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A Comparative Assessment of Water Corporations in Nigeria with Water Management in a Typical Developed Country

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ABSTRACT

Water Corporation is the principal supplier of water, wastewater and drainage services throughout a State. This paper assesses the water corporations in Nigeria with information on the substantial portions of the population without access to modern plumbing or sanitation to those trying to deal with outmoded sanitation systems and others that have been able to invest in the most modern technology and equipment. This paper shows a contrast using Southern Australia, a developed country with sophisticated treatment plants linked to elaborate sewerage systems. It has been discovered that water corporation of Nigeria need to be upgraded for optimal delivery and efficient performance

Key words: Water Corporations, Water Management

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1. INTRODUCTION

Water resource systems have benefited both people and their economies for many centuries. The services provided by such systems are multiple. Yet in many regions of the world they are not able to meet even basic drinking water and sanitation needs.

Water Corporation is the principal supplier of water, wastewater and drainage services throughout State. It is crystal clear that, in addition to clean air, the well-being of our planet also requires that water, wastewater and the resulting biosolids (sludge) need to be managed more seriously, and in a focused, coordinated and cooperative manner. Nigeria is a federation consisting of 36 states plus a federal capital territory of Abuja, the 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.

Nigeria is the most populous country in Africa; it has an estimated population of about 162.5 million people, half of whom live in urban areas. It also has one of the fastest-growing economies in the world. The economy is becoming more diversified and complex, with agriculture, oil and gas, and trade. In spite of its relatively strong economic track record, Nigeria is still confronting significant development challenges. Constraints to enhanced growth have been linked to, among other things, the investment climate, infrastructure, incentives and policies that affect agricultural productivity, and the quality and relevance of tertiary education.

According to the 2014 update to the WHO/UNICEF Joint Monitoring Program (JMP) report Progress on Drinking Water and Sanitation, access to reliable water sources in Nigeria's urban areas has barely changed, from 78 percent in 1990 to 79 percent in 2012. Moreover, these numbers do not guarantee that all those with access are connected to a dedicated point on their premises through a state water agency (SWA or Water Corporation) network: JMP data also show a significant decline in the proportion of households with access to piped water to premises, which dropped from 33 percent in 1990 to 6 percent in 2012.

The government sees the water sector as fundamental for the country's development and has made the provision of water and basic sanitation the responsibility of the Federal Ministry of Water Resources (FMWR) and state and local agencies. Water supply and sanitation are not provided efficiently in Nigeria.

Over the last 10 years, with the support of international partners the government has invested in both water infrastructure and sector reforms. Additional federal documents such as the National Low-Income Household Strategy for Water Supply and Sanitation, the Model Water Supply Service Regulatory Law, the Framework for Public Private Partnership in Water Supply, and National Water Sanitation Policy have been drafted to support the reformation of water corporations.

Responsibilities for providing water and sanitation service in urban areas are delegated to State Water Agencies (Water Corporations) or water boards depending on the geographic subdivision. Usually SWAs are responsible for establishment, operation, quality control, and maintenance of urban and semi-urban water supply. However, this responsibility is often only nominal. In most rural areas provision of water supply is the responsibility of local government authorities (LGAs).

There are 37 water agencies in Nigeria, one for each state and one in Abuja. Most of the SWAs in the South region, such as Lagos and Port Harcourt, and a few in the North region, such as Abuja, although fully owned by the state government are established as corporations and operate under corporation law. The others belong to a state and are run according to civil service rules as part of the state government. Generally, each SWA is established by an edict to develop and manage water supply facilities within its state and to meet sound financial objectives. Because the SWAs also bear primary responsibility for proposing reviews of water tariffs, tariff structures differ around the country and at the central government level. Moreover, there is no regulation or incentives to set tariffs that would help urban water utilities more effectively achieve financial sustainability.

2. LITERATURE REVIEW

The 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. The responsibility for sanitation is not clearly defined.

There are 37 water agencies in Nigeria, one for each state and one in Abuja. Most of the State Water Agencies in the South region, such as Lagos and Port Harcourt, and a few in the North region, such as Abuja, although fully owned by the state government are established as corporations and operate under corporation law.

2.1. Overview of Water Corporation and Water Supply in Nigeria

In Nigeria, as in most other countries, the Water Corporations or Water Boards are the major sources of information on water supply. They are State agencies with production/pumping stations and offices located in different parts of their areas of jurisdiction. The Local Government Headquarters also constitute sources of information on water supply. Such data are in respect of rural water supply schemes involving the sinking of boreholes and tube-wells with hand-operated pumps; in some cases with the support of international agencies. The surveys- or census-based data on water supply are produced by the NBS in the National Integrated Survey of Households (NISH) and in the National Integrated Survey of Establishments (NISE) where questions are asked on access to different sources of water.

The Water Boards also often conduct ad hoc water consumer surveys to estimate demand for water by different categories of consumers and to obtain consumers' opinions on their services and tariff policies,

The major water corporations in Nigeria as shown in figure 1 include: The Lagos State Water Corporation, Port-Harcourt Water Corporation, Osun State Water Corporations, and plateau State Water Board.

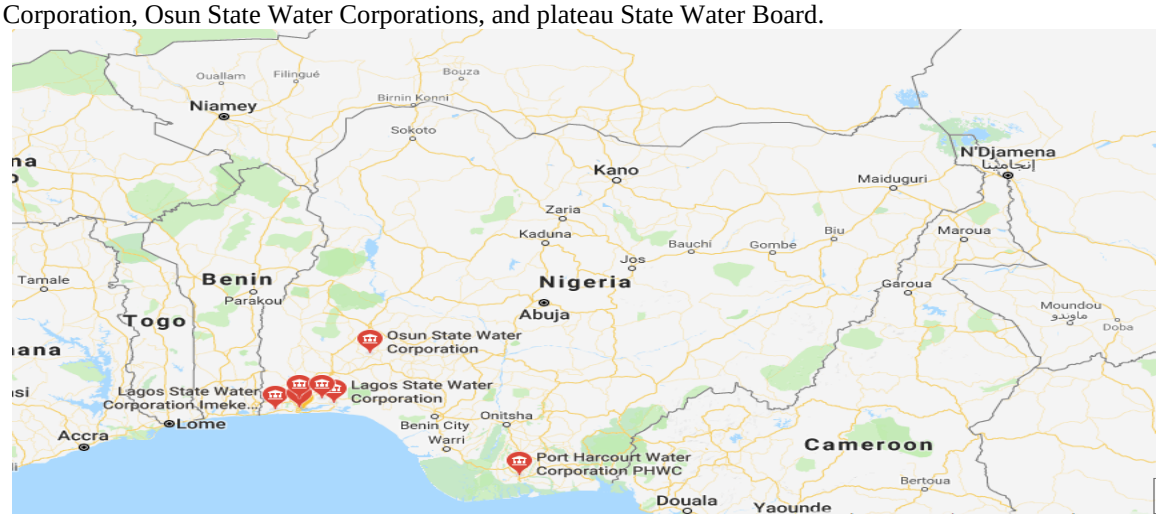

Fig. 1 Locations of Major Water Corporations in Nigeria

Abuja

Nigeria's capital Abuja receives part of its drinking water from the lower Usumadam. The capacity of the plant that treats surface water from the dam's reservoir was in the process of being increased in 2012 in order to cater for the growing

population of the capital. The Guara dam, which was under construction in 2012, is expected to further increase water supply to Abuja and to mitigate against the risk of drought Wastewater is treated in a 131,200 cubic meters per day plant at Wupa that was completed in 2007. The Federal Capital Territory, through the Abuja Environmental Protection Board, has contracted a private operator to run the plant. However, when the government apparently failed to pay the operator he walked away, confronting the area with a pollution crisis.

Lagos

Nigeria's largest city Lagos is surrounded by water from the sea and a lagoon. Its clean water supply in the city is about 81.32%. But since the raw water in the lagoon is too polluted, the city gets its water from Ogun River and Owo River. The city's oldest water treatment plant, LAGOS STATE WATER CORPORATION located in Iju on the Ogun River, was built in 1910. The Lagos Water Corporation (LWC) has gone through various developmental stages since its inception. It was formerly known as the Federal Water Supply (Under Federal Government), established in 1910, with the construction of Iju Waterworks. The Waterworks was commissioned by Mr. Lord Laggard, the then Governor General of Lagos, in 1915 at ObunEko Area of Lagos. The Iju treatment plant has a design capacity of 2.4 million gallon per day (MGD) and it was expanded in stages to 45m gallons per day. Another smaller plant was built at Ishashi on the Owo River in the 1970s. The biggest plant so far was commissioned in 1991 in Adiyan with a capacity of 70m gallons per day. It also draws from the Owo River. There are also seven mini-waterworks drawing from local sources with a combined capacity of 18m gallons per day. The Lagos Water Corporation states that the water produced in the plant meets the highest standards, and that it supplies "safe drinking water in sufficient and regular quantity to over 12.5 million people in Lagos State" However, water is often contaminated in the distribution network and people distrust tap water quality. Electricity supply interruptions prevent treatment plants from operating continuously. However, a dedicated 12.15 MW power plant was under construction in 2012 to supply power to the Adiyan, Iju and Akute water treatment plants. Access to water provided by the state Water Corporation is centred around the metropolis.

Makurdi

In Makurdi, the capital of Benue State, only about 25-30% of the population has access to portable water supply and inhabitants fetch raw water in buckets from the polluted Benue River. In 2008 the construction of a water treatment plant was left unfinished and officials were unable to account for USD 6 million. As of 2012, a water treatment plant (Water Corporation) was under construction as part of the Greater Makurdi Waterworks Project. According to Nat Apir, an independent water consultant, the lack of a modern distribution network will lead pipes to burst and the capacity of the plant is at risk of not being fully utilized.

Other Cities

Water in Kano is supplied from local rivers and from groundwater which is over-exploited. Public water supply is deficient, hence private water selling points are multiplying and generate profits generated for their private operators.
Kaduna receives drinking water from the Kaduna River. Ibadan receives its drinking water from Eleyele dam.

An Overview of the Structure of Water Corporations and Supply in Australia

The water Corporation of Australia – A typical developed country will also be assessed. The water supply and sanitation in Australia is universal and of good quality.

Australia consists of six states and two territories. Australia is a federation established in 1901 by the then six British colonies in Australia uniting under a single constitution. As may be expected, each colony (state) had established its own way of doing business, which resulted in major differences. Each state had, and still retains, responsibility for water management. Each state has a different structure for water management. For example, in Western Australia, which constitutes one-third of Australia, there is one water corporation responsible for bulk and retail water services for some 2 million people. On the other hand, New South Wales (NSW) (total population 6.8 million) has one water corporation for Sydney (4.2 million people) and more than a hundred local government councils administering water supply for the remaining 2.6 million people in NSW, with many servicing only a few thousand people. Victoria has a single bulk supplier and three retailers servicing its 3.2 million people in Melbourne, The remaining 1.8 million people of Victoria are serviced by 13 retailers.

The most applicable to and recommended for Nigeria with reference to the present total population of 1,842,348,259 (National Population Commission, 2018) is New South Wales, Australia.

The major water Corporations in New South Wales as shown in figure 2 below include: SUEZ Water Corporation, Sydney Water Corporation, Hunter Water Corporation and the New South Wales Water Corporation.

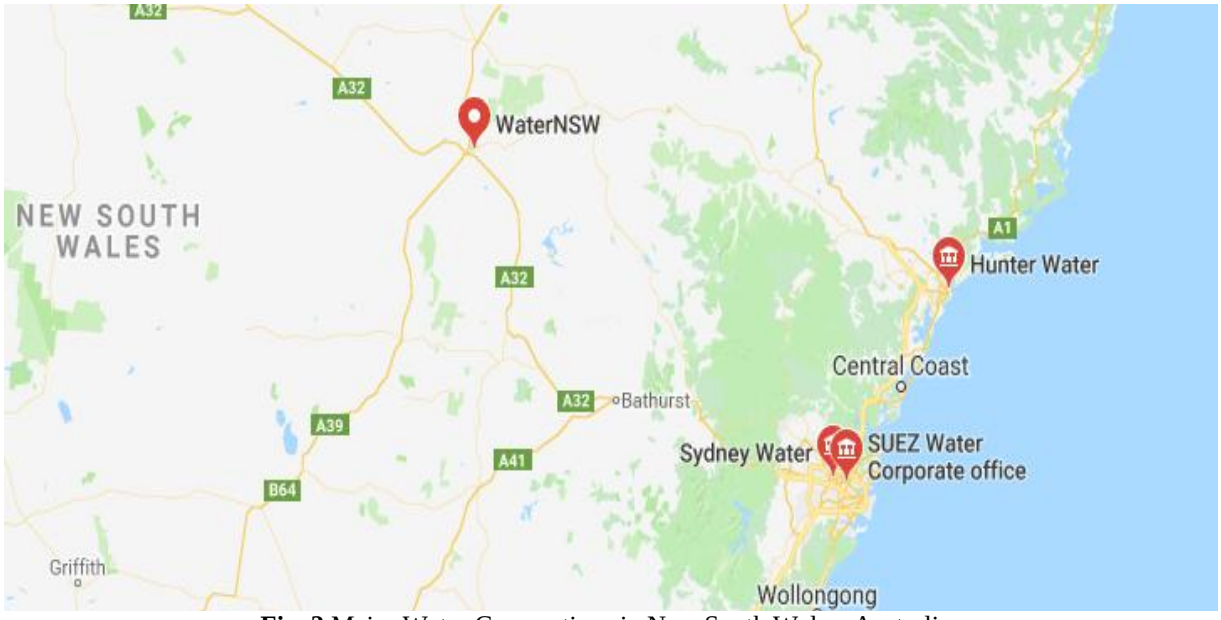

Fig. 2 Major Water Corporations in New South Wales, Australia

For this report, the regional example that will be presented to demonstrate the range of approaches to water and waste water management incorporating treatment, supply and distribution as well as other responsibilities and administration guidelines of a water corporation are the State Water Corporation and the Sydney Water Corporation located in New South Wales Australia.

3.0 METHODOLOGY

This study compares the water corporation in Nigeria with that of a typical developed country, hence two study locations will be discussed, an assessment of the water corporation envelops the structure of the water industry, water supply and sanitation services, decision making analysis, disposal methods, treatment and cost.

First Study Location- Lagos State

Lagos Water Corporation

Lagos Water Corporation has been in existence for over a century, and it is the water facility of Lagos State, with the primary responsibility of providing safe drinking water in sufficient and regular quantity to Lagosians. It is located in Ijuon the Ogun River; it provides 45m gallons of water per day. It should be noted that nearly all water corporations in Nigeria have similar mode of operations though under different jurisdictions.

Mode of Operation

Equipment and Facilities

Treatment plants, storage tanks, water pumps, tankers, water valves, generating sets (number, design and operational capacities, status and rate of use).

Services Provided

Rates and volumes of water delivered to categories of consumers who have paid a specified sum, use of pipeline extensions, length and gauge.

Personnel

Remuneration by sex and professional categories such as: administration, engineers, technicians, billing staff and meter readers, others.

Cost and Revenue Generation

Capital and recurrent expenditures, grants or subventions, receipts from consumers, etc. These items of data are recorded on daily, weekly or monthly time series by each reporting unit. The water corporation/board collates the data for each water work managed. Information on the following items is made available:

Design capacity, average production, number of consumers (categories), average consumption, employment, wage bill (categorized), costs (chemicals, fuels, electricity), other costs, revenue (itemized for major sources).

Current Method for Data Storage and Dissemination

There is at present no reporting system for water supply statistics in Nigeria. Data on water supply are available in bits and pieces, in hard copies in files and occasional reports of water corporations and summaries of activities at water treatment plants and pumping stations which have the ability to keep such records. Hence, retrieval and transfer follow the same pattern of hard copies of data storage. Although each water corporation is expected to keep detailed records of

activities in each of its water works, the National Bureau of Statistics may only be able to store aggregate or average information for all water works in each State on its data base.

Date Base Coding System

The National Bureau of Statistic Coding System (NBS) is the database coding system used for water supply statistics.

Due to the inadequacy and inconsistency of supply by the Corporation there is increased participation of the private sector. Their supplies are purchased from the agencies or drawn from private boreholes, tube wells and other sources, with very little/no monitoring; this will be further discussed in chapter four. Second Study Location – New South Wales

State Water Corporation (SW)

State Water Corporation is located in New South Wales.

As a stand-alone State Owned Corporation, State Water Corporation (SW) is identified as a water management authority and a major utility.

Function

It incorporates, into a single business, all of New South Wales (NSW's) bulk water delivery functions outside of the areas of operation of the Sydney Catchment Authority, Sydney Water Corporation and other water supply authorities.

SW owns 20 major storages, 280 weirs and delivers water to about 6,200 customers along some 7,000 km of river delivering on average 5,500 GL/year. SW delivers water to irrigation corporations, country town water supply authorities, farms, mines, and electricity generators by releasing water from its dams and storages into rivers to be accessed by water users.

SW has numerous obligations regarding its bulk water delivery business. Some of these responsibilities are river operation including water delivery, short term forecasting, wetland monitoring, flood forecasting and emergency planning.

SW also facilitates the compliance procedures established by regulators such as DWE, NWI and MDBA by collecting, collating and analyzing water information and providing the necessary information and reports.

Mode of Operation

In the process of achieving efficient delivery of this water it makes use of a network of stream flow gauges owned by the Dept of Water and Energy (DWE) and storage recorders and SCADA systems owned by SW.

State Water Corporation Manages and shares hydrological data within the corporate database, they also manage the water order and usage data within the State Water's Water Accounting System. Most of the hydrological data are telemetered and are electronically available. However, there are still a number of sites where daily readings are taken manually and are not electronically available.

Meteorological data in many sites are currently gathered manually. By installing automatic weather stations on main storages under State Water control, it would facilitate the timely delivery of Meteorological data for water delivery purposes. The implementation of this equipment provides a more accurate, timely and effective information for the management of storages enhancing the management of water resources around the state.

Sydney Water Corporation

Sydney Water Corporation is located in New South Wales.

Function

The organization Sydney Water supplies drinking water, recycled water, wastewater services and some storm water services to over four million people in Sydney, the Illawarra and the Blue Mountains. An area of operations covering around 12,700km^2. Sydney Water Corporation supplies more than 1.4 billion litres of water to more than 1.7 million homes and businesses each day.

Mode of Operation

Water is treated at nine water filtration plants and distributed to customers via a network of 266 service reservoirs, 148 pumping stations and nearly 21,000 kilometers of water mains. Below shows how the water corporation manages water:

Wastewater

Sydney Water Corporation collects and treats more than 1.2 billion litres of wastewater from homes and businesses each day. The sewerage network includes about 23,700 km of sewer pipes and 669 sewage pumping stations transporting wastewater to 31 sewage treatment plants.

Recycled water

Sydney Water Corporation has many recycling schemes in place that reduce discharges of treated wastewater to the environment and reduce demand on water supplies. These schemes currently produce approximately 70 billionliters a year.

Storm Water

Sydney Water Corporation maintains 443 kilometers of storm water drains serving around 25 per cent of metropolitan Sydney and operates 65 Storm water Quality Improvement Devices (SQIDs), which include devices such as trash racks, litter booms and sediment traps. Water information drivers, Timely and accurate water information is essential for operating such a large and complex system.

The key drivers responsible for improved water information include regulation, strategic planning and water efficiency. An example of this driver is detailed below;

Operating License

The Independent Pricing and Regulatory Tribunal (IPART) is an independent body that oversees regulation in the water, gas, electricity and public transport industries in NSW. IPART oversees the implementation of the Sydney Water Operating License. The objective of this license is to enable and require Sydney Water to lawfully provide services within its area of operations. Consistent with this objective, the license requires Sydney Water to:

- Meet the objectives and other requirements imposed on it in the Sydney Water Act
- Comply with the quality and performance standards in the license
- Recognize the rights given to customers and consumers
- Be subject to operational audits of compliance with the license.

Note: Within six months from the commencement of each five-year license, Sydney Water must develop and provide a monitoring and reporting protocol.

4. DISCUSSION

State Water Corporations/Boards in Nigeria used to have the monopoly of distributing potable water to consumers, but the inadequacy and inconsistency of supply by these agencies have led to increased participation of the private sector. Their supplies are purchased from the agencies or drawn from private boreholes, tube wells and other sources. A recent survey has shown that 80 per cent of boreholes in a locality in Nigeria are privately-owned and are selling water to the public. Most wealthy Nigerians with houses in the semi-urban and especially rural areas sink their own boreholes, while not less than 50 per cent of households sink theirs or have access to tube wells as supplementary (to water corporations supply) or sole sources of potable water supply.

A comparison of the Sydney Water Corporation and the State Water Corporation located in Southern Australia with the Lagos State Water Corporation Shows that Water Corporation in Nigeria is mainly focused of the quantity of water supply, with little attention given to the supply and distribution methods, very minimal/ no attention is given to the water treatment and waste water management. Waste water in Nigeria is mostly digested in the septic tank, while the effluent seeps into the surrounding soil in the soak-away pit. Others are poorly treated. Water generally is poorly managed and a huge percentage wasted.

In Australia, all kinds of water source are properly maintained and given attention from surface water to ground water to storm water. Hydraulic Services such as Pumps, reservoirs, water mains, dams etc are maintained annually, Water Audits are regularly conducted and the water supply schemes as well as project plans are very detailed and made available. Water Corporations in Australia due to the adequate investigation carried out and the dedication of the workers to provision of good quality water and water facilities to the society provide substantial information on the problems facing water management, the Environmental State of the Country as regards the degree of water pollution, public opinion as regards water projects undertaken and state of well being, Capital expenditures, Operating Cost, Energy Savings etc. are made available.

Water Corporation in Nigeria is lacking substantially and needs improvement in the following areas:

- Strategic Water Monitoring and Information Plan
- **Power Supply:** Most utilities in Nigeria rely on public power supply for their operations and considering the poor state of power in the country, all the utilities in Nigeria resort to the use of power generators. The cost of running generators in some cases is as high as 40% of operational costs, due to the need for diesel fuel required to run the generating plants.
- **Water Supply Operations:** Water distribution methods is poor
- **Customer Care:** The Operational Structure and Customer Care of water Corporations in Nigeria needs improvement.

5. CONCLUSION

The Nigerian government is dedicated to developing a sustainable system for providing water and wastewater systems throughout the country. If water services are to advance and provide sustainable services for the entire population, reformation of Water Corporations must be done. The current system of governance is characterized by major differences in the institutional settings of state water agencies (Water Corporations) and the presence of other water providers, who will remain on the scene for the foreseeable future. To finance the necessary investment, the government is encouraging innovative mechanisms to complement budget support, such as a water fund. It is expected that such a fund will be able

to address the differences and accommodate the needs of different states regardless of how their institutions are structured and at the same time provide resources for the water sector based on objective criteria. It is understandable that the federal government cannot provide all the needed infrastructural investment because it lacks the resources, and that private participation and external borrowing by state entities would complement the public funds available. While the government can allocate a portion of the financial resources needed, public-private partnerships (PPPs) are expected to play a key role in financing strategic infrastructure.

A more developed system in the management of water Corporations in Nigeria will go a long way in reshaping the countries water supply and treatment facilities as well as drainage services, it will significantly develop the nation and minimally reduce poverty.

Planning for and implementing the restoration effort requires application of state-of-the-art large systems analysis concepts, hydrological and hydro ecological data and models incorporated within decision support systems, integration of social sciences, and monitoring for planning and evaluation of performance in an adaptive management.

Effective water resources planning and management is a challenge today and will be an increasing challenge into the foreseeable future.

5.1. Recommendations

The following recommendations will be beneficial to water corporations in Nigeria:

- The first priority is to review accuracy of current management and administration system of water corporations and enhance it to achieve optimum efficiency
- Establish a clear and unambiguous baseline for water services. This should include not only State Water Agencies but also services provided by local government authorities, small local water providers, self-services, and rural water.
- **U**sing Sydney Water Corporation as an example, Investment should be made in the design and construction of treatment plants and proper handling methods for waste water, Recycled water, Storm water etc.
- Water Corporation should be more transparent and Committed by providing detailed designs of treatment plants and water supply schemes: during the course of this research, gaining information on the mode of operation and water supply schemes of Australia's water corporation was far less tedious than Nigeria's Water corporations, this is not due to security reasons but as a result of the inability of water corporations in Nigeria to provide a well detailed report on the Ongoing state of water supply and sanitation within the country.
- Assessment reports consisting of performance Indicators, Water Audits, Customer Service Indicators, Environmental Performance Indicator should be provided annually to track the state of water use and management within the state/country. This should be closely monitored and reviewed annually.
- A certain level of Uniformity and Cooperation is required amongst the various levels of Government (federal, state and local) geared towards proper Maintenance and Development of Water Corporations as well as ensuring that their responsibilities are adequately performed.
- Nigeria is saddled with numerous secondary water providers, such as sachet water providers, water vendors who sell water from tanks and drums on carts popularly referred to as Mai-ruwa, bottled water. Though they are institutions such as the National Agency for Food Drugs Administration and Control (NAFDAC) responsible for ensuring that water and other products are fit for use, numerous factors hinder the proper management of these secondary providers of water, this on the long run tarnish the image of water corporations in Nigeria and show poor management and planning skills
- In developed Countries Using State Water Corporation and Sydney Water Corporation – Southern Australia as an example, portable water is delivered directly to the populace from the water corporation via Underground pipes and other technologies.
- Public-Private partnership geared towards the provision of better water supply and treatment Infrastructure as well as reforming the system of water corporation management by providing advanced technologies
- Governance and Human Capacity: Apart from physical works rehabilitation, construction and expansion, attention should be given to governance issues such as: water policy, water law, and sector regulation. Human capacity development is also paramount to sustainability of Water Corporation; several training programs across all departments of the corporation should be scheduled.
- Planning and management processes should recognize and address the goals and expectations of the region's stakeholders, identify and respond to the region's water-related problems.

REFERENCES

[1]. AAA GAS PRICES *Price of diesel* Available at: http://gasprices.aaa.com (Accessed 3rd February **2018**)

[2]. Federal republic of Nigeria Official Gazette (**2007**) *Jos Population* Available at:http://www.nigerianbar.org.ng/index.php/downloads/send/2-documents/5-federal-republic-of-nigeria-official-gazette (Accessed 3rd February **2018**)

[3]. Greater Moncton Sewage Commission (**2006**): *global atlas of Excreta, Wastewater Sludge and Biosolids Management: Moving forward the sustainable and welcome uses of a global resource.* United Nations.
[4]. In M. B. Beck & P. Lessard (Eds.), WATERMATEX '97. Systems analysis and computing in water quality management.
[5]. NSW strategic water information and monitoring plan (**2009**): *Final report* Available at http://www.water.nsw.gov.au/__data/assets/pdf_file/0008/549674/nsw_swimp_final_report.pdf (Accessed 3rd February **2018**)
[6]. Somlyody, L. (**1997**). Use of optimization models in river basin water quality planning. Towards a new agenda (391 pp).
[7]. Stout, G.E. (**1998**). Sustainable development requires the full cooperation of water users. Water International, 23(1), 3–7.
[8]. Thanh, N. C., & Biswas, A. K. (Eds.). (**1990**). Environmentally-sound water management (276 pp). Delhi: Oxford University Press.
[9]. Thiessen, E. M., Loucks, D. P., & Stedinger, J. R. (**1998**).Computer-assisted negotiations of water resources conflicts. Group Decision and Negotiation, 7(2).
[10]. Thissen, W. A. H., & Walker, W. E. (Eds.). (**2013**). Public policy analysis: New developments (286 pp).New York, Heidelberg, Dordrecht, London: Springer. ISBN: 978-1-4614-4601-9; ISBN: 978-1-4614-4602-6(eBook). doi:10.1007/978-1-4614-4602-6
[11]. Tolley, G. S., & Riggs, F. E. (Eds.). (**1961**). Economics of watershed planning. Ames, Iowa: Iowa State University Press.
[12]. Water supply statistics Available at: http://www.nigerianstat.gov.ng/pdfuploads/WATER%20SUPPLY.pdf (Accessed 3rd February **2018**)
[13]. Wikipedia, The free Encyclopedia *Water Supply and Sanitation in Nigeria* Available at: http://en.wikipedia.org/wiki/Water supply and sanitation in Nigeria (Accessed 3rd February **2018**)