

Household Water Conditions in Gombe: A Profile of Water Scarcity in Nassarawo, Palliative and Mitigation Measures

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Abstract

Water is one of the important components that support life on earth. It is so important that it does not have alternative. Water is abundant on the planet earth, but the usable water especially for domestic purpose is limited, therefore making it a scarce resource. This is not unconnected with the uneven distribution of the resource around the globe. This study examines household water condition in Gombe, showing a profile of water scarcity in Nassarawo Community; palliative and mitigation measures being taken. Data describing the inventory of the sources of water in the study area, the functionality of the water point at all times of the year and the natural and anthropogenic factors that promote or hinder the availability of water in the study community were taken. Results obtained and analysed in tabular forms indicate that Gombe State Water Corporation, Ministry of Water Resources and Environment, along with other departments were shouldered with the task of supplying water for all uses. Despite these institutions' efforts and the colossal amount of money being spent to scale up supply, water scarcity remains a problem. Findings revealed that the community is restricted to a very few sources of water supply with water trucks being the major source, followed by rainfall. Thus, water supply in Nassarawo falls short of supply at all times of the year. Findings further reveal that the scarcity is as a result of poor public management system by water institutions, coupled with poor groundwater potentials of the area thereby creating both physical and economic water scarcity. The study calls for invigoration of public water supply institutions to leave up to their mandate and a radical change in behaviour on the use and management of water, and a public participation process where decisions are taken on the basis of bottom-top approach.

Keywords: Water; Scarcity; Households; Mitigation; Nassarawo; Nigeria.

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1. Introduction

Water is a vital resource, absolutely fundamental to life without substitute. It is essential for all aspects of our livelihood, from basic drinking-water to food production and health, from energy production to industrial development, from sustainable management of natural resources to conservation of the environment. Water also has religious and cultural values. Author in [1] also asserted that water is essential for sustenance of life and determines the overall socio-economic development of any nation. Just as man needs water for his various uses, plants and animals behave differently in their need for water. 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 [2]. 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 [3]

As small as fresh water seems to be, globally it is abundant. Enough rain and snow fall on the continent each year to cover the earth's total land area with 83% of water. It is annually reckoned that the volume of fresh water annually renewed by the hydrologic cycle could meet the needs of the world population 5 to 10 times its present size [4]. Fresh water is found on land in two basic forms: as surface water and as ground water. Surface water is liquid water and ice above the ground surface in rivers, lakes, ponds and swamps. It is derived from direct precipitation or from subsurface sources. Ground water is water below the ground surface in a saturated zone below the water table [5].

In many parts of the world however, water supplies are inadequate and dwindling. Freshwater that is safe for drinking and other household uses is a limiting resource and is certain to become even scarcer in the coming century. This assertion was supported by the former United Nations Secretary General, Ban Ki-Moon where he stated that "we live in an increasing water insecure world where demand is often outstripping supply and where water quality often fails to meet minimum standard. Under the current trends, future demand for water will not be met" [6]. All around the world, people spend their precious time and energy, the entire day searching for drinking water. 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 [7]. In a different dimension, regional water sufficiency or otherwise is a function of population size using the water, the demand it places on it and to a large extend, poor management of the sufficient available water resources adopted to manage the water.

According to World Bank report on the international day of Water in 2018, said the number of people with no access to clean drinking water has reached 842 million the report further said that one in every nine person on earth survives without access to clean drinking water [8]. This figure is discouraging, considering the MDG's goal of reducing by half, the population of people without access to drinking water. Whether this figure applies to all urban areas in Nigeria, is open for analysis. Another disturbing scenario was presented by [9] that about 57million people in Nigeria does not have access to clean and safe water. The report called for effective action in order to provide fresh water in the coming century.

Nigeria is a party to the United Nations Declaration of the Right to Water, which entitles everyone living in

Nigeria to sufficient, affordable, safe and acceptable water for personal and domestic uses [10]. Responsibility of water supply in Nigeria is shared between three levels of government – federal, state and local. The federal government is in charge of water resources management; state governments have the primary responsibility for urban water supply; and local governments together with communities are responsible for rural water supply [11]. In Section 20, chapter 11 of the constitution it provides that “the state shall protect and improve the environment and safe- guard the water, air, land, forest and wild life in Nigeria. Therefore, sourcing, producing, supplying and distribution of water fall under the concurrent legislative list under part II of the 1999 constitution. Each federating state is permitted by the constitution to legislate on water matters as it affects such state. Beside the constitution of Federal Republic of Nigeria, there are several federal and state laws and Acts that regulate the supply and usage of water in Nigeria. One of such acts is the various State Water Board Acts. The Act provides that all states in Nigeria should have State Water Board to manage, supervise, and control the use, consumption, maintenance of water and its ancillaries. State Water Boards report directly to the Governors of each state.

In order to live up to the acts establishing Gombe State Water Board, the board started its operations with few boreholes in Gombe city and Mallam Inna, while other rural settlements get their water supply from rivers, streams, earth dams and wells. Gradually more boreholes were sunk, water tankers were purchased and more earth dams were made to improve the supply of safe water to the people. In 1999 Gombe state regional water supply came into existence with a capacity to produce safe water up to 50 million litres per day. The scheme has a provision for expansion to produce 70 million litres per day in the 2025. From 1999 to date various water supply schemes, agencies and parastatals were established with a view to improve water supply to the people in the state. Among the various water agencies and parastatals established are:

- i. Gombe State water Corporation (GSWC)
- ii. Gombe State Agricultural Development project (GSADP)
- iii. Ministry of Water Resources, Town Planning and Environment (MWRTE)
- iv. Water and Sanitation Agency (WATSAN)

Even though these ministries and agencies still exist and are trying to alleviate the problems of water for all users both in rural and urban areas of the state, and while none of them is completely without merit, the truth is that they are yet to have significant solution to the much needed sustainable water supply in Gombe. Their services are unreliable, intermittent, and inaccessible in many places, giving raise to patronising supplementary sources which are often unsafe for consumption because they contain pathogens which are liable to cause diseases such as dysentery, diarrhoea, and typhoid.

Nassarawo settlement in Gombe city was chosen as a case study because it has all the features of household water conditions in Gombe. Moreover, it is important to note, that most of the challenges facing people in accessing water in Gombe are related and similar to that of Nassarawo settlement, though magnitude of impacts varies. Studies have been carried out in many parts of Nigeria, mainly to assess water scarcity and the attendant consequences. Reference [12], analysed water quantity and quality in the Guinea savannah region of Bauchi state. Reference [13] assesses domestic water supply in Ugbokolo community, Reference [14] observed the

residents coping strategies with water scarcity in Makurdi town, Nigeria. The common findings about these studies established that water is scarce in those areas and there are attendant consequences following the scarcity.

2. Aim and Objectives

There has been little or no literature that extensively studied the household water conditions in Gombe, coping strategy and people's palliation to the scarcity. This study therefore, aimed at extensive study of households water conditions of houses in Nassarawo settlement in Gombe. This can be achieved through the following objectives:

- (i) To identify sources of domestic water supply.
- (ii) To determine the adequacy or otherwise of water supplied by the sources identified in (i) above.
- (iii) To investigate the type and causes of domestic water scarcity if there is any.
- (iv) To explore the mitigation strategies adopted in face of the scarcity.

The findings of the study will unfold the true nature of household water conditions in Gombe city, which may be different from political statements made by policy makers in whose domain water supply policy lay. The study will also recommend additional ways to curb the problem of water shortage which if adopted by stakeholders in water issues, will bring the suffering of the affected people to the barest minimum.

3. Literature Review

Water is a valuable natural resource, very important for social and economic development, and the environment. When it is too much or too little, it can bring destruction, misery and death. Irrespective of how it occurs if properly managed, it can be an instrument for economic survival and growth [15]. Water is essential for all aspects of our livelihood, from energy production to industrial development, from agriculture to sustainable management of natural resources to conservation of the environment. Reference [16] Asserted that water is essential for sustenance of life and determines the overall socio-economic development of any nation. Unfortunately, water is becoming scare in many areas and regions of the earth.

Scarcity is an imbalance between demand and availability. Reference [17] defined water scarcity as an imbalance of supply and demand under prevailing institutional arrangements and/or prices; an excess of demand over available supply; a high rate of utilization compared with available supply, especially if the remaining supply potential is difficult or costly to tap. It exists when the demand for water exceeds supply [18]. The United Nations department of economic social affairs defines water scarcity as the point at which the aggregate impact of all users impinges on supply or quality of water under prevailing institutional arrangements to the extent that demand by all sectors, including the environment cannot be satisfied fully [19]. Looking at the population-water equation, hydrologists qualify water scarcity to occur when annual water supply develops below 1,700 m³ per person. When annual water supplies drop below 1,000m³ per person, the population faces water scarcity and below 500m³ absolute scarcity [20]. For the purpose of this study, water scarcity is defined as a gap between available supply and expressed demand of freshwater in a specified domain, under prevailing

institutional arrangements (including both resource ‘pricing’ and retail charging arrangements) and infrastructural conditions.

Water scarcity involves water shortage, water stress and water crisis. Water shortage results from climate change such as altered weather patterns. Climate change results in drought, floods, and water pollution. Increased human demand as a result of population increase or industrialization and over use of water also causes water shortage [21].

Water stress is a term which refers to a situation where a region consume more than their annual renewable supply, usually by pumping ground water faster than it is replenish by rainfall[22]. A relatively new concept defined water stress as difficulty in obtaining sources of fresh water for use during a period of time; it may result in further depletion and deterioration of available water resources [23]. Water crisis arises when there is not enough potable water for a given population. It manifest when ground water is excessively over drawn leading less amount of water per person per day. Water crisis is when people in a certain country or region could not afford to draw just enough amount of water they ought to use per day. The term also labels a situation where the available potable, unpolluted water within a region is less than that region's demand [24].

However, one defines water scarcity; it most revolves around the lack of enough safe water for the use at hand (quantity). Safe water in this context is taken to mean water that is of sufficient quantity to meet all domestic needs, that is available continuously and afford to all people. Water scarcity affects every continent. Around 1.2million people, or almost one fifth of world’s population live in areas of physical scarcity and around 500 million people are approaching this situation. Another 1.6billion people, or almost one quarter of the world population face economic water shortage [25].

Based on prior work by author at [26] as mentioned in FAO report 38, Water scarcity comes in two manifestations; physical water scarcity and economic water scarcity; physical water scarcity occurs when there isn’t enough water to meet demand, including the water needed to fulfil the demand of ecosystem to function effectively. Economic water scarcity refers to a situation where there is not enough human, institutional and financial capital to facilitate access to water even though the water is naturally available to meet human demand. It is a largely caused by lack of investment in managing water resources or insufficient human capacity to satisfy the demand of water [27].

According to UNDP, economic water scarcity is often the cause of countries or regions experiencing water scarcity as there is enough water worldwide to meet household, industrial, and environmental needs, but regions lack the means to provide it in an assessable manner [28] Mitigation strategy in face of water scarcity involves employing diverse measures or techniques to meet the water needs of the people or minimise the hardship that may arise as a result of total lack of water. Some of the strategies adopted in many places include dredging of hand dug well to obtain water, walk or driving long distances, storing water in big containers, and rain water harvesting, among other measures.

However, a report indicated that “there is enough water for everyone” and water insufficiency is often due to

mismanagement, corruption, lack of appropriate institutions, bureaucratic inertia and a shortage of investment in both human and capacity and physical infrastructure.

4. Materials and Methods

4.1 Description of the Study Area

Gombe town is located between latitudes $10^{\circ} 15'N$ to $10^{\circ} 20'N$ and longitudes $11^{\circ}10'E$ and $11^{\circ} 19'E$. It shares common boundary with Akko LGA in the South and West; Yamaltu-Deba to the East and Kwami to the North. It is the capital of Gombe State and occupied an area of about 45km^2 [29]. The climate of Gombe is characterized by a dry season of six months, alternating with a six months rainy season. As in other parts of the Nigerian Savannah this precipitation distribution is mainly triggered by a seasonal shift of the Inter -Tropical Convergence Zone (ITCZ). The mean annual precipitation is 835 mm and the mean annual temperature is about 26°C whereas relative humidity has same pattern being 94% in August and dropping to less than 10% during the harmattan period [30].

4.2 Data collection and analysis

The data required for this study involved the collection of the following sets of data:

1. Data describing the inventory of the sources of water in the study area. The data defines and describe water supply points for domestic uses of the community. Information on this data was obtained from map of Gombe town, hand held GPS, the internet, reconnaissance, fieldwork, and interview conducted with respondents during data collection exercise.
2. Data describing the functionality of the water point at all times of the year. Information on this was obtained from observations made during reconnaissance, on the spot assessment of the sources during data collection and during interview with respondents.
3. Data describing the natural and anthropogenic factors that promote or hinder the availability of water in the study community. Information on this data was obtained from the literature, borehole pre-drilling investigation reports and respondents interviews.

The major materials used for this study were maps of Gombe town, the internet, books, journals, borehole pre-drilling investigation reports hand held GPS, GIS, reconnaissance, and questionnaire. The first five materials were the secondary sources and the later were the primary sources of data used for this study. The GPS was use to obtained coordinates of water points within the study area; the GIS was used to assemble, store, manipulate, analyse and display the referenced information obtained from the GPS; the reconnaissance was undertaken to get familiar with the study area, establish data collection plan, and solve any problem that may arise in the course of data collection; the questionnaire was designed to get information on socio-demographic characteristics of the study respondents, their sources of water, functionality, quantity obtained from the sources, distance covered, amount of money spent too get a certain quantity of water (supply), and quantity of water needed (demand) to satisfy their need. A total of 250 pieces questionnaire were administered randomly by the researcher along with two research assistants. However 245 of these were valid for analysis. The results

were presented using descriptive statistics, the GIS, Likert scale and pre-drilling borehole investigation report.

5. Results and discussion

5.1 Demographic Data

Demographic data was obtained from head of households in houses that were selected at random.

Data collected include names of head of households, age, sex, ethnicity, education, occupation, number of residents in each household and gender. Table 1 below shows that vital statistics of this study.

Table 1: Demographic Characteristics of respondents

Gender	Frequency	Percentage	Education	Frequency	Percentage
Male	201	82	non formal	84	34.2
Female	44	17.9	primary	77	31.4
			secondary	60	24.4
			tertiary	24	9.9
Marital status			Income (N/month)		
Married	98	40	< 18,000	80	32.6
Single	36	14.7	19,000-50,000	101	41.2
Others	11	4.5	51,000-100,000	56	22.9
			>100,000	8	3.3
Age distribution			Family size		
<30	14	5.7	2-5	27	11.0
31-40	74	30.2	6-10	191	78
41-50	92	37.6	11-16	27	11.0
51-59	53	21.6	>16	0	0
>60	12	5.0			

Source: Author's fieldwork, 2017

5.2 Sources of water 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 [31]. The study area by force of circumstance depends on very few sources of water which are incapable of supplying their water needs throughout the year.

This work, among other objectives, seeks to identify these sources of water upon which Nassarawo community get their domestic water supply. The sources include, natural and man-made sources.

The natural sources are rainfall, and stream, while the man-made sources are hand pumps, water trucks and others. Table 2 below shows these sources and their patronage during rainy and dry season.

Table 2: Inventory of water sources

Sources	Rainy season		Dry season	
	frequency	Percentage	Frequency	Percentage
Rainfall	201	82	31	12.7
Stream	12	5	18	7.3
Stand pipes	49	20	51	21
Water trucks	34	14	211	86.1
Other sources	3	1.2	3	1.2

Source: Author’s fieldwork, 2017

From the sources of water identified, 82% of households obtain their water from rainfall during rainy season. During this period, shallow wells, pit latrines, and ‘soak away’ are full, such that people use cups and buckets to obtain water from them with ease. During dry season, 13% of respondents who have large reservoirs continue to use rain water they reserved for up to 3-4 months after rain ceases to fall. Stand pipes supply a little above 20% of respondents water supply during both seasons. The stand pipes were installed and are being managed by GSWC. Despite increase in population and break down of water infrastructure in the community, GSWC has made little effort to expand coverage to match current water needs, and broken water pipes have not been repaired. Water trucking by commercial water vendors accounts for 14% of respondents’ source of water during rainy season. During dry season, especially from January, more than 86% of respondents get their water supply from vendors selling in trucks. Stream and other sources, especially sachet and bottle water account for a small portion of households’ water supply in the study community. It is worth noting that respondents patronize all sources at any time to meet up their water requirements.

Tight to these sources of water are, the functionality of the sources, the quality of water, distance covered and time taken to obtain water. At the time of data collection (January, 2018), it was discovered that only 13% of respondents with large reservoirs still use rain water. Some 7% of the respondents scoop sand on the stream bed to obtain water. Street and house tap water sources are rationed. This had tremendous effects on people as daily routine are altered whenever there is tap supply. Reconnaissance reveals that, areas with broken pipes, new residential areas and residences that are located on higher areas failed to get water even when water are allocated to the taps. In terms of quality, rain, trucks and tap water if collected and saved in clean containers are adjudged to be good for consumption, but water from streams are mostly used for household washing. Distance covered to obtain water limits the quantity household can fetch. Once the distance taken to fetch water exceeds 5 minute or 100 metres, the quantity of water collected decreases significantly (Cairncross & Fetchem, 1993). This work discovered that water trucks deliver door to door service; hence households get water at their door

steps. Tap water is usually patronized by those living close to street stand pipes and those with reticulation in their houses, and so it does not require long distance to get water. 92% of respondents however, revealed that it was only during rainy season, when all sources are available that their water needs are partially met.

5.3 Quantity of Water Available to Respondents

In most communities in Nigeria, the quantity of water needed for household chores is more than supply [32]. The national water and sanitation policy defined access to water supply as the availability of at least 30 litres per person per day of improved water supply from a source within 250 metres of users' dwellings [33]. Improved water here is taken to mean water that is obtained from household tap connection, public stand pipe, bore hole, protected spring or well and rain water. However, the daily per capita consumption of water in Nigeria varies from 10- 27 litres. The situation in the study area, fall short of nationally recommended minimum per person as presented in table 3 below.

Table 3: Household water demand and supply

Quantity obtained (litres)	Frequency	Percentage
100-150	17	7
151-200	42	17.1
201-250	83	33.8
251-300	43	17.5
301-350	28	11
>350		
Total	245	100

Source: Author's fieldwork, 2017

The findings of this study showed that most of the households (33.8%) have daily per capita household water use between 251 liters to 300 liters (Table 3) and further 17.5% have between 301 to 350 liters per day. The average household size of 12 persons from the sampled households in the study area implies that average water availability and use within the area is about 15 liters per capita per day which meet only half of the minimum criterion for water supply of 30 liters per capita per day and far less than the average in most parts of Europe, for instance, Denmark use an average of 100 liters per person per day, France, 110 liters per person per day, Germany, 125 liters per person per day and in Britain, 150 liters per person per day [34]. Even though hand-washing and basic food hygiene may be possible at 15 liters per capita per day, laundry and bathing may be difficult. This shortfall is due to limited sources of water available in the study area. This is evident from section 4.2 which shows only 4 sources of water from which the community is restricted to obtain water.

5.4 Respondents' perception of the causes of Water Scarcity in Nassarawo Community

Generally, the causes of water scarcity are categorized according to physical and economic water scarcity. The physical factors may be as a result of drought, position of a place, and unavailability of underground water. Economic water scarcity results from poor management of the sufficient available water resources. This work investigates the types and causes of water scarcity in Nassarawo and table 4 below shows the result obtained on the household perception on the matter.

Table 4: Household perception of the causes of water scarcity

Causes	Strongly agree	Agree	Disagree	Strongly disagree
Drought	3 (1.2%)	20 (8.1%)	71 (28.9%)	151 (61.6%)
Poor groundwater potential	164 (66.9%)	51 (20.8%)	11 (4.4%)	9 (3.6%)
low level of income	41 (16.7%)	135 (55.1%)	38 (15.5%)	31 (12.6%)
Population increase	53 (21.6%)	48 (19.5%)	81 (33.1%)	63 (25.7%)
Poor public water management system	83 (74.6%)	31 (12.6%)	17 (6.9%)	14 (5.7%)
Low storage facility	31 (12.6%)	49 (20%)	120 (48.9%)	45 (18.3%)

Source: Author’s fieldwork, 2017

Most of the respondents, 83 of 245 (74.6%) are of the opinion that, poor public water management system by GSWC is the main reason for water scarcity in the study area, coupled with poor groundwater potential at 66.9% of respondents’ perception (Table 4). The other reasons why water is scarce according to the respondents are: population increase (21.6%), low level of income (16.7%), drought (8.1%) and low storage facility at (20%).

6. Reasons for Water Scarcity in Nassarawo Community

Both physical and economic types of water scarcity are found to be the causes why Nassarawo community in Gombe faces water scarcity. In terms of physical scarcity, borehole pre-drilling geophysical survey carried out by Gombe State Fadama III reports that Nassarawo lies within the Pindiga formation which is located in the northern part of Gongola basin within the upper Benue trough. The report further clarify that the area is of cretaceous sediment and in the sedimentary formation, the lithology types found were shale imbedded by limestone, shale, thin limestone of >30m thick intercalation and siltstone beds. Using Electrical Resistivity Survey, at four locations (Behind Emir’s palace, Dan Madami’s mosque, Nassarawo A and Maternity), the survey revealed that at 175m and >85m in the locations above, no water level was found. The conclusion arrived at was that the area has very poor groundwater potentials. This finding supports earlier respondents’ claim that poor groundwater potential is a major reason of water scarcity in Nassarawo (table 4).

In terms of economic water scarcity, the community was linked with Gombe Regional water scheme in 1999, which supplies water from Dadin Kowa dam. However, in 2016 during township road construction projects in

the area, major pipes that supply the community with regional water were dislodged. Though some pipes have been restored, a large part of the community, especially the eastern part, with large number of people and vast land for potential development have been cut off from the regional water supply which serves as their major source of water. Another reason that causes economic water scarcity in the study area is broken water pipes. Areas that get water from the regional water scheme battle with broken pipes and spoilt stand pipes that supply water to the streets. Water rationing and poor reticulation and system expansion have also been attributed to poor public water system management that causes economic water scarcity in Nassarawo community.

Form the above findings; it is clear that Nassarawo community in Gombe town suffers from both physical and economic water scarcity. Consultant’s investigation revealed poor groundwater potential which renders the sinking of borehole and construction of wells poor options to provide water, while poverty, poor system maintenance and lack of public participation in managing water infrastructure further compound the situation.

7. Strategies used by respondents to cope with water scarcity

Having established the causes of water scarcity in Nassarawo community, it is worth noting that these causes cannot be solved over night. Hence, people device various mitigation methods to cushion the effects. Table 5 below shows respondents’ strategies used in Nassarawo community in Gombe.

Table 5: Mitigation strategies for water scarcity in Nassarawo community

Rain water harvesting	Buying from trucks at 4am	Minimizing water use	Water reuse	Storing water in big containers	Scooping water from stream bed	Buying from sales points
191	101	237	174	213	24	109
78%	41%	97%	71%	87%	10%	45%

Source: Author’s fieldwork, 2017

The results from the above table reveal that 97% of respondents minimize the use of water in their domestic chores. Methods used include using small quantity of water for bathing, washing clothes once a week, buying non-white clothes, digging of pit latrines, etc. The ultimate source of all natural potable water is rain. Therefore, during rainy season, water supply improves so also people maximize their use of water. Another important measure taken by 78% of respondents is a technique of collecting, filtering and storing of rainwater for later use in the household- otherwise known as rain water harvesting. This strategy has gained importance worldwide especially in areas that are prone to water scarcity. It has also been established earlier in this study that 82% of respondents affirmed to collecting rain water to use it later when rain stops falling. Additional 12.7% uses rain water, four months after rain ceases to fall.

Some 71% of respondents mitigate water scarcity through water re-use. This is done by washing several clothes with a certain quantity of water depending on their dirt, color and importance. Dirty water from washing clothes is reused to flush toilets, irrigate garden plants. Water is reused by adding alum substance, when the dirt settles; the clean water is used for animals' consumption, car wash and buildings. People buy and store water in large containers to avert scarcity. Study findings indicate that 87% of households in the study area have large containers from which they store water they buy from trucks, many (41%) as early as 4am. Other mitigation strategy employed by respondents are buying water from sales points (45%) and scooping water from stream beds (10%). The study further observed that people use combination of the aforementioned strategies to mitigate water scarcity; yet, their water needs are hardly met.

8. Conclusion and Recommendations

This work established a water scarcity situation in Nassarawo community that is rarely found in many settlements. The situation is such the study area is faced with both physical and economic types of water scarcity. Hence, the area is engulfed in water crisis and its attendant consequences. The household water situation in Nassarawo is so precarious that residents' efforts to mitigate the effect are not solving the problem.

To ensure reliable source of water for the area, it is essential to innovate ways to improve water supply. Since it was established that the area has poor groundwater potential, regional water supply from Dadin Kowa dam has become the immediate alternative. Moreover, as recommended by authors at [35], it is recommended to i) Improving service initial coverage to newly constructed residents, ii) Extension of service coverage to 100% of the population in the year 2020; iii) deploy public service trucks to supply areas that cannot be reached by pipes; iv) Sustain 100% full coverage of water supply and wastewater service for the growing population beyond the year 2020.

Other palliative measures centred on the people should be on enlightening the people toward recognizing the social, environmental and economic values of water; a radical change in behaviour on the use and management of water, and a public participation process where decisions are taken on the bases of bottom-top approach.

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