

ASSESSMENT OF THE GEOGRAPHIC DISTRIBUTION OF WATER FACILITIES AND THEIR CONDITION IN SABON WUSE, NIGER STATE NIGERIA.

UMARU E. T.¹, EBEHIKHALU N. O.², UJAH A. I.¹ & YISA M. K.³

¹Department of Urban and Regional Planning, Federal University of Technology, Minna, Niger State. ²Department of Geography and Environmental Management, University of Abuja, Abuja. ³Centre for Human Settlements and Urban Development, Federal University of Technology, Minna, Niger State

Abstract

Globally, there has been an increase in water demand by about 2.4% per annum since the 1970s in most of the cities of the world. This increase in the demand for water is connected to the urbanization process every city in the world is experiencing. The sustainability of improved drinking water sources is often compromised by a lack of technical skills, equipment or spare parts for operation and maintenance, and a lack of sustained financing mechanisms for requirement costs as well as rehabilitation of the existing service provision. Sabon Wuse is also experiencing inadequate supply of clean water; the available facilities are not well maintained and they are not easily accessible to the inhabitants of the community. This paper seeks to assess the geographic distribution of water facilities and its conditions in Sabon Wuse. Questionnaires were used to get information about the accessibility from the water source, condition of the water facilities, routine maintenance of public water facilities, sufficiency of public water facilities and proximity to public water facilities. Hand held GPS was used to obtain co-ordinates of the water facilities in the study area for the purpose of knowing the geographic structure of the distribution. Descriptive statistics was used to analyse the data and buffer analysis was used through the ArcGIS 10.3 to create a buffer for each point of the water source. The results revealed the various water source points and their condition. The condition of the facilities was further asked to the respondents. 67% of the respondents opined that the conditions of the water facilities are bad. The buffer analysis result revealed that there is a high proportion of overlapping between the water facilities, meaning that the facilities are clustered and are unevenly distributed within the study area. The study recommends that there should be revival of water facilities that are non-functional as this will go a long way in complementing the existing ones and further ease the problem of water inadequacy; furthermore, the facilities should be centrally located to residents for easy accessibility.

Keywords: Distribution, Facilities, Geographic, Proximity, Water

Introduction

According to Yewondwossen (2012), out of all the public infrastructures and services, water is the most important. It is the most indispensable necessity of life after oxygen. Anything that disturbs the provision and supply of water therefore tends to disrupt the very existence of humanity. It is a basic need for human beings' welfare. Adequate domestic water supply is an entry point to sustainable development, however, in most

developing countries, limited access associated with poor water supply, hygiene and sanitation is widening the poverty gap (Gender and Water Alliance, 2006).

Global water service is emerging as one of the highest priorities on the development agenda. This is evidenced by several efforts to assess the present condition of the resource. There has an increase in the global water demand by roughly 2.4% per annum since the 1970s (Yewondwossen, 2012). The

Assessment of the Geographic Distribution of Water Facilities and their Condition in Sabon Wuse, Niger State Nigeria.

sustainability of improved drinking water sources is often compromised by a lack of technical skills, equipment or spare parts for operation and maintenance, and a lack of sustained financing mechanisms for requirement costs as well as rehabilitation of the existing service provision (Medhin, 2006).

As stated by the United National Development Program (UNDP, 2006), a good number of the World population's sourced drinking water from the unimproved sources, and in many developing areas, progress in expanding clean water coverage is modest. Moreover, access to and use of safe drinking water can make an immense contribution to health, productivity, and social development. However, many people in developing countries continue to rely on unimproved water sources. For example, in sub-Saharan Africa, for instance, the proportion of the population that depends on unimproved sources has declined only slightly, from 52 percent in 1990 to 44 percent in 2004 (UNDP, 2006). Water shortages and lack of access may limit economic growth in the years to come, according to the 2016 United Nations world water development report.

Rapid urbanization with industrialization has brought many development opportunities for developing countries urban residents, but besides this opportunity numerous social problems have been observed. Uncontrolled and unregulated urban physical expansion created crises on the existing poor social services. The high density development needs efficient public service delivery because high concentration of people leads to a public health risk (Burke, 1970). In these high density areas, the low income residents are living without most basic water and sanitation service. Rapid urbanization has generally outstripped the provision of basic services such as water. (Foster and Chilton, 2003). The basic service such as water has been stressed

due to the explosive demand growth and increasing population densities (Vairavamoorthy *et al*, 2008).

Nigeria is endowed with water resources having surface water and groundwater potential but access to water is limited due to physical and socio-economic constraints. Therefore, uneven spatial and temporal occurrences affect distribution of water services because of climate variability and demand particularly the drinking water, which is tied to high level of urbanization and development, population distribution, per capita consumption and socio-economic factor (Foster and Chilton, 2003) This situation was increasingly intensified by the mismanagement that also brings conflicts and increases tensions in urban areas, keeping in view the importance of supply and consumption of water for domestic uses.

The current and envisaged problems of water supply in Nigerian communities are enormous and include growth of slums, poor level of service, poor and inadequate reticulation network, high level of distribution losses, increasing level of poverty, pollution, inadequate monitoring of water-related projects, poor quality control, water-related diseases, energy generation and capacity building. Likewise, the funding, management and efficient running of water services, as well as the need to find infrastructural solutions that are environmentally sustainable remains an uphill but surmountable task (Anselm, 2010). According to Kehinde and Longe (2003), the water supply sector has been bedeviled by problems such as inadequate infrastructure for water treatment and distribution, ageing and corroded pipe network, booster stations, unplanned extensions, non-availability of maintenance and repair services and poor staffing and capacity building. The other issue inviting attention in water supply sector in Nigeria in general is deficiency of physical

infrastructure as well as inadequate management capacity to handle policy and regulatory issue and to plan, operate and maintain the service. Such inadequate supply, together with inequitable distribution system and low quality of water influence the well-being of people in the area particularly and the socio-economic condition of urban area as whole (Bamgbose *et al.*, 2000)

StudyArea

Sabon Wuse is a settlement located in Tafa Local Government Area, Niger State. It lies between latitude $90^{\circ}18'55.54''N$ and $90^{\circ}18'30.64''N$ and on longitude $70^{\circ}14'39.35''E$ and $70^{\circ}15'11.26''E$ on the northern fringe and on latitude $90^{\circ}17'28.40''N$ and $90^{\circ}17'51.23''N$ and longitude $70^{\circ}14'20.42''E$ and $70^{\circ}13'41.80''E$ in the southern fringe. It covers a land area of about 459.1 hectares i.e. $4591000m^2$. Sabon Wuse consists of two political districts: Wuse East and Wuse West, it has six traditional districts, each headed by a district head, they are; Aso, Mabushi, Katampe, Hayi, Karon-majigi and Wuse district.

Sabon Wuse is a settlement that lies along the main arterial road linking Abuja and Kaduna town. It is a settlement developed to

accommodate the displaced people for the development of the Federal Capital, Abuja. The town acts as the absorbing town for the spill population of the Federal Capital, as accommodation is cheaper compared to that of the Federal Capital Territory. Life in Sabon Wuse is cheaper, food items are not expensive, couple with the fact that cost of rent age (accommodation) is cheaper, and this in turn brings about influx of people into the town for the purpose of resettlement. The distance between Sabon Wuse and the heart of Abuja as the crow flies is 61.87 Km and the distance between Sabon Wuse and the heart of Kaduna as the crow flies is 146.48 Km. The natives of Sabon Wuse are predominantly farmers and its proximity to Federal Capital is changing the face of occupation in the city as many civil servants find it easy for cheaper accommodation.

The developed land in Sabon Wuse covers about 459.1 Hectares (this is about 45.0%) of the total land area for the resettlement scheme of Sabon Wuse. The major land use types in Sabon Wuse include: Residential, Commercial, Industrial, Public and Vacant lands.

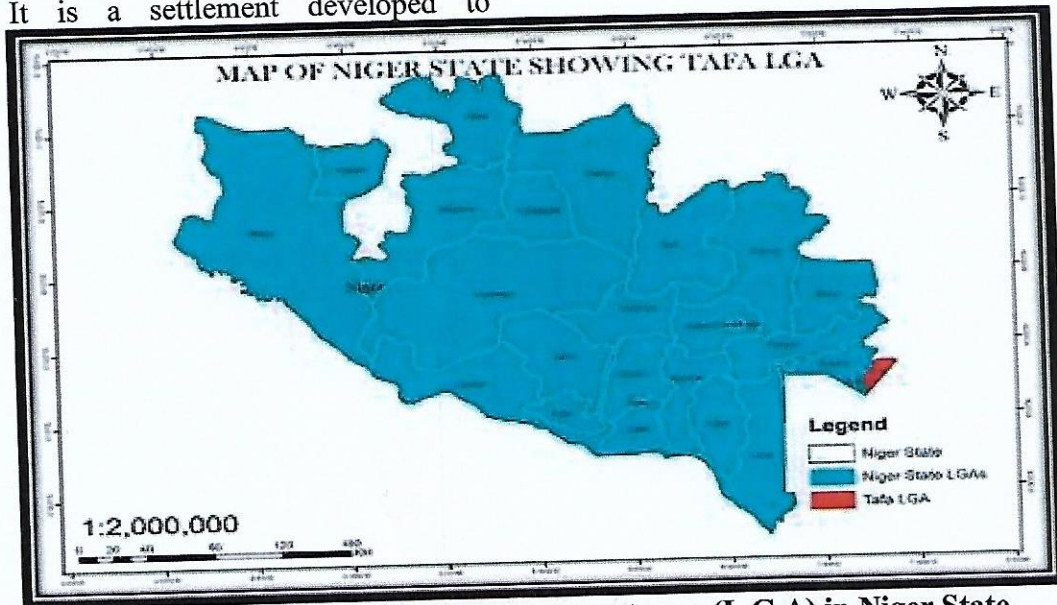


Figure 1.1 Location of Tafa local government area (L.G.A) in Niger State
 Source: Department of Urban Regional Planning

Sabon study of people Feder with seekin rent). the co impro water of the simila where been exper safe from and t town inade contr degra

Assessment of the Geographic Distribution of Water Facilities and their Condition in Sabon Wuse, Niger State Nigeria.

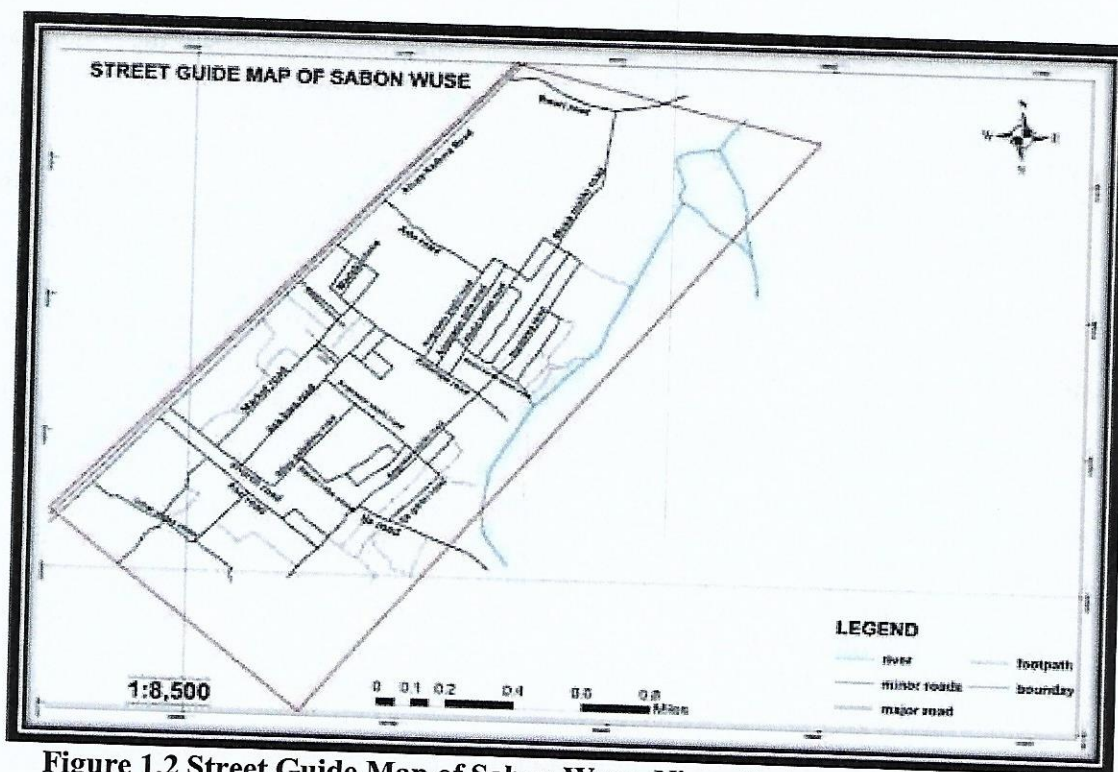


Figure 1.2 Street Guide Map of Sabon Wuse, Niger State.
Source: Department of Urban Regional Planning

Sabon Wuse town, the study area for this study has been experiencing a steady growth of population due to the displacement of people as result of the development of the Federal Capital Territory (FCT) Abuja and with the emergence of migrants who are seeking a cheaper accommodation (cost of rent). The rapid spatial expansion going on in the community needs a suitable action plan to improve their urban infrastructure particularly water supply (Sulyman, 2014). The situation of the water supply in Sabon Wuse is very similar to that of other developing countries, where water supply situation in the town have been deteriorating. The inhabitants have been experiencing the problem of inadequate and safe water supply. They source their water from the nearby rivers, streams, water vendor and traditional wells since the inception of the town. The problems associated with inadequate water supply services in this town contribute to urban environmental degradation and cause public health

problems. Hence, the problem of water supply in Sabon Wuse town is not only the problem of adequacy and quality but also it has been the problem of distribution and reliability. Therefore, the paper seeks to assess the spatial distribution of water facilities and the condition of the facilities in Sabon Wuse community.

Methodology

To acquire adequate data from the chosen sources, the following data gathering instrument were utilized which incorporate questionnaire, field observation, and map. The questionnaires were the major tool for data collection. The following instruments were used for gathering data:

- **Questionnaire:** This is the use of listed questions designed to obtain information from respondents by ticking/filling in the appropriate answers from the options or space provided. the questionnaire was

mainly for the inhabitants of the study area. The questionnaires were being prepared to ask questions on socio-economic and demographics of the household as well as the sources of water in the area, accessibility from the water source, condition of the water facilities, routine maintenance of public water facilities, sufficiency of public water facilities, proximity to public water facilities.

- **Field observation:** this involved personal observation of phenomenon and process in order to describe them, it also involved site assessment.
- **Map:** This is an instrument that shows the description and spatial distribution of the facilities.
- **Global positioning system (GPS):** GPS was used to obtain co-ordinates of the water facilities on the study area.

- **Sampling Size:** Sabon Wuse had a population of 3,250 as at the 1991 national census, the population projected to date, which is 12,167. The sample size was generated using Abraham and Rusell (2008) formula for sample size, the sample size of Sabon Wuse was gotten as 333..

Method of Data Presentation and Analysis

The technique used in data analysis was descriptive statistical method which includes the use of tables and maps. This is so in light of the fact that information broken down in tables and maps give exact information and guarantee faster understanding and clarifies the data. Furthermore, buffer analysis was conducted for the various water sources in the study area using the spatial analysis tool in the ArcGIS software.

Results and Discussions

Identifying the Spatial Distribution of Public Water Facilities

Table 1: location, type of water facility and coordinates of water facilities

S/N	Location	Types of Water Facility	Coordinates	
			X	Y
1	Aso	Borehole	1028157	0306841
2	Aso	Overhead Tank	1028329	0306790
3	Aso	Borehole	1028401	0306834
4	Aso	Borehole	1028588	0306934
5	Aso	Borehole	1028558	0306809
6	Anguwan Yashi	Borehole	1029176	0306875
7	Anguwan Yashi	Borehole	1029229	0306812
8	Anguwan Yashi	Borehole	1029352	0306902
9	Sabon Pegi	Borehole	1029410	0307048

*Assessment of the Geographic Distribution of Water Facilities and their Condition in Sabon Wuse,
Niger State Nigeria.*

10	Anguwan Hausawa	Borehole	1029379	0306613
11	Anguwan Hausawa	Borehole	1029182	0306611
12	Anguwan Hausawa	Borehole	1029234	0306546
13	Anguwan Yashi	Overhead Tank	1029077	0306705
14	New Wuse	Borehole	1028950	0306465
15	New Wuse	Borehole	1028920	0306536
16	Anguwan Sama	Borehole	1028826	0306548
17	New Wuse	Borehole	1028692	0306374
18	Katampe	Borehole	1028692	0305939
19	Anguwan Karu	Borehole	1028224	0306212
20	Anguwan Karu	Borehole	1028139	0306136
21	Aso	Borehole	1028379	0306592
22	J.s.s Aso	Borehole	1028509	0306628
23	Aso	Borehole	1028596	0306518
24	Aso	Borehole	1028464	0306387
25	Aso	Overhead Tank	1028493	0306210
26	Katampe	Borehole	1028485	0305905
27	Aso	Reinforced Concrete Reservoir	1028485	0305654
28	New Wuse	Borehole	1029301	0306577
29	Karon Magiji	Well	1029385	0307110
30	Karon Magiji	Well	1028997	0306651
31	Katampe	Well	1028763	0306894

Source: Field Survey, 2018.

Table 1 above shows the location, type of water facility and the coordinates of every water facility in the study area. Furthermore, data on the coordinates was used to create a point map showing the spatial distribution of public water facilities across the study area. Figure 3 shows the spatial distribution of public water facilities in the study area with

blue dots representing manual boreholes, green dots representing public well, purple dots representing overhead tanks and orange dots representing a reservoir which is still under construction. It also indicates the exact location of the facility on the ground and the names of each facility.

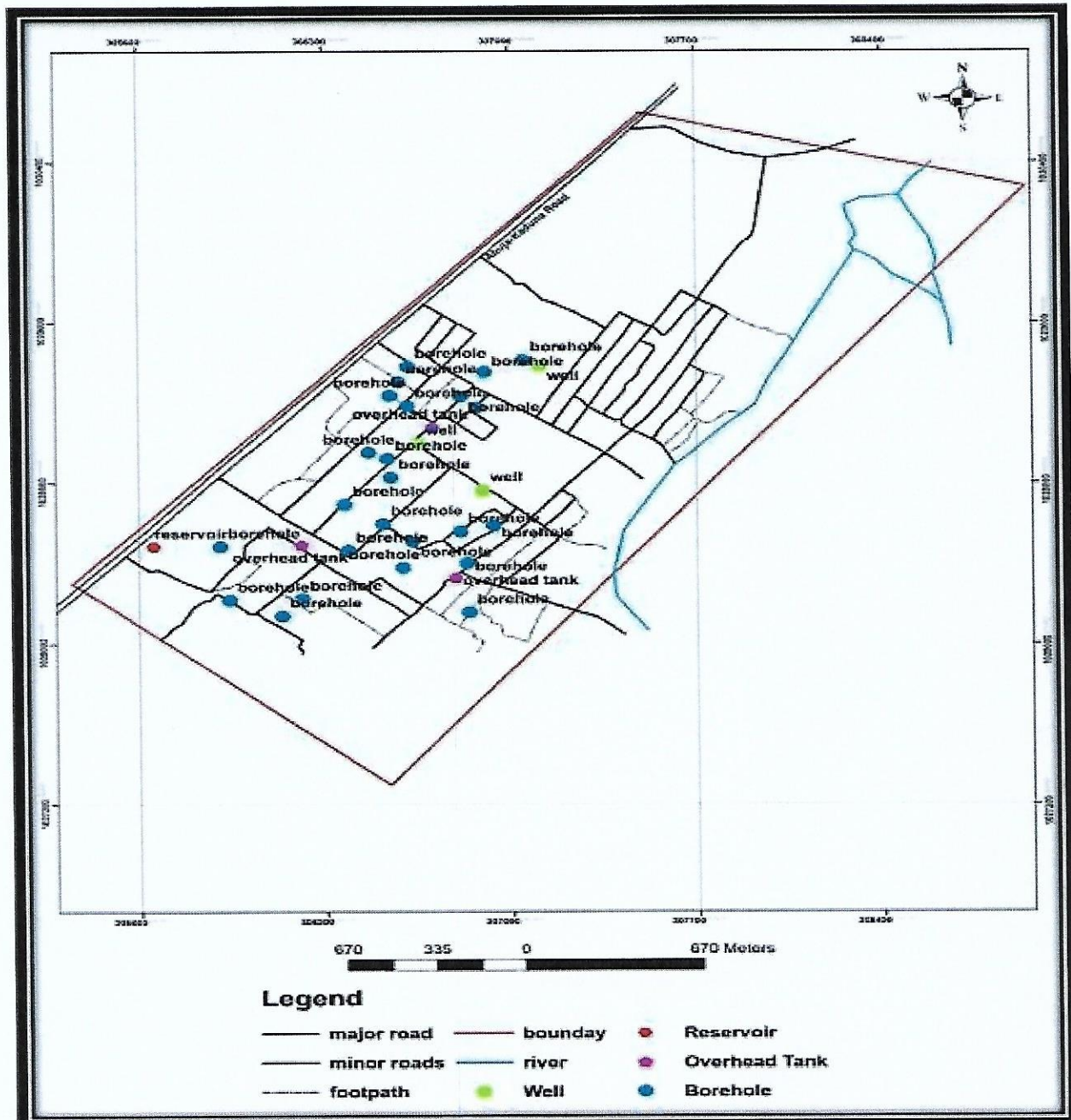


Figure 3. Point map of spatial distribution of public water facilities.

Source: Field Survey, 2018.

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16
- 17
- 18
- 19
- 20
- 21
- 22
- 23
- 24
- 25
- 26
- 27
- 28
- 29
- 30
- 31

Assessment of the Geographic Distribution of Water Facilities and their Condition in Sabon Wuse, Niger State Nigeria.

Assessing the Condition of Public Water Facilities

Table 2: location, type of water facility and condition

S/N	LOCATION	TYPES OF WATER FACILITY	CONDITION
1	Aso	Borehole	Functional
2	Aso	Overhead Tank	Functional
3	Aso	Borehole	Non-Functional
4	Aso	Borehole	Functional
5	Aso	Borehole	Non-Functional
6	Anguwan Yashi	Borehole	Non-Functional
7	Anguwan Yashi	Borehole	Functional
8	Anguwan Yashi	Borehole	Non-Functional
9	Sabon Pegi	Borehole	Functional
10	Ang. Hausawa	Borehole	Non-Functional
11	Ang. Hausawa	Borehole	Non-Functional
12	Ang. Hausawa	Borehole	Non-Functional
13	Anguwan Yashi	Overhead Tank	Non-Functional
14	New Wuse	Borehole	Functional
15	New Wuse	Borehole	Functional
16	Anguwan Sama	Borehole	Functional
17	New Wuse	Borehole	Non-Functional
18	Katampe	Borehole	Non-Functional
19	Anguwan Karu	Borehole	Non-Functional
20	Anguwan Karu	Borehole	Non-Functional
21	Aso	Borehole	Functional
22	J.s.s Aso	Borehole	Non-Functional
23	Aso	Borehole	Non-Functional
24	Aso	Borehole	Non-Functional
25	Aso	Overhead Tank	Non-Functional
26	Katampe	Borehole	Functional
27	Aso	Reinforced Concrete Reservoir	Under Construction
28	New Wuse	Borehole	Non-Functional
29	Karon Magiji	Well	Functional
30	Karon Magiji	Well	Functional
31	Katampe	Well	Functional

Source: Field Survey, 2018.

Table 2 above shows the location of every public water facility and its condition, out of the 31 water facility assessed, 17 boreholes are non-functional, 1 reservoir is still under construction, 10 boreholes are still functional and 3 functional public wells. This says a lot about the condition of water supply in Sabon Wuse community.

Perception of the Respondents on the Condition of Existing Public Water Facility

Table 3 below shows that 67% of the respondents opined that total public water facility is not functional, while 33% are still functional. This indicates that more than half of these water facilities are non-functional. Furthermore, data on the coordinates was used to create a point map showing the spatial distribution of public water facilities that are functional and non-functional within the

study area. Figure 4 below shows the spatial distribution of public water facilities that are functional and non-functional in the study area with blue dots representing public water facilities that are functional, red dots representing public water facilities that are non-functional, while the pink dots representing facilities that are still under construction, it also indicates the exact location of the facility on the ground and the names of each facility.

Table 3:

Condition of water facility	Frequen cy	Percentage (%)
Functional	110	33
Not Functional	223	67
Total	333	100.0

Source: Field Survey, 2018.

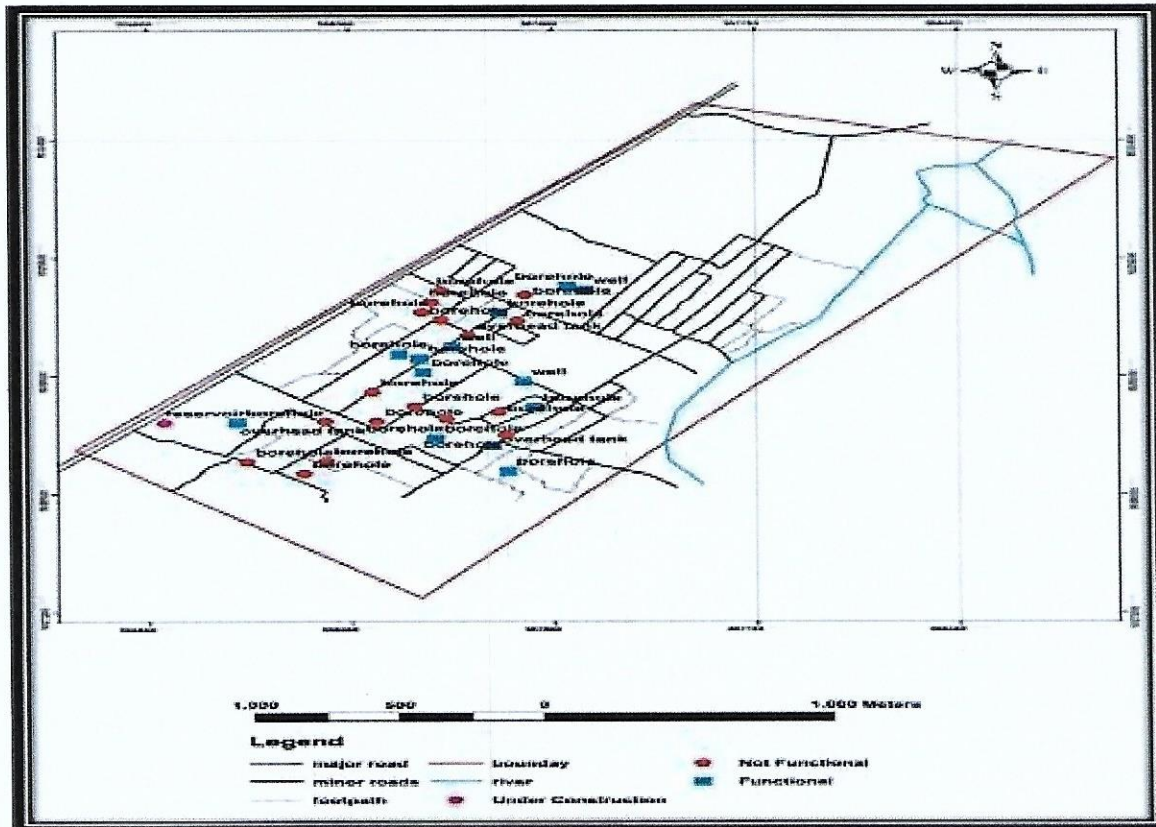


Figure 4 Point Map Showing the Spatial Distribution of Public Water Facilities that are functional and non-functional.

Asses
Sou
Serv
Faci
In
exis
asce
(200
wat
four
mor
urba
Tab
to
reve
less
trav
wat
half
dist
the
a st
from

Assessment of the Geographic Distribution of Water Facilities and their Condition in Sabon Wuse, Niger State Nigeria.

Source: Field Survey, 2018

Service Radius of the Existing Water Facilities/Sources

In examining the service radius of the existing water facilities/source, it was ascertained according to UN-HABITAT (2003) report on equitable accessibility of water that water facility/source be it public fountain or public stand pipe should not be more than 200metres from households in urban areas.

Table 4. below is a result about the proximity to the nearest existing water facility. It reveals that 65% of the population travelled less than 1km, 34% travelled 1-2km, and 1% travelled 2-3km, before accessing the nearest water facility. This indicates that more than half of the sampled population travel a great distance just to access water facilities. With the acceptable UN Habitat standard of having a stand pipe of not more than 200 meters from every household, it shows that the

available water facilities are not sufficient enough for the community.

Table 4.

Proximity to water facility	Frequen cy	Percentage (%)
Less than 1km	216	65
1-2km	113	34
2-3km	4	1.0
3-4km	0	0
4km and above	0	0
Total	333	100

Source: Field Survey, 2018.

Considering the UN Habitat UN Habitat standard of having a stand pipe of not more than 200 meters from every household, 200m buffer was applied to each water facility/source using ArcGIS and the outcome is shown on Figure 6.

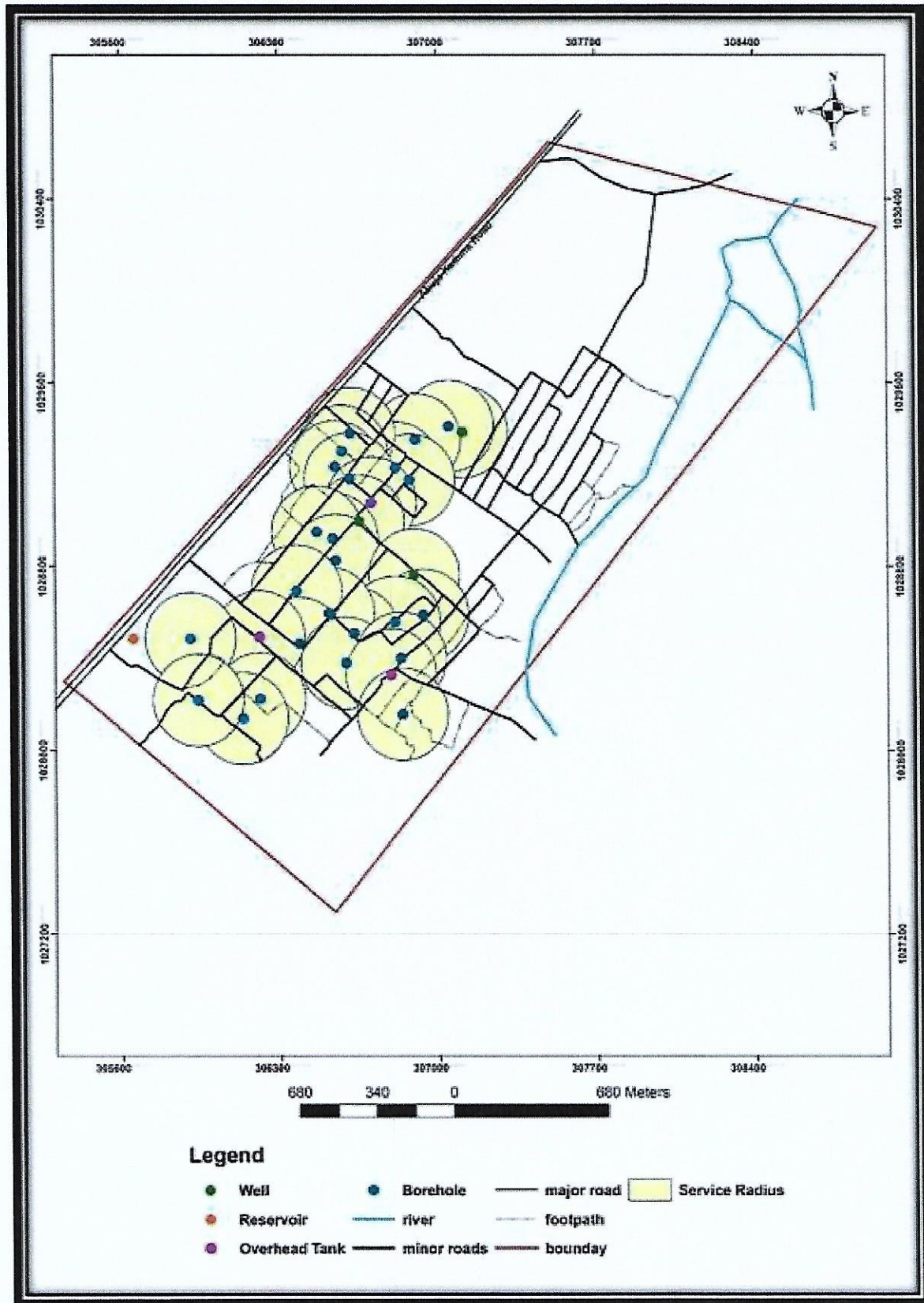


Figure 4.4 200m Buffer around water facilities in Sabon Wuse
Source: Author 2018

Assessr

It can
propert
facilitie
clustere
of the
patrona
function
walk g
water
moreov
Katamp
these
inhabita
water f
these fa

Summa

(i).

(ii).

(iii).

(iv).

(v).

Conclu

With th
almost
like ar
experie

Assessment of the Geographic Distribution of Water Facilities and their Condition in Sabon Wuse, Niger State Nigeria.

It can be observed that there is a high proportion of overlapping between the water facilities. This means that the facilities are clustered and are unevenly distributed, some of these facilities will experience no patronage because most of them are non-functional, thus compelling the inhabitants to walk great distance before accessing other water facilities/source that are functional, moreover, inhabitants in new wuse and Katampe are not within the service radius of these facilities. This implies that the inhabitants of new wuse and Katampe lack water facilities and are in serious need of these facilities.

Summary of Findings

- (i). Sabon Wuse town does not have access to pipe borne water system, not even a single public water stand pipe is made available to the inhabitants of this study area.
- (ii). The study also revealed that about 60-70% of the existing water facilities are not functional.
- (iii). The study revealed that water vendors are the major suppliers of water to the people of this area.
- (iv). Majority of the inhabitants of Sabon Wuse source water from unimproved source. Many obtain water from water vendors, well and seasonal streams and some of these sources are known to be of bad quality which is unhealthy for human consumption.
- (v). It was observed that most of the inhabitants cover a long distance from their house, in order to access water facilities/source.

Conclusion and Recommendation

With the high rate of urbanization going on in almost every part of the world, Sabon Wuse like any other town in Nigeria is also experiencing high rate in population growth

and migration. Unfortunately, the authorities have not put any measure in place to address the issue of facilities that will accommodate the high level of urbanization process going on. The study assessed the geographic distribution of water facilities and its conditions in Sabon Wuse. The study recommends that before any public water facility is sited, the proximity of the residents to the facility should be taken into consideration for easy accessibility.

References

- Anselm, A.J.(2010). Megacities-mega challenges: Evolving Future Nigerian Cities Through Sustainable Initiatives, Archibuilt 2010.
- Abraham W. T and Rusell D. W (2008). *Statistical Power Analysis in Psychological Research. Social and Personality Psychology Compass* 2/1: 283–301, 10.1111/j.1751-9004.2007.00052.x
- Bamigbose, O., Arowolo, O., Oresanya, O., & Yusuf, A. (2000). Assessment of Urban Waste Management practice in Lagos, Nigeria. *African Scientist*, 1(1), Nigeria: Klobex Academic Publisher.
- Burke, G.L. (1970). *The growth and Nature of urban areas in developing countries, London: Collage of Estate Management*
- Foster, S.S.D., and Chilton.P.J. (2003). Groundwater; The processes and global 55 significance of aquifer Degradation, *Philosophical Transactions Biological Science*,358(1440).
- Gender and Water Alliance (GWA), (2006) *Gender, Water and Poverty*,

- www.gender and water.org*. (Accessed on 10-7-2013).
- Kehinde M.O. and Longe E.O. (2003). Providing water at affordable cost in developing economies, 29th WEDC International Conference, Abuja, Nigeria, pp 22
- Medhin F, (2006) *Household Demand for Improved Water Service in Urban areas*; the case of Addis Ababa, Ethiopia.
- Sulyman, A. O. (2014) Infrastructure Provision And Classification Of Rural Settlements In Niger State, Nigeria. *An International Journal of Science and Technology* Bahir Dar, Ethiopia Vol. 3 (1), S/No. 6, 12-34
- UNDP, (2006) *Human Development Report beyond Scarcity: Power, Poverty and the Global Water Crisis*. United Nations Development Programme (UNDP), 2006b. Human Development Report Beyond scarcity: Power, poverty and the global water crisis. 1 UN Plaza, New York, 10017, USA.
- Vairavamoorthy, K. Gorantiwar.S, and Pathirana.A.(2008). *Managing urban water supplies in developing Countries- Climate change and water scenarios*, Physics and Chemistry on Earth, 33,330-339.
- UN Habitat, (2003) *Water and Sanitation in the world's cities: Local Action for Global goals*. Earths can Publication Ltd, London.
- Yewondwossen Tesfaye, (2012). *A Comparative Study on Woreda Managed and Community Managed Rural Water Supply Projects, with Respect to their Planning, Implementation Functionality and Utilization*; Amhara National Regional States, Ethiopia.