

# Inventory of Rural Domestic Water Supply Points in Gombe State, Nigeria

Ahmad Abdullahi<sup>1</sup>, Sa'idu Idris<sup>2</sup>, Ali Abdu<sup>3</sup>

<sup>1, 2, 3</sup>Department of Geography, Federal University of Kashere, Gombe State, Nigeria

**Abstract:** *Water of different types and circumstances is always available where people live. This is so because, people cannot live without water, and since it does not have alternative, they will not reside where there is none. Water is found in a locked up system called the hydrologic system, which involves huge quantity of water storage and transfer between the atmosphere, oceans, and land. Yet, renewable fresh water resources at all levels are insufficient to satisfy growing needs. The challenge for water service in light of growing competition for water is to ensure that sufficient quantities of good quality water are available for domestic and other uses. In order to have robust water service delivery, there is the need for every community or water consuming entity to have a framework which recognizes acquiring a stock of the available sources from which plans are to be made. This work attempted an enumeration of surface and underground rural water supply points, described the functionality of the sources in term of supplying water and what the water is being used for in rural homes. The study used a purposive method of selection to choose viable localities for the study, a random selection of respondents in the chosen localities and a FGD to substantiate interview responses. The study discovered a total of 913 rural water supply points in the 50 communities where the research was conducted. On the average, each community has 18 water supply points. These sources comprise natural and man-made types. The natural sources include rivers, streams, and shallow wells. The man made sources include hand pumps, deep boreholes, concrete wells earth dams, gravity flow, among others. Findings from the study also revealed that natural sources were at various degree of dryness, interview with beneficiaries revealed that 52% of the man made supply points were not functional, some 14.5% were temporarily down, and 1.8% of could not be ascertained, that means only 31% of the sources were functional at time of conducting the study. In terms of usage, research findings indicate that 78% of respondents obtain water for indoor use only, while 22% seek water for both purposes, outdoor being for watering animals. Of all the indoor water use in the study area 62% of respondents affirmed that laundry, bathing and flushing toilet consume the greatest quantity of water per person per day in the household, followed by food processing and cooking at 30%. Drinking, religious, and other cultural chores consume the remaining 8%. The study recommends an urgent need for a state wide inventory of surface and ground water resources of the state, to resuscitate other water supply points in order to meet up with the 50 liters per person per day as recommended by WHO.*

**Keywords:** Inventory of Rural Domestic Water Supply Points in Gombe State, Nigeria

## 1. Introduction

Water is one of the important components that support life on earth. Man, plants and animals depend on water for survival. Nwakwoala (2011) asserts that water is essential for the sustenance of life and determines the overall socio-economic development of any nation. It is important in every aspect of our society including agriculture, manufacturing, energy production and municipal drinking supplies (Mike, 2012). Water is found in a locked up system called the hydrologic system, which involves huge quantity of water storage and transfer between the atmosphere, oceans, and land (Cutter, Renwick and Renwick, 1991). Much of the water in this cycle is however, unavailable for human use, because it is either saline (97%), or locked up as ice (2%). The remaining (1%) of it is in a form of that can be used for all household chores, called the fresh water. It is the water on which most terrestrial biota, ecosystems and humans depend (Richard & Dorathy, 2011). Yet, renewable fresh water resources at all levels are insufficient to satisfy growing needs (UN-ESCWA, 2013). In many parts of the world water scarcity has become a fundamental challenge to sustainable development. The problem as observed by experts in water matters "is not with global amount of water, but with its distribution (natural and artificial) and reliability (Getis, Getis & Fellmann, 2011). Obtaining data on the global distribution of water, as important as it is, will not suffice in making plans for domestic water supply to communities. In order to have robust water service delivery to this ever increasing socio-economic and environmental pressure, there is the need for every community or water

consuming entity to have a framework which recognizes acquiring a stock of the available sources from which plans are to be made.

The challenge for the water service in light of growing competition for water is to ensure that sufficient quantities of good quality water are available for domestic and other uses. There is an old adage, "you can't manage what you don't measure". Additionally, you can't measure if you don't know what you have (Mike, 2012). In Gombe State, a lot of programmes and policies have been put in place to improve water supply situation by different political administrations, NGOs and other service providers. Despite this, complains from urban and rural areas is 'no water'. The rural areas worse hit. An accurate level water resources inventory and assessment of water quantity and quality in Gombe state is essential to identify needs and threats, prioritize work, and take prescriptive actions. In the past decades there are extensive literatures on the inventory of water resources at regional and national levels but, very little or nothing has been written on the inventory of the sources of domestic water supply in Gombe state.

## 2. Aim and Objectives

The inventory of water supply sources in the study area is a systematic effort to enumerate and describe the functionality of the sources and what the resource is being used for; Its main aim is to provide a number of sources and a basis for accounting the investment made on water facility; how functional the sources are in terms of quantity and quality;

and informing discussion and fostering dialogue on these precious resources that have become increasingly important to sustain development in an era of growing demand and dwindling supply. These and more can be achieved through the following objectives:

- 1) To examine the institutional framework of water supply for water resource inventory.
- 2) To identify the available domestic water supply points in Gombe State.
- 3) To assess base on (2) above, the functionality of the sources of domestic water supply.
- 4) To examine what the water is being used for

The results will be a comprehensive reference document of the sources, functionality, and utilisation. The research targets a wide range of action from decision-makers, government representatives, academia, donors, and specialized agencies, international and non-governmental or civil society organizations in order to enhance quantity, quality and service delivery of domestic water.

### 3. Literature Review

Water of different types and circumstances is always available where people live. This is so because, people cannot live without water, and since it does not have alternative, they will not reside where there is none. It may be in a river, pond, and lake, hand dug well, on stand pipes or gushing from beneath a rock. It may be obtained from afar, with difficulty, dirty, coloured, polluted, etc. Notwithstanding, water has to be available.

Domestic water supply means the source and infrastructure that provides water to households. A domestic water supply can take different forms: a stream, a spring, a hand-dug well, a borehole with hand pump, a rainwater collection system, a piped water supply with tap stand or house connection, or water vendors. Households use water for many purposes: drinking, cooking, washing hands and body, washing clothes, cleaning cooking utensils, cleaning the house, watering animals, irrigating the garden, and often for commercial activities. Different sources of water may be used for different activities, and the water sources available may change with the seasons (Watsan, 2005).

The primary sources of drinking water are groundwater and surface water. In addition, precipitation (rain and snow) can be collected and contained.

Most water systems consist of a water source (such as a well, spring, or lake), some type of tank for storage, and a system of pipes for distribution. Means to treat the water to remove harmful bacteria or chemicals may also be required. The system can be as simple as a well, a pump, and a pressure tank to serve a single home. It may be a complex system, with elaborate treatment processes, multiple storage tanks, and a large distribution system serving thousands of homes. Regardless of system size, the basic principles to assure the safety and portability of water are common to all systems. Large-scale water supply systems tend to rely on surface water resources, and smaller water systems tend to use groundwater (Thomas & Gnomolia, 2012).

Like in many places, water resources are not evenly distributed in Gombe State, but it exists in every locality in the forms of surface and ground water. Among the surface rivers are the Gongola and its tributaries, River Balanga and its tributaries, River Watira, River Tukulma, River Pamadu, River Jalangu, and River Dadiya. Other surface water resources are the Swamps and other natural and manmade earth dams with a collective coverage of 13.8% (swamps covering 8.99% and water body 4.19%). Ikusemoran *et al.* (2016) revealed that major swamps and water body areas were found along the basin of River Gongola in Dukku, Nafada and Funakaye L.G.As, as well as around the Dadin-kowa dam in Yamaltu-Deba LGA. There is a large expanse of water at the central portion of the state being shared by Gombe, Yamaltu-Deba and Akko L.G.A. Areas that are covered by water body and swamps in the savannah vegetation belts in Nigeria are commonly referred to as the "fadama". The rivers are very important to the inhabitants of the state in terms of water provision for domestic and irrigation purposes (Ikusemoran *et al.*, 2016) and provision of livelihood resources (Ahmad, 2010) especially during the dry season when rainfall amount is scanty.

In terms of ground water, the state lies mostly within the poor ground water provinces in the Gombe sandstone, the Pindiga shale; kerrikerri formation of tertiary age and the isolated hills region of the northern central and southern parts. Groundwater occurs between 180m depth on the sandstones. In these areas, because of the cretaceous sandstone and shale, groundwater is generally erratic and meagre. The collective coverage of 13.18% of the land area of Gombe State is covered by swamps and water body (swamps covering 8.99% and water body 4.19%). This could be attributed to the presence of River Gongola in the State. Ikusemoran, Bala and Lazarus, (2016) revealed that major swamps and water body areas were found along the basin of River Gongola in Dukku, Nafada and Funakaye LGAs, as well as around the Dadin-kowa dam in Yamaltu-Deba LGA.

Inventory of domestic water supply is the characterization of domestic water source area. It involves the description and assessment of intrinsic, natural features of water source and source area of a water supply (British Columbia, 2017). The inventory of water resources in this study collects information including coordinates of natural and artificial sources of water, functionality of these sources-both natural and artificial, quantity and quality of water and water related infrastructure.

### 4. Methodology

#### 4.1 The Study Area

Gombe State is located in the north-east region of Nigeria between latitudes 9° 30' and 12° 30' North and Longitudes 8° 45' and 11° 45' East (Figure 1). The state lies in the centre of the North-East geopolitical zone of Nigeria. It covers a total land area of only 17, 258.6 km<sup>2</sup> representing 6.3% of the 272, 395 km<sup>2</sup> of the total land area of the northeast geopolitical zone. It shares boundary with all the other states in the Zone, namely Adamawa and Taraba to the

south, Bauchi to the west, Borno to the east and Yobe to the north.

Gombe State is geologically part of the Upper Benue trough and constitutes a major sedimentary basin. In terms of drainage system, the Gongola River is the main drainage system, running approximately north-south toward the Benue river basin, but with principal tributaries draining from the west to east into River Gongola. At Nafada, the

Gongola bends in a loop southward and flow through much of the eastern border of the state before it joins River Benue at Numan. It is the sixth longest river in the country, being 530km, much of which is within Gombe state (Figure 1), thus Gombe is within the wider Benue Drainage Basin, with the dominance of the western part of Gongola basin.

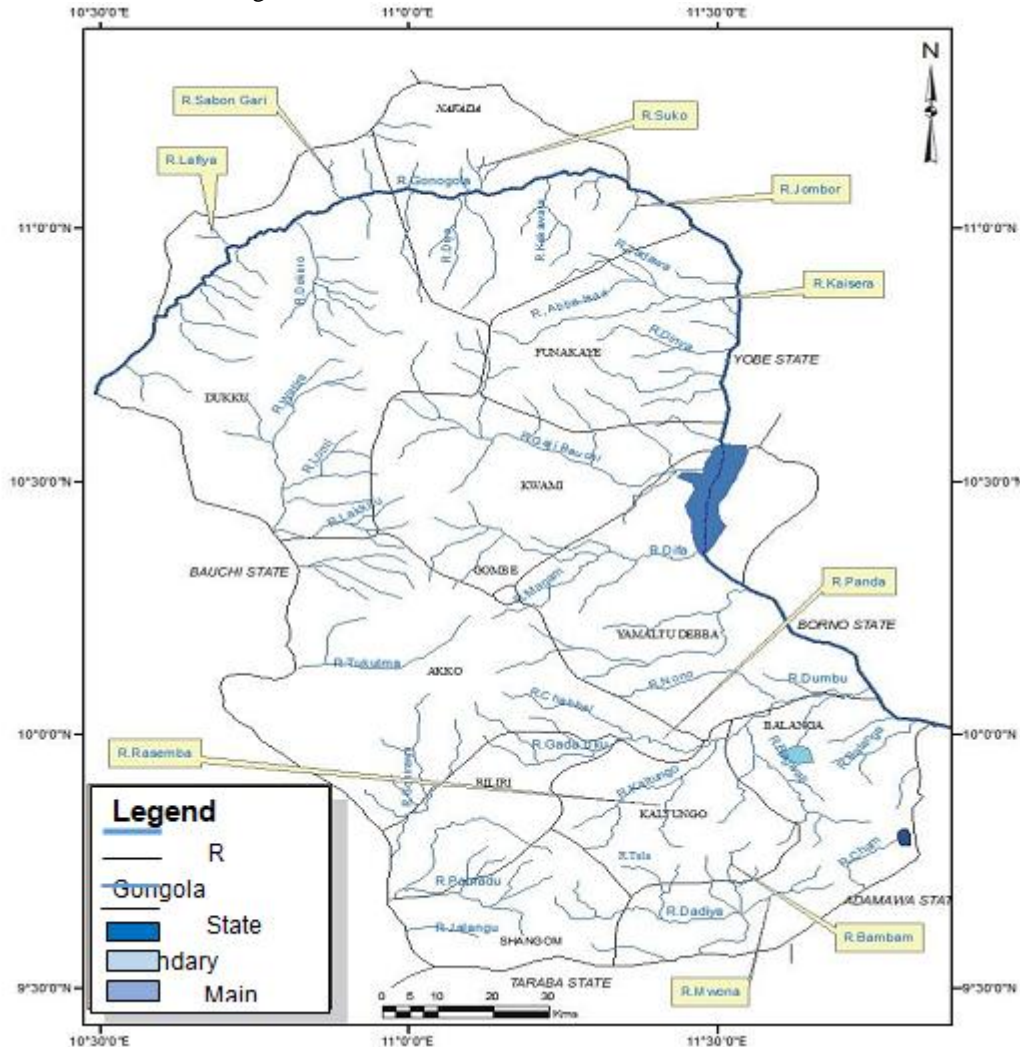


Figure 1: Hydrology map of Gombe Sate, 2018

### 5. Process of Data Collection

For the purpose of this study, a combination of two sampling techniques was selected.

- a) Purposive or judgement selection: The choice of this technique was made bearing in mind that not all localities in the state engage in water management. Furthermore, the number of people in some localities is merger to conduct this type of research. Therefore selection of localities from a compendium of localities in Gombe State was made where a total of 5 localities were selected from each of the 10 local government areas in Gombe state. The author along with research assistants took coordinates of water supply points in 50 selected localities.
- b) The other sampling method adopted was the random selection of respondents for interview and questionnaire

- c) Another type of interview used was the Focus Group Discussions (FGDs) with officials of water agencies and /or community leaders charged with the responsibility of water planning, procurement or supply. Dialogue with senior officials in government ministries, the NGOs, international donor agencies and stakeholders in rural water supply.

## 6. Results and Discussions

### 6.1 An Inventory of Water Supply Sources in the Study Area

The United Nations (UN) and World Health Organisation (WHO) have indicated that water supply is not always commensurate with demand worldwide. In Nigeria, 60% of urban areas have faced low supply of water (ADF, 2007). The rural communities by force of circumstances depend on many sources of water supply because no one source is capable of supplying all their domestic water needs throughout the year. One of the major objectives of this research work is to identify the sources of rural water supply points in Gombe State. The research findings discovered a total of 913 sources of rural water in the 50 communities where the research was conducted. On the average, each

community has 18 water supply points. These sources comprise natural and man-made types. The natural sources include rivers, streams, and shallow wells. The man-made sources include hand pumps, deep boreholes, concrete wells, earth dams, gravity flow, etc. From the 913 sources identified for the study, hand pumps accounted for 45.8% of the supply points, followed by deep boreholes and shallow wells trailing behind with 16.4% and 12.9% respectively. Some 0.8% of the respondents reported that they fetch water from the gravity flow systems. Other 9.3% of the respondents collect their water from earth dams. During FGD made with officials of water agencies as well as in-depth interview with Government officials, service providers and water agencies have at various times installed, constructed, renovated, expanded, reticulated water facilities in order to meet up with the need for water, especially in the rural areas of the state.

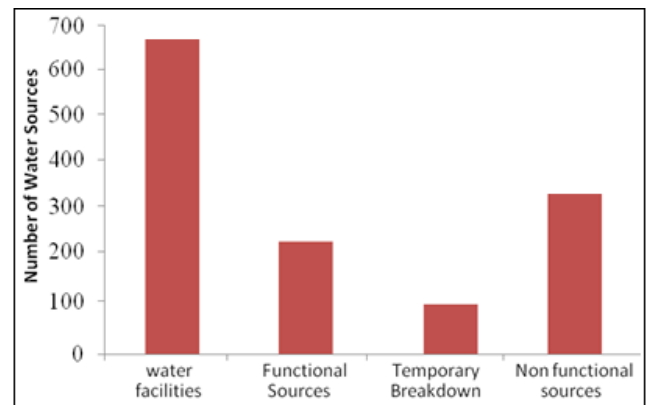
**Table 1:** Inventory of water supply points

LGA	Deep Borehole	Hand Pumps	Streams	Earth Dams	Gravity Flow	Shallow Wells	Others	Total
Akko	8	60	0	12	4	2	0	86
Balanga	14	61	38	0	0	14	0	127
Billiri	8	48	0	8	0	46	0	110
Dukku	12	20	6	20	2	8	0	68
Funakaye	4	50	40	5	0	0	0	99
Kaltungo	20	28	6	18	0	20	0	92
Kwami	20	14	0	18	0	20	3	75
Nafada	40	24	10	2	2	8	0	86
Shongom	18	48	26	2	0	0	0	94
Yamaltu/Deba	6	66	4	0	0	0	0	76
<b>Total</b>	<b>150</b>	<b>419</b>	<b>130</b>	<b>85</b>	<b>8</b>	<b>118</b>	<b>3</b>	<b>913</b>
<b>Percentage</b>	<b>16.4</b>	<b>45.8</b>	<b>14.2</b>	<b>9.3</b>	<b>0.9</b>	<b>13</b>	<b>0.3</b>	<b>100</b>

Despite the number, all communities complained of shortage of water citing dry season, non-functionality of water facilities, temporary breakdown of facilities and long distance being covered to fetch water. It is worth noting that most communities have 3 to 4 sources to fetch from at any time of the season. Furthermore, 62.4% of the respondents said that the water was of good quality and the quantity being fetched was adjudged by 62.3% of respondents to be satisfactory when water systems function and during rainy season.

### 6.2 Functionality of Water Supply Points

Findings from the study during interview show that most water infrastructure were available as claimed by water agencies. The natural sources were at various degrees of dryness. Interview with beneficiaries revealed that 52% of the supply points were not functional, some 14.5% were temporarily down, and 1.8% could not be ascertained (Figure 2). That means only 31% of the sources were functional at time of conducting the study. This scenario put some settlements in dire need of functional sources of water. Water level in shallow wells, streams and earth dams were at all times low as at the time of conducting this research work (March) and rainy season was still ahead by months.



**Figure 2:** Water supply points information, 2018.

### 6.3 Domestic water Requirement and uses in Gombe

According to World Health Organization (WHO), "the basic need for water includes water used for personal hygiene and human welfare. But defining a minimum requirement has limited significance as the volume of water used by households depends on accessibility" (Cristina M, 2015). Access in this regard is defined in terms of basic, intermediate and optimal which distances range from 50-1000 meters from users' dwellings. In the U.S.A for instance, a person uses 80-100 gallons of water for indoor daily use which is obtained through pipes in the houses. In the study area however, water use and accessibility vary with season, location, climate, population density, management practice and functionality of water supply

points. Furthermore, the quantity of water needed for household chores is more than supply as evidenced by section....which shows that only 31% of their water sources are functional at the time of data collection and thus, accessibility in this study is only 31%. In terms of demand, basic water requirements are categorized into four: water for drinking, water for human hygiene, water for sanitation and modest household needs for preparing food (Gleik and IWRA, 1996). Earlier in 1992, Gleik recommended for the adoption of 50 liters per person per day, status and class regardless. However, Nigeria's water and sanitation policy defined access to water supply as the availability of at least 30 liters per person per day of improved water supply form a source within 250 meters of users' dwellings (Nwakwoala, 2011).

Domestic water use according to this work is water that is obtained by the end user from the functional supply points mentioned in (6.2) above for the purpose of household welfare and hygiene and that which is used for both indoors and outdoors. Water used indoors is for drinking, preparing food, bathing, laundering, washing dish, personal belongings and other house items, brushing teeth, flushing the toilet, religious use and mopping. Outdoor uses of water include water use for landscaping, washing cars, swimming pool, watering animals and for gardening.

Research findings indicate that 78% of respondents obtain water for indoor use only, while 22% seek water for both purposes, outdoor being for watering animals. Of all the indoor water use in the study area 62% of respondents affirmed that laundry, bathing and flushing toilet consume the greatest quantity of water per person per day in the household, followed by food processing and cooking at 30%. Drinking, religious, and other cultural chores consume the remaining 8%. Figure 3 is relevant.

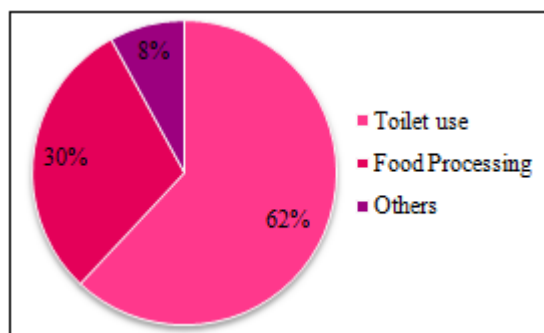


Figure 3: Water quantity and usage

## 7. Conclusion

This work examined the institutional framework for water supply in Gombe state and discovered that there was no institutional arrangement to take stock of surface and underground water resources in the state. Hence the state has no available data as to its surface and underground water resources. The study identified 913 surface and underground sources of domestic water supply points in the study areas. The study further assessed the functionality of the sources of domestic water supply and discovered that only 31% of these sources were functional as at time of conducting the

research. This implies that people are forced to obtain water from few supply points. The study also examined how the water collected from these points is used. Of the water being collected 78% is for indoor use and 12% for outdoor use. Of these quantities, toilet use in form of bathing, flushing and laundry constitutes 62% use of water per person per day, followed by food processing and cooking at 30%. Drinking and other household chores make the least use of water in the study area at 8%. Both the quantity of water that can be accessed and that which is being used by people in the study area, falls short of recommended quantity of water to be accessed and utilized per person per day, based on the WHO and the national water policy.

It is obvious from above that based on the inventory of water resources conducted by this study, and array of problems were identified. The study therefore makes the following recommendations:

## 8. Recommendations

- 1) An urgent need for a state wide inventory of surface and ground water resources of the state.
- 2) Since people get their water from multiple sources, attention needs to be given to the quality of the water points. Clean tap water or well water supply points with minimum health risk must be given priority in supply continuously.
- 3) There is a need to resuscitate other water supply points in order to meet up with the 50 liters per day as recommended by the WHO and other scholars.
- 4) It is hoped that the recommendation given if implemented will assist in water related planning and policies. It will also bring to minimum incessant water scarcity in the study area.

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