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An Overview of Water Supply Infrastructural Challenges in Nigeria: A Case Study of Taraba State

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Abstract: *Every day, we depend on the health, social, economic and environmental benefits that clean and safe water provides. In order to continue to enjoy these benefits, we must construct a sustainable water infrastructure. Water supply with considerations for quality requirements is important irrespective of the source type, so that the intended benefits of improved water supplies can be achieved. Both boreholes and pipe borne water supply facilities used for drinking water supplies can deliver contaminated water, if adequate quality provisions are not effectively considered. Damage of water supply and/or sewage disposal infrastructures poses the immediate threat of severe epidemics of waterborne diseases, some of which can be life-threatening. There are fourteen (14) Water Supply Schemes spread across the State, but only Jalingo and Ibi - Wukari were operational. The remaining 12 water schemes are either grounded due to broken down machines and equipment or in some cases, not operational due to lack of operation inputs. The State Government since 2007 has embarked on spring water development for community water supply under the small town water supply in collaboration with the MDGs/CGS programme of the Federal Government and also established Taraba State Rural Water Supply and Environmental Sanitation Agency. This agency service delivery coverage for potable water and sanitary facilities stand at 53.5% and 41.3% respectively, achieved through the support of the State, FGN, LGAs, External Donors and NGOs.*

Keywords: *Bore holes, environmental sanitation, health, infrastructure, sewage disposal, water supply*

I. Introduction

Water supply with consideration of quality requirements is important irrespective of the source type, so that the intended benefits of improved water supplies can be achieved [1]. In order to meet water supply and sanitation provisions of the reviewed 1977 United Nations declaration that, "all people irrespective of their development, economic and social condition are entitled to have access to drinking water in good quality and quantities", the Federal Government of Nigeria directed and encouraged the establishment of State Water Supply Agency and State Rural Water Supply and Sanitation Agency in each State.

Although, great stride have been made in meeting the challenges in terms of water supply provision services, the safety of many water supplies remains unknown and uncertain [2]. Drinking water supplies is required to meet guidelines for microbial and chemical contamination. States in Nigeria are largely responsible for managing water supplies, while national and some international organizations provide recommendations and guidelines [3]. An institution such as the National Water Resources Institute, Kaduna performs applied research, in all aspects of water resources development and management, in order to adequately advise government on policy formulation.

Water-supply infrastructure consists of what is built to pump, divert, transport, store, treat, and deliver safe drinking water. Both the boreholes and pipe borne water supply facilities can deliver contaminated water, if adequate quality provisions are not effectively considered. Destruction of water supply and/or sewage disposal infrastructures after major catastrophes (floods, crises, etc.) poses the immediate threat of severe epidemics of waterborne diseases, and several of which can be life-threatening [4; 5].

Infrastructural challenges that affects water supply quality in the study area
Water supply provision - the government approach

Taraba State Water Supply Agency was established by Law No 5 of 1992 and saddled with mandate for the supply of water for various uses in urban and semi-urban centers in Taraba State with the general headquarters in Jalingo. According to [6] there are fourteen (14) water supply schemes spread across the state including Jalingo metropolis, but only Jalingo and Ibi - Wukari are operational. The remaining 12 water treatment plants are either grounded due to broken down machines and equipment in some cases or not operational due to lack of operation inputs such as diesel, lubricants, water treatment chemicals, etc. The State Government since 2007 has embarked on spring water development for community water supply under the small town water supply in collaboration with the MDGs/CGS programme of the Federal Government. The towns include Mbamnga, Nguroje, Furmi, Mayondaga, Dorofi, Bang-3 Corner, Tamnya, Maisamari, Leme,

Gomu, Munga-Lelau and Bambuka. In order to meet the state's water supply and sanitation provisions, the State Government established Taraba State Rural Water Supply and Environmental Sanitation Agency under Edict No 5 of 1996. This agency service delivery coverage for potable water and sanitary facilities stand at 53.5% and 41.3% respectively, achieved through the support of the State, FGN, LGAs, External Donors and NGOs.

Sanitation

The health burden associated with lack access to improved water supplies and adequate sanitation is staggering. Each day people especially children are dying from diseases associated with lack of access to safe drinking water, inadequate sanitation and poor hygiene [7]. According to [8] an estimated 103 million Nigerian still lack basic sanitation facilities and 69 million do not have access to improved source of water. Sanitation receives far less attention in Nigeria. For semi-urban, 15% are without access to safe excreta disposal facilities, 75% use pit latrines and 60% discharge wastewater directly to the environment. The situation in the rural areas is not better as only 55% are said to have access to reliable sanitation facilities. The national access to sanitation is put at 42%.

In addition to the above sanitation statistics, it is worrisome to note that majority of the water supply infrastructure, i.e. groundwater wells are constructed without proper consideration of sanitation such as provision of drainage systems for wastewater and spilt water. If provided is either inadequate or requires sensitization on sustainable cleaning (Figs. 1 - 4). Whilst hazardous events range from insanitary/unhygienic activities and the introduction of substances that cannot be treated by the plant conventional treatment processes formed part of the pipe borne water issues of concern (Fig. 9). Consumers' pipe connections and to a lesser extent trunk pipe connections are mostly channeled through poorly sanitized gutter to individual households (Figs. 5 - 8).

Figures 1 – 4: Poor Sanitary conditions of some borehole water supplies

Figures 5 – 8: Pipe connection through insanitary gutter of some pipe borne water supplies

Figure 9: Insanitary activity at Ibbi – Wukari raw water Intake

Service quality

Challenges in water service quality are linked to human health in several ways; water for ingestion, water for hygiene and water for food production [9]. Adequate water for ingestion and food preparation is necessary for human health [1]. However, water consumption increases in warm climates, with physical activity and during pregnancy and lactation. WHO review recommended a minimum of 7.5 liters per capita per day to meet the requirements of most people under most conditions [9].

Many of the people in the study area having access to pipe water receive poor or very poor quality of service. Water supply service quality has many dimensions: continuity (almost all those provided from public utilities in Taraba State receives water on an intermittent basis); water quality (Drinking water sources contains pathogens, dangerous metals or other hazardous chemicals.); pressure (Water pressures vary in different locations of distribution system. Water mains operate at higher pressures, but water users especially car washers and other commercial purpose users connect themselves to the water mains) [10].

Meeting the MDGs for water and sanitation in the next decade will require substantial economic resources, sustainable technological solutions and courageous political will. We must not only provide "improved" water and "basic" sanitation to those who currently lack these fundamental services, but also to ensure that these services provide sustainable safe drinking water, adequate quantities of water for health, hygiene, agriculture and development.

Private sector participation

Private sector water supply is now a dominant force in all urban and semi-urban dwellers through water tankers, jerry cans, bottle water, sachet water etc. [11; 12]. However, the quality of most of these water service providers cannot be guaranteed.

Tariffs

Water supply service providers in the country charge tariffs to recover part of their costs. Many pipe borne water supply systems do not have individual meters on households and therefore, charge flat rates, independent of use. Not only may this lead to undetected leaks, but the flat rates do nothing to encourage conservation of water. Support water provider by paying water bills, as they seek additional funding to make the necessary upgrades. For the cost today is far less than what consequences of inaction would result in the future.

Small leaks and big breaks of storage and distributions system

Historically, the provision of piped water directly to the household has been associated with improved hygiene and reduction of water related diseases [13; 14]. However, as standards of living have risen and water infrastructures have aged, there has been growing recognition that water distribution systems are vulnerable to contamination and contributes to endemic and epidemic water related diseases, especially waterborne diseases [15; 16]. Breaks of distribution systems are cause for alarm and pose significant threats Figs. 10 (A, B & C). Beyond the economic consequences, there are also environmental impacts when the pipes carry wastewater.

Old pipe borne and groundwater boreholes casing are not the only infrastructures that needs urgent attention, dams are rated potentially high hazard and need to be repaired. Water supply facilities occupy a key position, and, therefore, it is essential that they operate without interruption [17; 18]. Although mains failures (burst mains) are often regarded as a structural problem, it should be recognized that any mains failure introduces additional risk to water quality. Pipe leakage is inevitable as pipes age, pipes are broken during construction projects, or new land uses put increased pressure on buried pipes. Greater unaccounted losses of water trigger the search for leaks. Broken or leaking pipes may allow bacteria to enter the distribution system. Not all pipe borne water supplies in the study area are metered and therefore the extents of water loss cannot be accurately evaluated. A major area where water conservation needs to be implemented is in the repair of leaking water distribution systems.

It should be known that, there are varieties of approaches to maintaining water quality integrity in a water distribution system. Different pipe materials have different life times and it is important for water utilities to invest on rates that will maintain the network as a whole and to ensure that it does not deteriorate to such an extent that the number of repairs required either reaches an unacceptable level or cannot keep pace with the outbreak of new leaks.

Figure 10: (A) Improper connection at Wukari GRA, (B) Leakage covered garbage sacks at Gembu Kaka Qtrs, (C) Leakage along network at Gembu Mansur Qtrs.

Diminishing water supply and aging water infrastructure

A diminishing natural water supply and aging infrastructure will impact water business and the state for the foreseeable future [19; 20]. The decline of fresh water has been caused, in part, by draw-down of aquifers, dwindling seasonal change, global warming and increasing levels of contamination, which severely reduced the amount of available quality water that could be pulled. Whilst, the decline in treated water from pipe borne supplies in the study area is associated with, illegal connections on trunk pipes, pipes bursts, inadequate/inappropriate treatment chemicals, capacity building etc. It was evident that some water works uses improvised inappropriate methods to treat raw water as shown in Figs. 11(A & B).

Figure 11: (A). Improper dosing of coagulant (alum) at Ibi-Wukari water treatment plant, (B) Inspecting improper dosing of disinfectants (HTH) at Ibi-Wukari water treatment plant.

Capacity building and awareness creation

Capacity is the ability of individuals, organizations and societies to perform functions, to solve problems and to set and achieve their own objectives [21; 22]. In the water supply and sanitation sector, there are many interpretations of capacity building most of which include reference to approach (the method by which something is done), process (the way and means by which something is done) and investment (what effort and finance is put in to, how and the way something is done) [23]. The concept of capacity building has been in existence since the UN Water Conference in 1977, and its importance has subsequently been reiterated in a number of fora. The water supply sites observation revealed that the major contributing factor for water supply infrastructural failures in Taraba State can be attributed to inadequate capacity of the personnel involved in operation and maintenance leading to facilities mismanagement and subsequent breakdown. Hence, capacity of the personnel involved in water supply of Taraba State needs to be built on regular basis to enable them adequately handle and/or meet new challenges.

Research observations

In the course of this assessment survey the following have been observed;

1. Taraba State Water Supply Agency, supply water to the public through reticulated boreholes, surface water treatment schemes and springs development, but only 2 are operational, while the remaining are either grounded or not functioning due to lack of operational inputs such as diesel, lubricants, water treatment chemicals, etc.;
2. The operational water treatment plants are operating without process control and quality control tests, but physical/visual assessment of the raw and treated water is mostly adopted;

3. Existing spring water schemes have no provision for disinfection, leaving the water unsafe and the network unprotected from recontamination;
4. Standard mode of water treatment operations and maintenance is not observed;
5. No functional laboratory for water analyses, process and quality control tests in the State. Although, the state water agency has constructed a laboratory, but yet to be equipped;
6. No proper documentation of records for operation and maintenance activities.

Major constrains

Although there are many water supply type specific constrains to provision of quality water access in Taraba State. The common difficulties include but not limited to the following;

1. Inadequate investment in water infrastructures;
2. Lack of political will to tackle the tough problems in this area;
3. Inadequate provisions for operation inputs such as diesel, lubricants, water treatment chemicals, etc.;
4. None equipped laboratory in all water treatment schemes for process control and quality control of water to be produced, so as to avoid overdose or under dose of the water treatment chemicals;
5. Improper documentations of records for operation and maintenance activities;
6. None conduct of water intervention surveys to determine whether they are successful and sustainable.

II. Conclusion

Every day, we depend on the health, environmental, social, and economic benefits that clean and safe water provides. In order to continue to enjoy these benefits, we must create a sustainable water infrastructure. For water treatment plant operations, maintenance and management personnel to effectively carry out their roles and responsibilities, they require trainings. The ”Basic Water Treatment Operations Course” is recommended for the Plant Operators; Maintenance Group should be trained on ”Water Treatment Plant and Equipment Maintenance Course” and; The Production Managers/Plant Supervisors, etc., should undergo training on ”Water Supply Operations and Maintenance and Quality Control Course”. There is also the need for community sensitization and mobilization on hygiene and sanitation practices, so as to reduce exposing water sources to variety of hazardous events with potential impact on public health. Establishment of Water, Sanitation and Hygiene Committee (WASHCOM) or Water Consumers Association (WCA) needs to be highly encouraged among the community members.

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