurmin Mashi | 5 | 17 | 58.6 |
| | 10 | 7 | 24.1 |
| | 6.00 | 5 | 17.3 |
| | Total | 29 | 100.0 |
| Television | 5 | 10 | 23.8 |
| | 10 | 7 | 16.7 |
| | 20 | 7 | 16.7 |
| | I don't know | 2 | 4.8 |
| | 6.00 | 15 | 35.7 |
| | Total | 41 | 97.6 |
| | System | 1 | 2.4 |
| | Total | 42 | 100.0 |
| Tudun Wada | 5 | 35 | 39.7 |
| | 10 | 27 | 30.7 |
| | 20 | 7 | 8.0 |
| | I don't know | 10 | 11.4 |
| | 6.00 | 9 | 10.2 |
| | Total | 88 | 100.0 |
| Ungwan Muazu | 5 | 24 | 41.4 |
| | 10 | 10 | 17.2 |
| | 20 | 7 | 12.1 |
| | I don't know | 16 | 27.5 |
| | 6.00 | 1 | 1.7 |
| | Total | 58 | 100.0 |

Source: Field Survey (2015)

Also in Tudun Wada, a greater number 39.7% reported that 5 household share their toilet, 30.7% reported 10 household shared their toilet facility, 8.0% said 20 household

share their toilet facility, while 11.4% do not have an idea on the number of household sharing their toilet facility. The result from Ungwan Muazu shows 41.4% of the respondent reporting that 5 household share their toilet facility, 17.2% reported that 10 household share their toilet facility, 12.1% reported that 20 household share their toilet facility while 27.6% said they have no idea on the number of household sharing their toilet facility. Also most practice an unhealthy habit of sharing their toilet which is unacceptable by the WHO standard and work against the achievement of the Millennium Development Goal (MDG).

The summary from table 4.2.9 shows that the area is characterized by multi-households houses and it also reveals that the level of the economic well-being of the respondents. Though the table showed a high level of shared facility, field observation revealed that the income level of the respondents determines the kind of toilet facility used by households.

### 4.3.5 Distribution of Frequency of Inspection of Facility by Sanitation Officers

Table 4.10 above shows that in Barnawa, 2.0% of the respondent acknowledge that sanitation or health officials inspected their homes weekly and fortnightly respectively. 18.5% acknowledged that their homes were inspected on a monthly basis. Also, 14.3% said quarterly inspection was carried out and 40.8% said no one has ever inspected their sanitary conditions while 22.4% said they have no idea if their homes were ever inspected. In Kakuri Gwari, 12.8% acknowledge that quarterly inspection was carried out in their home, 79.8% said never was their house ever been inspected, while 7.4% said they have no idea if an inspection of their sanitary condition was ever carried out. Another 6.9**%** of the respondent in Kurmin Mashi reported that their sanitary condition was inspected on a monthly basis and 79.3% reported that never was their sanitary condition been inspected, 13.8% acknowledge they have no idea if their sanitary condition had been inspected at any

time. Also, 16.7% of the respondents from Television acknowledge that inspection was on a weekly basis, 26.2% acknowledge inspection was a monthly routine, 45.2% acknowledge no inspection has been carried out by health officials, while 11.9% had no idea if an inspection had been carried out in their homes.

The Table also reveals that 1.1% acknowledges that inspection had taken place fortnightly and monthly in Tudun Wada respectively, 6.8% acknowledges there has been a quarterly inspection while 91.0% said there has been no inspection of their sanitary condition at any time. The case in Ungwan Muazu shows 46.6% of the respondent acknowledges a monthly inspection has been carried out, 43.1% acknowledged a quarterly inspection has been going on while 10.3% said never has their home been inspected.

From the overall result in table 4.10, the role played by sanitation and health officials is not very significant due to the rate and frequency of inspection in households. Majority of the respondent acknowledges there has not been inspection in their homes with only respondent from Ungwan Muazu acknowledging a monthly and quarterly inspection taking place in their homes. This shows that the ability to monitor the sanitation situation is non functional due to the manner in which health officials carry out their duties. The overall effort in monitoring the existing situation falls short of requirement and below standard. The issue of water and sanitation improvement in Nigeria is characterized by good legislation and policy formulation but poorly monitored and implemented. This can be affirmed by the MDG 2015 end point report for Nigeria which shows that 90% of the Goals have not been met in Nigeria.

**Table 4.10 Frequency of Inspection of Facility by Sanitation Officers**

| Location of Respondent | Interval of inspection | Frequency | Percentage |
|---|---|---|---|
| Barnawa | Weekly | 1 | 2.0 |
| | Fourth nightly | 1 | 2.0 |
| | Monthly | 9 | 18.5 |
| | Quarterly | 7 | 14.3 |
| | Never been inspected | 20 | 40.8 |
| | I don't know | 11 | 22.4 |
| | Total | 49 | 100.0 |
| Kakuri Gwari | Quarterly | 14 | 12.8 |
| | Never been inspected | 87 | 79.8 |
| | I don't know | 8 | 7.4 |
| | Total | 109 | 100.0 |
| Kurmin Mashi | Monthly | 2 | 6.9 |
| | Never been inspected | 23 | 79.3 |
| | I don't know | 4 | 13.8 |
| | Total | 29 | 100.0 |
| Television | Weekly | 7 | 16.7 |
| | Monthly | 11 | 26.2 |
| | Never been inspected | 19 | 45.2 |
| | I don't know | 5 | 11.9 |
| | Total | 42 | 100.0 |
| Tudun Wada | Fourth nightly | 1 | 1.1 |
| | Monthly | 1 | 1.1 |
| | Quarterly | 6 | 6.8 |
| | Never been inspected | 80 | 91.0 |
| | Total | 88 | 100.0 |
| Ungwa Muazu | Monthly | 27 | 46.6 |
| | Quarterly | 25 | 43.1 |
| | Never been inspected | 6 | 10.3 |
| | Total | 58 | 100.0 |

Source: Field Survey (2015)

Most of the indicators and parameters to towards achieving the MDG show that Nigeria is on the negative slide (UNDP, 2015).

As countries strive to compliment the achievement of the Millennium Development Goals (MDGs) through the Sustainable Development Goals Agenda 2030, implementing institutions, communities, families and individuals must ensure that the issue of water and environmental sanitation is given high priority in their list. This is critical to the survival of communities, families and the world in general and must be top of their agenda as we drive towards sustainability.

### 4.4 Chi-Square Tests Statistics

Tables 4.11 reveals that in the six selected wards, results from five Wards (Barnawa, Kurmin Mashi, Television, Tudun Wada and Ungwan Muazu) shows that there is no significant difference in improved water and sanitation among household in the area with a value greater than 0.05% at 0.5 degree level of freedom, so the null hypothesis is not rejected, while the results from Kakuri Gwari ward shows a significant difference in improved water and sanitation among household and therefore we reject the null hypothesis for the ward. This may be due to poverty situation and population concentration in the area which is a consequence of the closure of most industries within the area and has rendered most household heads redundant and rid of their livelihood.

The coverage rate for improved water in the area is about 80% which revealed that the MDG target on water coverage has been met while the sanitation coverage rate in the area is less than 50% due to the level of shared facility which is considered unimproved and in addition to the lack of sanitary inspection at household level. Therefore, the 2015 target on sanitation has not been achieved in the area.

**Table 4.11: Chi-Square Tests**

| Location of Respondent | Chi-Square Value | | Df | P-Value |
|---|---|---|---|---|
| Barnawa | Pearson Chi-Square | 8.710 | 9 | .464 |
| | N of Valid Cases | 43 | | |
| Kakuri Gwari | Pearson Chi-Square | 23.431 | 6 | .001 |
| | N of Valid Cases | 100 | | |
| Kurmin Mashi | Pearson Chi-Square | 4.896 | 6 | .557 |
| | N of Valid Cases | 15 | | |
| Television | Pearson Chi-Square | 11.085 | 12 | .522 |
| | N of Valid Cases | 36 | | |
| Tudun Wada | Pearson Chi-Square | 16.356 | 9 | .060 |
| | N of Valid Cases | 74 | | |
| Ungwa Muazu | Pearson Chi-Square | 6.924 | 6 | .328 |
| | N of Valid Cases | 58 | | |

Source: Field Survey (2015)

# CHAPTER FIVE : SUMMARY, CONCLUSION AND RECOMMENDATIONS

## 5.1 Introduction

This chapter looked at the general summary of the research work, conclusions from the overall findings of the study and final recommendation for further studies and policy makers.

## 5.2 Summary of the Study

The purpose of the study as indicated in chapter one (1) was to assess the level of improved water and sanitation coverage in Kaduna South Local Government area. The research dealt with the objectives of the study which were; to identify the sources of water; assess the role of household members in improving water and sanitation; determine the time taken by household to access water; determine the number of household using improved water and sanitation facility and to identify key players in providing improved water and sanitation in the study area. Based on the aim and objectives of the study, the research was conducted at the household level in Kaduna South Local Government Area. This was carried by administering 382 copies of the questionnaire design for the research work.

The study was able to establish that the level of improved water and sanitation coverage in Kaduna South Local Government Area of the Kaduna State was on average. The overall findings of the research indicated that most household in the study area had access to improved water and sanitation facility with the exception of Kakuri Gwari resident which had limited access to improved water and sanitation facility.

From the findings of the research, it also emerged that most households had access to drinking water sources within reasonable time and distance. However, households with pipe into dwelling were very inadequate. Most household had protected well as their main

source of water but due to their sanitary conditions as observed by the researcher, it may not be very reliable. Some of the households within the study area use pit latrine that may contaminate their well due to underground seepage of contaminated water from the surrounding.

The study also found that key players in providing improved water to household are adult female with few household having adult male. This can be attributed to religious factor which does not allow adult women in public regularly. The study also established that most household in the study area had access to water within reasonable distance. Majority of the household in the study takes 30 minutes to access water from a distance less than one kilometer which is acceptable by WHO.

Majority of the household had access to improved sanitation facility considering the number of persons using shared facility. The result shows that about 60% of household having only members of the same household using the shared facility, with about 10% of the respondent having more than one household using shared facility. However, the level of sanitary inspection has been very low and is of great concern. Over 80% of the respondent reported that never was their home been inspected while 30% of the respondent favored quarterly inspection which is very inadequate. The frequency of inspection and enforcement is grossly inadequate and need to be enhanced.

As countries strive to compliment the achievement of the Millennium Development Goals (MDGs) through the Sustainable Development Goals Agenda 2030, implementing institutions, communities, families and individuals must ensure that the issue of water and environmental sanitation is given high priority in their list. This is critical to the survival of communities, families and the world in general and must be top of their agenda as we drive towards sustainability.

The issue of water and sanitation improvement in Nigeria is characterized by good legislation and policy formulation but poorly monitored and implemented. This can be affirmed by the MDG 2015 end point report for Nigeria which shows that 90% of the Goals have not been met in Nigeria. Most of the indicators and parameters to towards achieving the MDG show that Nigeria is on the negative slide (UNDP, 2015).

## 5.3 Conclusion

Based on the findings from the research work, the study arrived at the following conclusions:

- There is no significant difference in improve water and sanitation among household. This is shown from the result of the Chi-square analysis which gives a p-value greater than 0.05% for most households.
- The main source of improved water in the study area is the protected well.
- Only about 38% of households in the study area are connected to private pipe showing a very low access rate.
- The role of government in providing improved Sanitation is generally low due to the low level of sanitary inspection in the area.
- The average time to access water by households in the area is 30 minutes meeting WHO standard for access time to water source(s).
- The level of shared toilet facility in the area is high and unacceptable based on the WHO standard.
- The groups of people responsible for fetching water and cleaning the toilet facility in the area are mainly adult female and female children less than 15 years.
- The problem of sanitation is more prevalent in Kakuri Gwari where the p-value for improved water and sanitation is less than 0.05 showing a significant difference.

## 5.4 Recommendations

As the global communities move towards sustaining the achievable result in the Sustainable Development Goal (SDG), countries must intensify efforts in ensuring that the committed effort is maintain towards a healthy society. Following the findings of the research work, these recommendations are put forward:

- Government should intensify effort in encouraging and providing improved coverage on water and sanitation in Kaduna South Local Government Area through regular inspection of sanitary condition.
- Proper enlightenment should be carried out by both the Government and private partners on the need for maintaining a healthy and hygienic environment.
- More households should be connected to pipe water to reduce the burden experience by households.
- Priority should be given to water and sanitation; this would on the long run curb disease caused by poor access to potable water and proper sanitation.
- The issue of quality water and better sanitation is the responsibility of all; therefore all stakeholders must work as partners to bring about better service delivery.
- Policy that would enhance better water and sanitation improvement should be implemented to improve on current situation.
- Government should be more proactive in ensuring formulated policies are properly monitored and implemented for the common good of all to avoid recurrent failures.
- Further research work should be encouraged so that progress in providing water and effective sanitation can be monitored and attaining the objective of the Millennium

Development Goal (MDG) and also towards the Sustainable Development Goal (SDG) .

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**APPENDIX A: HOUSEHOLD SURVEY QUESTIONNAIRE**

**DEPARTMANT OF GEOGRAPHY**

**AHMADU BELLO UNIVERSITY, ZARIA**

**QUESTIONNAIRE ON ASSESSMENT OF IMPROVED WATER AND SANITATION COVERAGE IN KADUNA SOUTH LOCAL GOVERNMENT AREA, KADUNA STATE**

Dear Respondent,

This questionnaire is designed to assess the level of **"IMPROVED WATER AND SANITATION COVERAGE IN KADUNA SOUTH LOCAL GOVERNMENT AREA OF KADUNA STATE"** To enable accurate assessment, it is important that all information required in the questionnaire be provided and completed as accurate as possible. This exercise is purely academics and so any information supplied would be used strictly for that purpose and thus treated as confidential. Thick or circle your choice of answer.

**SECTION A**

**DEMOGRAPHIC AND SOCIO-ECONOMICS CHARACTERISTICS OF RESPONDENT.**

**Location of respondent: [ ] Barnawa [ ] Kakuri Gwari [ ] Kurmin Mashi [ ] Television**

**[ ] Tudun Wada North [ ] Ungwan Muazu**

1. Age (a) less than (a) 15 [ ] (b) 15-19 [ ] (c) 20-24 [ ] (d) 25-29 [ ] (e) 30-34 [ ]

(f) 35-39 [ ] (g) 40-44 [ ] (h) 45-49 [ ] (i) 50 -54 [ ] (i) 55-59 [ ] (j) 60-64 [ ]

(k) 65 and above [ ]

2. Sex (a) Male [ ] (b) female [ ]

3. Marital Status: (a) Single [ ] (b) Married [ ] (c) Widowed [ ]

(d) Separated [ ] (e) Divorced [ ]

4. Type of Marital Union (for those who have ever married) (a) Polygamy [ ]

(b) Monogamy [ ] (c) Others [ ]

5. Educational Attainment (a) Tertiary [ ] (b) Secondary [ ] (c) Primary/Quranic [ ]

(d) None [ ] (e) Others (specify)……..

6. Do you have any gainful employment (a) yes [ ] (b) No [ ]

7. If yes (in 6 above), type of employment (a) Casual Laborer [ ] (b) civil servant [ ]

(c) Business/Petty trading [ ] (d) Farmer [ ] (e) Unemployed [ ] (f) Student [ ]

(g) Others (Specify)……...

8. Type of accommodation (a) One/two rooms apartment [ ] (b) flat [ ] (c) Duplex [ ] (d) Hostel [ ] (e) Ownership of Accommodation [ ]

**SECTION B: IMPROVED WATER SOURCES**

9. What is your source (s) of water? (a) Unprotected well [ ] (b) Protected well [ ]

(c) Pipe into dwelling [ ] (d) Bottle Water [ ] (e) Public tap [ ] (g) Rain Water [ ]

(h) Stream [ ] (i) Others [ ]

10. What is your most preferred source? (a) Unprotected well [ ]

(b) Protected well [ ] (c) Pipe into dwelling [ ] (d) Bottle/Sachet Water [ ]

(e) Public tap [ ] (g) Rain Water [ ] (h) Stream [ ] (i) others [ ]

11. What is your other source (s) of water apart from (10) above? (a) Stream [ ]

(b) Truck/Tanker [ ] (c) Public pipe [ ] (d) Vendors [ ]

12. How long does it take you to get water and return back to your house from the source?

(a) 30mins [ ] (b) 1hr [ ] (c) 2hrs [ ] (d) 5hrs [ ] (d) I don’t know [ ]

13. What is your average household water usage per day? (a) 5 liter [ ] (b) 10 liters [ ] (c) 20 liters [ ] (d) 50 liters [ ] (e) I don't know [ ]

14. Do you treat your water in any way to make it safer? (a) Yes [ ] (b) No [ ]

15. If yes in 14 above, what do you normally do to make your water safe for drinking? (a)Boil [ ] (b) Add bleach/Chlorine [ ] (c) Strain it through a cloth [ ]

(d) Let it stand and filter [ ] (e) others [ ]

16. Who is the main person used in fetching water? (a) Adult Man [ ] (b) Adult Woman [ ]

(c) Female Child less than 15 [ ] (d) Male Child less than 15 [ ]

17. What are your challenges of getting quality water? (a) Lack of Quality water [ ]

(b) Distance from my house [ ] (d) Quality water readily available [ ]

(e) Cost of obtaining Quality water [ ] (f) I don't have any challenge [ ]

**SECTION C: BASIC SANITATION**

18. What type of toilet facility do you have? (a) Pit Latrine [ ] (b) Flush Toilet [ ]

(c) Ventilated Latrine with slab [ ] (d) Open Defecation [ ] (e) others [ ]

19. What is your most preferred type? (a) Pit Latrine [ ] (b) Flush Toilet [ ]

(c) Ventilated Latrine with slab [ ] (d) Open Defecation [ ] (e) others [ ]

20. Do you share the facility with other households apart from members of your household? (a) Yes [ ] (b) No [ ]

21. If yes in (20) above, whom? (a) Friends [ ] (b) Neighbors [ ] (c) Passers bye [ ]

(d) Visitors [ ]

22. What is the average number of households using the facility? (a) 5 [ ] (b) 10 [ ]

(d) 15 [ ] (e) 20 [ ] (f) I don't know [ ]

23. How many household are sharing the facility? (a) 2 [ ] (b) 3 [ ] (c) 4 [ ] (d) 5 [ ] (e) 5 [ ]

24. How often do you clean the toilet facility? (a) Hourly [ ] (b) Twice Daily [ ]

(c) Daily [ ] (d) Weekly [ ] (e) I don't know [ ]

25. How frequent do sanitation officers inspect your facility?

(a) Weekly [ ] (b) Fourth nightly [ ] (c) Monthly [ ] (d) Quarterly [ ] (e) Never been inspected [ ] (f) I don't know [ ]

26. Are you satisfied with your sanitary condition? (a) Yes [ ] (b) No [ ] (c) I don't know [ ]

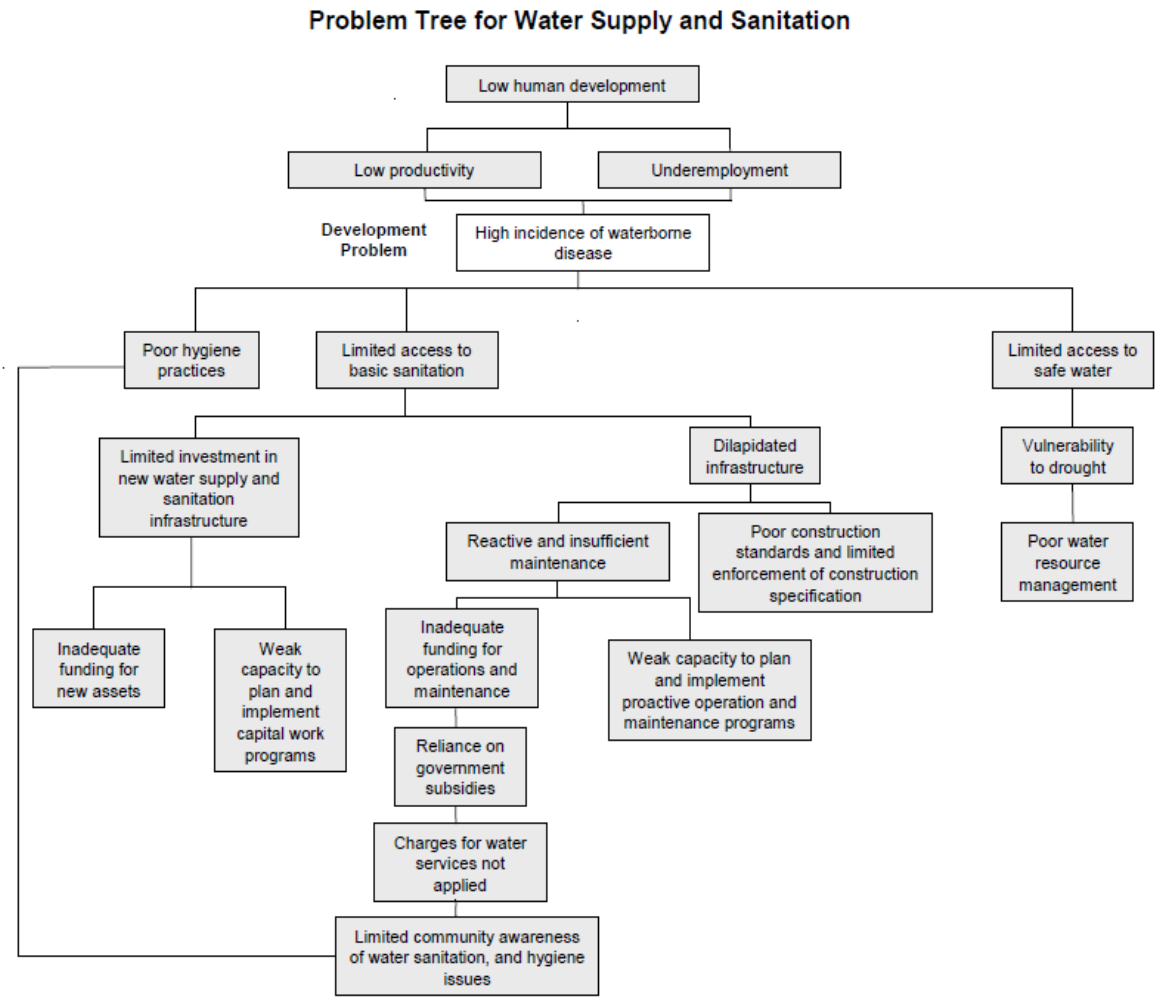
27. If yes/No in 26 above, what do you think can be done to improve on the present condition?

(a) Regular inspection [ ] (b) Enlightenment on the need for proper hygiene [ ]

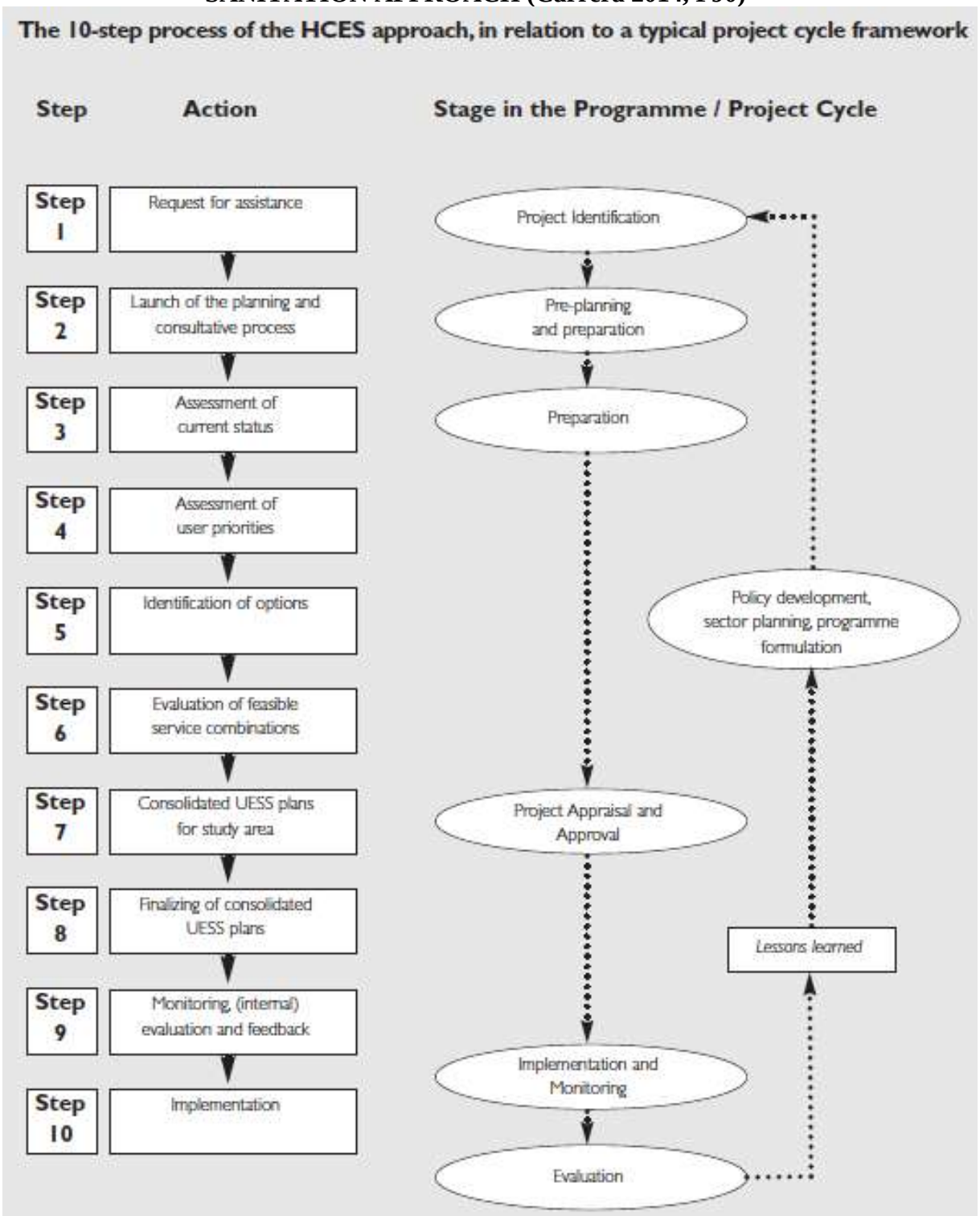
(c) Prosecution of those found not maintaining hygienic conditions

(d) I don't know [ ]

## APPENDIX B - PROBLEM TREE FOR WATER SUPPLY AND SANITATION



**APPENDIX C – THE HOUSEHOLD-CENTERED ENVIRONMENTAL SANITATION APPROACH (Carrera 2014, P90)**



## APPENDIX D: SUMMARY OF NIGERIA'S MDGS END POINT PROGRESS REPORT 2015

| INDICATOR | PARAMETER | REMARKS |
|---|---|---|
| Indicator 1.1 | Proportion of population below USD 1 (PPP) per day (%) | *Weak* |
| Indicator 1.8 | National Level Prevalence of underweight children under-five years of age | *Fair* |
| Indicator 2.1 | Net enrolment in primary education (%) | *Weak* |
| Indicator 2.2 | Primary Six Completion rate | *Weak* |
| Indicator 2.3 | Literacy rate of 15-24 year olds | *weak* |
| Indicator 3.1a | Ratio of girls to boys in primary education | *strong* |
| Indicator 3.1b | Ratio of girls to boys in secondary education | Fair |
| Indicator 3.2 | Share of women in wage employment in the non-agricultural sector (per cent) | *Weak* |
| Indicator 3.3 | Proportion of Seats held by Women in the National Parliament | *Weak* |
| Indicator 4.1 | Under-five mortality rate | *Strong* |
| Indicator 4.2 | Infant mortality rate | *Fair* |
| Indicator 4.3 | Proportion of 1 year-old children immunizedagainst measles | *Weak* |
| Indicator 5.1 | Maternal mortality ratio | *Met* |
| Indicator 5.2 | Proportion of births attended by skilled health personnel | *Weak* |
| Indicator 5.3 | Contraceptive prevalence rate | *Weak* |
| Indicator 5.5 | Antenatal care coverage (atleast one visit) | *Weak* |
| Indicator 6.1 | HIV prevalence among pregnant young women aged 15 – 24 | *Weak* |
| Indicator 6.2 | Young people aged 15–24 years reporting the use of a condom during sexual intercourse with a non-regular sexual partner | *Weak* |
| Indicator 6.3 | Proportion of the population aged 15–24 years with comprehensive correct knowledge of HIV and AIDS | *Weak* |
| Indicator 6.5 | Proportion of the population with advanced HIV infection with access to antiretroviral drugs | *Weak* |
| Indicator 6.7 | Proportion of under-five children sleeping under insecticide-treated bed nets | *Weak* |

| | | |
|---|---|---|
| Indicator 6.9 | Incidence of TB per 100,000 population | *No progress* |
| Indicator 7.1 | Proportion of land area covered by forest | *Weak* |
| Indicator 7.9 | Proportion of population using an improved drinking water source | *Weak* |
| Indicator 7.10 | Proportion of urban population living in slums | *Weak* |
| Indicator 8.1 | Per capita ODA to Nigeria | *Fair* |
| Indicator 8.2 | Debt service as a percentage of exports of goods andservices | *Strong* |
| Indicator 8.14 | Telephone lines per 100 people | *Weak* |
| Indicator 8.15 | Cellular phone subscribers per 100 people | *Strong* |
| Indicator 8.16 | Internet users per 100 people | *Fair* |
| Indicator 8.17 | Tele-density | Strong |