

**Full Length Research Paper**

# Challenges and Opportunities of Water Supply in Enugu Metropolis, Nigeria.

**Gladys Ogochukwu Chukwurah**

University of Nigeria, Nigeria.

**Article history**

Received: 04-05-2018

Revised: 11-05-2018

Accepted: 15-05-2018

**Corresponding Author:**

**Gladys O. Chukwurah**

University of Nigeria,  
Nigeria.

**Abstract**

Water scarcity is experience everywhere in the city. This study becomes a necessity to find out the challenges and opportunities of water supply in Enugu metropolis by providing basic information (why inequitable distribution of water supply, sources of water supply and water supply scheme). Primary and secondary sources of data were utilized; and qualitatively analyzed. The study shows that the degree of challenges of water supply is more severe in the low and medium density; and both densities spend much money in the purchase of water than the high density. It also discovered six sources of water supply scheme to Enugu: Iva Valley scheme, 9<sup>th</sup> Mile Bore-holes, 9<sup>th</sup> Mile Crash Programme scheme, Ajali water scheme, Ekulu water scheme, and Akuke water scheme. Only Ajali and Iva Valley scheme are operational, functions occasional and very far below production capacity while the 9<sup>th</sup> Mile Crash programme boreholes scheme is an emergence relief whenever the main Ajali scheme is temporary off. Other problems of water supply includes; shortage of skilled manpower, pipe leakage, lack of funds for improvement, replacement, extension of distribution, maintenance and operations, insufficient power supply, low income generation, lack of general metering, non- funding of water supplies, scheme not working according to design, out of design and distribution scheme. The study recommends; Renewal techniques which could be actualized through the collaboration of the federal government, state government and Enugu state water corporation with the assistance of the non-intergovernmental agencies such as UNICEF, UNDP, WHO, etc. and by full citizen participation.

**Key Words:** Causes, Challenges, Opportunities, Water supply scheme, Water supply sources.

**Introduction**

Adequate water supply to community has been a problem for centuries and remains so till the present time. Even in the advanced country such as U.S.A, public issues concerning water are known to have erupted sporadically at the local, state, and National level for about two centuries while the problem of wise allocation is still very serious. The situation of water supply is worse in Nigeria and in other (LDCs) Low Developing countries due to a number of factors. According to Ohwo (2012) such shortages can lead to serious economic disruptions and human suffering.

Enugu as a capital city of Enugu state has never enjoyed adequate water supply as supposed since its inception. The inhabitants of the town since its inception have used the rivers and streams as a source of water. The sorry case of water supply in Enugu started with the development of the town. In those early days, the Aria Layout, the colliery Layout (Udi siding), and Hill Top that formed the starting point of Enugu, had a water reservoir of about five million gallon capacity. This reservoir that is the Iva Valley scheme serve the growing population till new scheme started developing. A look into the historical development of Enugu municipality will discover that the water supply development is not commensurate to the population growth of Enugu and hence, shortage of water has been a very big problem to the people of Enugu urban. The metropolis has been characterized by recurring water scarcity. Some areas have water occasionally whereas some are totally out of the water supply and distribution scheme. For instance, some areas and layout at Awkunanaw, Maryland, New GRA, Trans Ekulu and Emene are yet to be included in the water supply scheme and alternatively be equipped with water facilities. As a result, since water is a life's necessity, individuals have to find substitute, they resort to well water, water tankers, open streams, rainwater and spring water. There is no running tap water in most of the buildings in Enugu. The result is that toilet gets filled up with undisputed human wastes, creating critical health hazards for the population. In fact Enugu seems to face real dangers of epidemics from this singular circumstance alone. Most of the taps are found to be dried for several months and a tank of water of about 500 liters sells at a cost of N3000 are purchased by households once in one weeks or two weeks depending on the size of the families or household. People who cannot afford it travel to any available stream around to fetch water for cooking and drinking. Besides, as one walks around the city, one regular scene is the long queue around wells and plastic and metallic

tanks. Lots of time is spent to get water including the risk involved in crossing road with busy traffic. Water scarcity is experience everywhere in the city. Hence the necessity of this study in other to compare the water supply situation in the various parts of Enugu urban, using the following parameters; average quantity of water needed per day per household, source of water supply, average amount of money spent in procuring water per month per household and also to assess the causes of shortage of water supply by examining the sources of water supply scheme in Enugu urban.

Muta'aHellandendu, (2012), stated that although Nigeria is blessed with abundant water resources, governments at all levels (federal, state and local) have not been able to successfully harness these resources to ensure a sustainable and equitable access to safe, adequate, improved and affordable water supply and sanitation to the population. World Bank and Federal Ministry of water Resources (2000), also reported that out of the 85 million people living in urban and semi-urban areas, less than half have reasonable access to reliable water supply. Hence, the public sector has not been successful in meeting more than a small portion of the demand for water for residential and commercial uses. As a result, many households, often the poor, end up buying water from water vendors at great expense. This situation has been confirmed by studies of different cities in Nigeria. For instance, despite investments and reforms, Lagos still lacks adequate treatment capacity to deliver enough clean water for drinking and household use. By the end of 2008, vigorous efforts by the state water authority achieved a water delivery capacity of 200 million gallons per day against a demand of 600 million gallons, a gap of about 66 per cent. This has made households to turn to private wells or street vendors to meet drinking water needs, which has exposed consumers to bacterial and heavy metal contamination exceeding local regulatory standards, Stimson Global Health Security (2013). WHO/UNICEF joint report on water and sanitation, reviewed that access to portable water supply lack behind in Nigerian cities. For instance, Nigeria and many other Sub-Sahara African countries are lagging behind in achieving the millennium development goals and targets set for water and sanitation, as drinking water coverage in Nigeria decreased from 49 per cent in 1990 to 48 per cent in 2004, as against the expected 65 percent coverage. As of 2000, about 80% of all government-owned water systems in small towns were non-operational, SON (2007). Studies done by Ohwo, (2011) also reviewed that the Warri Urban Water Board is moribund, making it incapable of supplying potable water to households in Warri-Effurun metropolis. This situation has forced the inhabitants of the metropolis to depend on other sources of water supply (wells, boreholes, etc), whose quality may not be guaranteed because of their susceptibility to quality degradation by leachate from waste disposal dumps and other sources of pollution. According to the World Bank and Federal Ministry of Water Resources, (2007), water production facilities in Nigeria were "rarely operated to capacity due to broken down equipment, or lack of power or fuel for pumping". World Bank (2010), report that the operating cost of water agencies is increased by the need to rely on diesel generators or even having to build their own power plants, since power supply is erratic. Equipment and pipes are poorly maintained, leading to intermittent supply and high levels of non-revenue water. Oboli (1985), studied city administration with respect to pipe borne water in Enugu. From his study, it was found that the water corporation of Anambra states operates a relatively primitive standard of water treatment compared to those of the developed nations. Other finding included; irregular relief of Enugu having advantage of reducing distribution cost of water since gravity is ensure. High income household having more access to pipe borne water than low income ones either by design or accident, considering the effect of an epidemic outbreak in Enugu it would be disastrous. Ifenna, I and Chinedu, O (2012), reported that shortage of water supply is a serious problem in Nnewi, a town, popular for its commercial and industrial activities in Anambra State, most of the households depend on borehole, well water and 'sachet water' as major potable water sources.

This study therefore, examines the challenges and opportunities of water supply in Enugu metropolis; by providing basic information on water supply such as why inequitable distribution of water supply, sources of water supply and water supply scheme. This could be utilized in formulating appropriate strategies for the provision of adequate water supply to the inhabitants of Enugu metropolis so that the people will have a new lease life.

## Materials and methods

### Study Area

Enugu is located between  $6^{\circ} 27'N$  and  $7^{\circ} 29' E$ . It covers an area of about 73 square kilometers. It silts about 223 meter above sea level. Enugu is bound in the south by River Nyaba and in the North by AmaojiAgu-Knik further off towards the west it is bound by Obiagu. Enugu falls within the Equatorial belt, having temperature rainfall and seasons indicating a tropical rainforest. Enugu is composed of roughly six built up area divided by streams, valleys and the rail roads, which cuts a great swath through the middle of the town.

### Sampling design

The study adopted the survey design. The study was conducted in Enugu urban. Using purposive sampling and simple random sampling techniques 400 copies of questionnaires were distributed in the three densities of Enugu urban such as high density, medium density and low density residence. The odd – even product moment correlation statistics was used to test the reliability of the instrument. The co-efficient index was calculated and the score obtained was 0.78.

### Sample Size

The sample size of the population was determined using Taro Yamani formula.

$$X = N/1 + Ne$$

Where  $X$  = sample size;  $N$  = population of the study;  $e^2$  = level of significance or error factor which is  $a = 0.05^2$

Applying the above formula, a total of 400 was gotten. Since the data required from this source is to corroborate the secondary data as well as get manageable population size, 400 respondents were used in the study as the sample size. Sample size of 133 respondents was chosen for low and medium densities while 134 respondent was used for high density; independent layout was chosen as one of the low density area, New Haven which is among the middle density and Obiagu for high density residence. Data on the sources of water supply scheme was qualitatively analyzed. Data was also collected from Enugu State Water Corporation.

#### *Data Presentation and Analysis*

Water supply situation in the various parts of Enugu urban, were analyzed using the following parameters; average quantity of water needed per day per household, sources of water supply, average amount of money spent in procuring water per month, per household and average number of times water vendor supplied water to the residential areas per month. The low density residence needs more quantity of water per day than the middle and the high density residence. The main sources of water supply are mainly through purchase from water vendors other sources include well, and streams. Pipe borne water is a very minor source of water supply especially in the low density residence and middle density residence. This shows that Enugu state water corporation is in a crises situation. The low density residence spend the sum of 6 thousand naira in the purchase of water monthly while the middle density spend 400 thousand naira and the high density residence spend an average of 2 thousand naira monthly in the purchase of water. This reveal that the low density residence spend much money in the purchase of water than the middle density whereas the high density residence spend less, however all the densities spend money in the purchase of water in Enugu.

#### *Sources of Water Supply Scheme and Other Challenges of Water Supply in Enugu Metropolis*

Before one can conveniently and successfully handle the water supply problem in Enugu Metropolis, a close and meticulous study of the water supply sources is highly imperative. Any supply or distribution network will invariably depend on the feasibility and economy of these sources. The sources are enumerated below:

1. Iva Valley Scheme
2. 9<sup>th</sup> Mill Bore – holes
3. Crash Programme Scheme
4. Ajali Water Scheme
5. EkuluWater Scheme
6. AkwuWater Scheme

#### *Iva Valley Scheme or Iva Headwork Scheme*

This was the first water supply in Enugu State. It was commissioned in the year 1924. The source of this scheme was from three clean water springs called Grottos. These Grottos were the source of Iva scheme. At inception, this was made to serve the expatriate coal miners and the colonial government administrators of the eastern region. Subsequently, as population increased and urbanization followed suit, the scheme started experiencing expansion. This expansion kept on till the scheme now supplies both the government quarters and teeming population and industries. The latest expansion between 1960 and 1962 gave rise to the final commissioning of this scheme. This scheme has a capacity of over 12000m<sup>3</sup> per day. It supplies water to Iva valley, G.R.A, Iva pottery and secretariat quarters among other areas. The treatment plant of this scheme is at Ngwo. This plant comprises intake structures and sedimentation tanks. The treatment is cheap in the sense that the only chemical treatment prescribed for this scheme is disinfecting by chlorinating; besides there are no pumping operations. After treatment, water from the sedimentation tank flows directly into DW 450-ductile/steel pipeline to 4,500m<sup>3</sup> reservoir, the system is then connected from the distribution network to the populace.

#### *9<sup>th</sup> Mile Bore – Holes*

These consist of five bore holes located at 9<sup>th</sup> mile corner. These were sunk in 1966 and were commissioned in 1976. Though these bore hole were not general meant for the metropolis but nearby towns like NgwoAsaa, Ngwo Uno, Ebe, Eke, and Abhor, yet it supplies coal camp in Enugu. Presently, these bore holes are meant to be reactivated so that elevated areas of coal camp could be served adequately again.

#### *Crash Programme Scheme*

The Crash programme was commissioned in 1982. This came about because of the upsurge in population together with increased domestic as well as industrial demand for portable water. Just as the name implies, the crash program was put in place as a stop-gap measure to augment the Iva Valley and Ekulu water schemes during the construction of the main Ajali water project. The crash programme comprises the drilling of 12 bore holes in bore hole field, with a combined output of about 2400cu.m<sup>3</sup>/day, all of which are pumped into a common steel main and hence to the reservoir at the foot of Milken Hill.

The scheme was successfully completed in about 9 months. These boreholes are energized by three generating sets, each 525kva capacity which serves as alternative power supply to Power Holding. Each of these generating sets controls four pumps. The transmission of the water is through DW 200mm Asbestos cement pipeline to a DW 600 steel pipe manifold. This later discharge into the Ajali transmission pipeline near 9<sup>th</sup> mile corner for onward transmission to Enugu. These bore holes have an operating capacity of 1200m<sup>3</sup>/hr (or 28,800m<sup>3</sup>/day) with each 100m<sup>3</sup>/hr (or 26,400m<sup>3</sup>/day). With rehabilitation, it is expected that the scheme would generate 48,000m<sup>3</sup>/day.

*Ajali Water Scheme*

The Ajali water scheme was commissioned in 1985. This scheme was developed to supply Enugu urban and environs. Though this supplies Enugu metropolis, it equally supplies other satellite towns of Ngwo, Emene, Iji-Nike, Edem Nike, Nsude and Eke. The sources of water to this scheme are Ajali River at Owa-Imezi town at Ezeagu Local Government Area, about 38km west of Enugu. The design capacity of this scheme is about 77,000m<sup>3</sup> /day and about 80% of water is meant to be distributed to the service areas of Enugu and environs. This scheme basically is comprised of: the intake and weir, Abonuzu headwork, trunk and rising mains, booster station and reservoirs. The water is abstracted through weir and intake structures. It is then lifted to the Abonuzu Headwork where the treatment is done and from there the water is pumped to the Nsude break pressure tanks. After this, the water is then allowed to flow by gravity through a number of reservoirs into the distribution network. The sub-division of the Ajali water scheme are thus: The weir, Intake structure, Wet pit, seven vertical pumps with control panels and a 2300KVA generating set as alternative power source. The weir is constructed just downstream of the intake as a free flow concrete structure. However, during the flood period, a gate is used as flood regulator. The radical gate completes the span of the weir across the width of the river. There is a lift pumping station that houses the seven vertical pumps. These pumps have a delivery capacity of 580m<sup>3</sup> /hr each of raw water to the Abonuzu Headwork some 6km away. The intake can accommodate up to 3,500m<sup>3</sup> /hr but under design condition, only five of the pumps run simultaneously with total discharge of 69, 600m<sup>3</sup> /day, while two are on standby. The water from the pumps moves down from the wet pit to the Abonuzu headwork via a DW 1000 steel pipeline.

*Ekulu Water Scheme*

The source of the Ekulu water scheme is: Inyi stream (900m<sup>3</sup> / day), Ekulu stream (13,000-14,00m<sup>3</sup> / day) and Iva stream (2,700m<sup>3</sup> / day). The treatment plant is located at Ekulu where water flows by gravity from Ekulu and undergo full conventional treatment. Consequently, water from Iva is conveyed over a concrete weir and through an intake at aeration to Ekulu treatment plant. From here it goes through some unit operations. Treated water is pumped from a 4, 095m<sup>3</sup> clean water tanks by three horizontal pumps (523m<sup>3</sup> 1 hr each) a total head to 24.4m Via DN 600 steel pipe to the 20,000m reservoir at Miliken Hill generating set. However, on the completion of the Ajali water supply scheme, the Ekulu water scheme was abandoned because of cost maintenance and water treatment taking into account the relatively low quantity of water produced.

*Akwuke River Bank Shallow Wells*

This scheme which comprises of three number riverbank shallow wells equipped with submersible pumps and disinfecting system was commissioned in 1996. The water from this scheme is meant to serve apart from Akwuke, other nearby town and Villages like Obiaga, Amechi and Ugwuaji all surrounding Enugu metropolis by boosting. The yield for this system is below estimation. The schemes have not combated the water supply problem to Enugu conveniently and as a result, consume often resort to the use of other alternative such as water vendors, shallow wells and rainwater. Other prevailing challenges of water supply systems of Enugu urban that have caused a lot of bottlenecks in the water supply system of Enugu state and any attempt to boost water supply in Enugu metropolis are presented below as follows:

*Inadequate Water Supply*

About six sources of water supply scheme are identified for supply to Enugu, though they do not supply Enugu metropolis alone but also other nearby towns and villages, this goes a great extent to reducing the quantity of water to Enugu on daily basis. Currently all these water supply scheme are no more operational except the Ajali river scheme which is presently the main source of water supply but far below production capacity, the Iva Headwork scheme though of very small output and the 9<sup>th</sup> mile crash program borehole scheme which is called upon as an emergency relief whenever the main Ajali scheme is temporary off.

*Shortage of Skilled Manpower*

It is pathetic to hear that the Enugu State Water Corporation (ENSWC) that handles the supply and distribution of water to Enugu lack qualified and skilled personnel. Out of a total of 590 employees in 1999 report, shows that 539 (91.4%) are trade test certificate, first school leaving certificate and West Africa school certificate holders. A total of 25 (4.3%) are without any qualification. This is higher pathetic and yet some of the qualified staff have been forced to retire or resign due to lack of job satisfaction or low morale. This has greatly crippled the productivity of ENSWC and tends to make the water supply problem in Enugu to look more chronic.

*Pipe Leakage*

The quality of the pipes depends on the type of material it is made of and this determines its efficiency and effectiveness. But unfortunately, the case in Enugu is old, weak asbestos cement pipeline. These no longer sustain the hydraulic pressure in many sections of the distribution systems. This has given Enugu a characteristic scene of pipe burst and leakage in all the nook and crannies of the city. This had led to indiscriminate waste of available water.

*Lack of Funds for Improvement, Replacement and Extension of the Distribution Network, Maintenance and Operations*

Development funds are known to be paid by land purchasers in new layout, but invariable this money is not released or made available when required for pipeline reticulation of new layouts and the private developers themselves are forced to bear the capital cost of pipeline extensions. Several operational and maintenance problems are generally traceable to this, including transport problems, and lack of working facilities.

*Problem of Power Supply*

The sorry state of the epileptic power supply of the country has greatly affected water supply to Enugu. Many at times Enugu experience a blackout that may stretch from hours to days even weeks. Enugu has even experienced a total black – out that lasted for at least one month and cost of running the generator is so high.

*Low Income Sensation*

At inception or during commissioning, the ENSWC that is in charge of water distribution, amongst other things are equally charged to generate revenue for her running through tariffs. But it has been noted that their commercial efficiency is low. Since the consumer enumeration is poor and the effort to build and collect water bills is low, revenue generation is therefore low. This has reduced their efficiency in water supply to Enugu.

*Lack of General Metering*

In a situation of inadequate water supply and uneven distribution over the town, metering offers one of the effective means of redistribution of supply by controlling demand and waste in high pressure areas. There is also every need to explore the feasibility of metering individual consumer by Power Holding and other utilities) rather than one meter for whole premises.

*Non-Funding of Water Supplies by Federal Government*

Considering the financial capabilities of various tiers of government on one hand, and the importance and cost of water supply on the other, the non-funding of water supply project and services by the federal government (the custodian of most funds) is seen as major problem of water supplies in the country generally. Notwithstanding, constitutional provisions or anything contrary, to the federal government should be partly responsible for water supply.

*Scheme Not Operating According to Design and out of design*

The report of the need for water rationing to most layout in the town, side by side with inadequate supply, is indicative that either the scheme is not operating according to design, or the design of distribution system was defective. While some are totally out of design and distribution scheme.

**Results and discussion**

The study reported that shortage of water supply is a serious problem in Enugu metropolis. It also revealed that the degree of challenges of water supply is more severe in the low and middle density residence than the high density residence as a result the low density spend much money in the purchase of water than the middle and the high density spend less. This is in contradiction to Oboli (1985). Six sources of water supply scheme such as *Iva Valley scheme, 9<sup>th</sup> Mile Bore-holes, 9<sup>th</sup> Mile Crash Programme scheme, Ajali water scheme, Ekulu water scheme, and Akuke water scheme* were discovered, though they do not supply Enugu metropolis alone but also other nearby towns and villages, this goes a great extent to reducing the quality of water to inhabitant. Currently all these water supply scheme are no more operational except the Ajali river scheme which is presently the main source of water supply but very far below production capacity, the Iva Headwork's scheme though of very small output and the 9<sup>th</sup> mile crash program borehole scheme which is called upon as an emergency relief whenever the main Ajali scheme is temporary off. The 9<sup>th</sup> mile crash programme borehole scheme functions occasionally and far below production capacity. So only very few areas of Enugu gets water occasionally and in a very small quantity. It also revealed that the Enugu state water corporation has not been successful in meeting more than a small portion of the demand for water to the residence. This is inconsistent with World Bank and Federal Ministry of water Resources (2007). This implies that Enugu State Water Corporation is in a crises situation, making it incapable of supplying potable water to various densities in Enugu metropolis. This situation has forced the inhabitants of the metropolis to depend on other sources of water supply (purchase of water from water vendors at great expense, wells, streams and spring popularly known as Miri-Ani which is found mainly in high density residence), whose quality may not be guaranteed because of their susceptibility to quality degradation by leachate from waste disposal dumps and other sources of pollution. It is also pathetic to note that some area of Enugu metropolis such as awkunanaw, Maryland, New G.R.A, Trans-Ekulu and Emene are yet to be included in the water supply scheme and alternatively be equipped with water facilities. Since water is a life necessity the inhabitant resort to well, water vendors, streams and rain water. Inadequate water supply, shortage of skilled manpower, pipe leakage, lack of funds for improvement, replacement and extension of the distribution network, maintenance and operations, problem of power supply, low income sensation, lack of general metering, non-funding of water supply by federal government and scheme not operating according to design were also discovered as other prevailing challenges of water supply in Enugu Metropolis.

**Conclusion**

It is certain that the water supply situation in Enugu is far from being satisfactory. There is need for both the government and the people to adopt more vigorous strategies to improve on the pathetic water situation. The study therefore recommends renewal techniques through the process of redevelopment, revitalization and rehabilitation of the entire water supply systems. All the six sources of water supply scheme should be properly rehabilitated to operate according to the design capacity and extended to those areas that are yet to be included in the water supply scheme. Spring water popularly known as miri-ani should also be developed and harness as one of the sources of water supply scheme. Water supply facilities such as broken pipes should be replaced and distribution network rehabilitated. Enugu state water corporation should be revitalized; well-funded to carry out its responsibilities which include

maintenance of water supply facilities and qualify staff employed. Alternative power supply such as solar system should be provided for constant power supply and prepaid metering system should be used in every density for accurate generation of fund. Lots of finance is needed to carry out renewal techniques however it could be actualized through the collaboration of the federal government, state government, and the state water corporation with the assistance of the non- intergovernmental agencies such as UNICEF, UNDP, WHO, etc. and by full citizen participation. The challenges of water supply will be a thing of the past in Enugu if these measures are applied.

### References

- Enugu State Water Corporation (2004), “*unpublished report on Enugu state water supply scheme*’.
- Hwo. O. (2011), “Spatial Analysis of Quality of Borehole Water Supply in Warri-Effurun Metropolis, Delta State, Nigeria”, *Ikogho: A Multi-disciplinary journal*, 9(2&3). 91-103. April-September.
- Ohwo.O. (2012) “Quality of Water Supply from the Hand –Dug Wells in Warri-Effurun Metropolis, Delta State,Nigeria, “*Nigeria Geographical Journal*, 8(2).73-86.
- Ifenna, I. A and Chiedu, O. (2012) “Heavy Metal Levels and Physico- Chemical Parameters of potable Water in NnewiAnambra State Nigeria, “*Archives of Applied Science Research*, 4 (5). 2094-2097.
- Lagos Water Corporation (2012), “*Lagos woos investors in wastewater*”.
- Muta’ aHellandodendu J, (2012) “Health Implications of Water Scarcity in Nigeria,” *European Scientific Journal*, Vol.8 No. 18. 111-117.
- Obeli, C.J. (1985); City Administration: A case of pipe borne water in Enugu. Unpublished Bsc thesis. Dept. of geography and planning, University of Benin pp34.
- Stimson Global Health Security, (2012) “Lagos: Growth without infrastructure,” *The Stimson Centre*, 2012 [Online]. Available: <http://www.stimson.org>.
- WHO/UNICEF (2007), Joint Monitoring Programme for Water Supply and Sanitation “*Nigeria Washwatch*.”
- World Bank (2010): New Project to Bring Clean Water to 50,000 Households.
- World Bank and Federal Ministry of Water Resources, (2007) “Water supply and sanitation interim strategy note on Nigeria,” [Online]. Available: [http://siteresources.worldbank.org/NIGERIA\\_EXTN/Resources/wss1100](http://siteresources.worldbank.org/NIGERIA_EXTN/Resources/wss1100).