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Urban Transformations - Cities and Water



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Urban Transformations: Cities and Water

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50th ISOCARP

**International Planning Congress
Urban Transformations - Cities and Water**

GDYNIA, POLAND, 23-26 September 2014

4. Water Management

Ayangbile, Oluwabukola; Adeleye, Bamji, University of Ibadan, Ibadan, Nigeria

Residents' water needs in the indigenous core of Ibadan City, Nigeria

The physical availability, accessibility, sufficiency and safety of water and sanitation efforts are a major challenge in Beere, a notable slum in Ibadan, Nigeria. This has resulted in indiscriminate waste disposal, and major health challenges. This paper therefore assesses the availability of portable water and sanitation practices in Beere, Ibadan.

Du, Ningrui; Tang, Wenzhuan, Wuhan University, Wuhan, China

Spatial impacts on water systems and the transition of planning in urbanized areas - Case study in Wuhan, China

It is essential to integrate space for water system into spatial planning. Therefore, the spatial planning system in China needs to be transformed and the integrated water-spatial planning framework is established for the future urban development. (Peer-reviewed)

Glaudinova, Mekhirbanu, International Educational Corporation, Almaty, Kazakhstan

Water in medieval culture and architecture of Turkic people of central Asia

This paper discusses water in the religion, architecture, town planning, irrigation, sacred wells and basins in ancient and medieval temples. This paper also looks at water supply systems and types of hydraulic engineering constructions in Turkic cities.

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Analysis of urbanization of water in India: Implications for policy and practice

This paper examines decision practices regarding rural-urban water transfers, and the consequences of these practices particularly for rural supplying regions in India, in order to recommend improved means for transacting such transfers.

Magazowski, Christoph; Peters, Irene, HafenCity University Hamburg, Hamburg, Germany

A pricing scheme for new sanitation system services

This paper analyzes the hypothesis that NDSS should be implemented because they are able to face the current challenges and they have a cost advantage compared to the centralized system.

Maneewan, Chayanun; van Roon, Marjorie, University of Auckland, Auckland, New Zealand

Effectiveness of constructed wetland systems for mitigating urban runoff and water contamination: A review of recent advances in a tropical climate

The ongoing urbanization of Bangkok has resulted in increased impervious surfaces, high degree of contamination, increased water runoff, and decreased water quality. This study examines the potential of constructed wetlands for contaminant removal and runoff reduction in tropical regions that are parallel to the Bangkok areas. (Peer-reviewed)

Mc Millan, Marissa, Port Of Spain, Trinidad and Tobago

Residents' Water Needs in the Indigenous Core of Ibadan

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Synopsis

The physical availability, accessibility, sufficiency and safety of water and sanitation efforts is a major challenge in Bere, a notable slum in Ibadan, Nigeria. This has resulted to indiscriminate waste disposal, health challenges such as malaria and diarrhea. This paper therefore aims to assess the availability of portable water and sanitation practices in Bere, Ibadan.

1.0 Introduction

Water is the most basic natural resource. More than 97% of the earth's water, for example, is saline ocean water. Another largely unavailable reservoir of water is the 2% of the earth's water frozen in polar ice caps and glaciers. Of the remaining 1% of the earth's water, more than half (0.6% of the total supply) is contained in groundwater (Shiklomanov, 1993).

Water is needed for the maintenance of health. Its importance is not only related to the quantity, but also the quality. Access to water in the required quantity is needed to achieve good personal and domestic hygiene practices (Huttly, 1997); while availability of good quality water ensures that ingested water does not constitute a health hazard, even in a life time of consumption (Ezzati et al, 2003).

Water is vital to the existence of all living organisms, but this valued resource is increasingly being threatened as human populations grow and demand more water of high quality for domestic purposes and economic activities.

Providing safe and secure water to people around the world and promoting sustainable use of water resources are fundamental objectives of the Millennium Development Goals. It is most closely tied to specific targets of the goal 7: to ensure environmental sustainability which are; to integrate the principles of sustainable development into country policies and programmes and

reverse the loss of environmental resources; halve by 2015 the proportion of people without sustainable access to safe drinking water and basic sanitation; significantly reduce biodiversity loss by 2010; and achieve significant improvements in the lives of at least 100 million slum dwellers, by 2020.

However, Nigeria is currently not on track to reach the MDG targets of 75% coverage for improved drinking water and 63% coverage for improved sanitation by the year 2015 (Laah, J.G., 2013). According to the World Health Organization/UNICEF Joint Monitoring Programme for Water Supply and Sanitation (JMP), 36% of the developing world's population- 2.5 billion people lack improved sanitation facilities, and about 768 million people still use unsafe drinking water sources. Inadequate access to safe water and sanitation services, coupled with poor hygiene practices, kills and sickens thousands of children every day, and leads to impoverishment and diminished opportunities for thousands more (WHO,2013). The WHO and UNICEF report for 2012 ranked Nigeria third behind China and India, as countries with the largest population without adequate water and sanitation.

The crave for portable water has been on the increase in every community as population increases. This is the same with the inhabitants of Bere, Ibadan. Assessing portable water has been a major challenge in this area over the years as little attention is paid to the residents water needs, not in words, but in action by the Government and Non-Governmental Organizations.

1.1 Study Area

Ibadan, located in Western Nigeria is the country's second largest city and capital of the Oyo state. It covers an area of nearly 200 km² with a 2014 population estimated at 7,445,995 million. Ibadan is located on the longitude 3° 55' 0" and latitude 7°23' 47". It is linked to Lagos by a major dual carriage highway. Although it has an airport, its use commercially is very limited as a result of its proximity to Lagos the hub of air transport in the country. Ibadan is supplied water from two sources namely the Asejire and Eleiyele dams that feed three existing treatment works. The Asejire dam supplies water to Asejire and Osegere treatment works, while the Eleiyele dam supplies water to Eleiyele treatment works. (Ibadan Water Supply II Project, 2004). Bere which stands as the focus area is found in the Ibadan North West local Government area surrounded by OdoOsun, Oke ado, Orita- aperin and Olaogun with a 1996 population of 1315 persons. However, the population over the years have grown at a geometric rate rather than

arithmetic. The community is likewise an organic settlement with a history connected to the overall capital city growth.

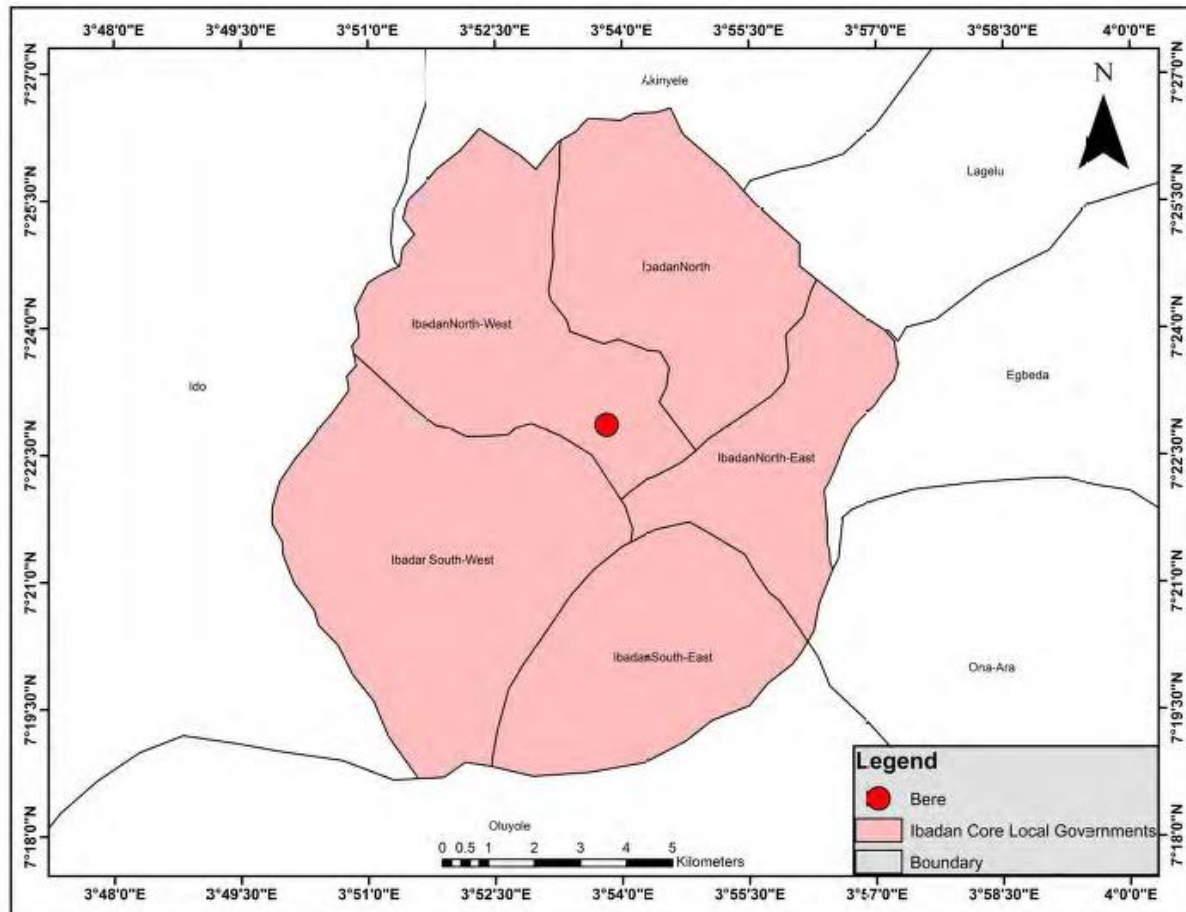


Figure 1: Core Local Governments in Ibadan locating the Study area

Source: Author (s), 2014

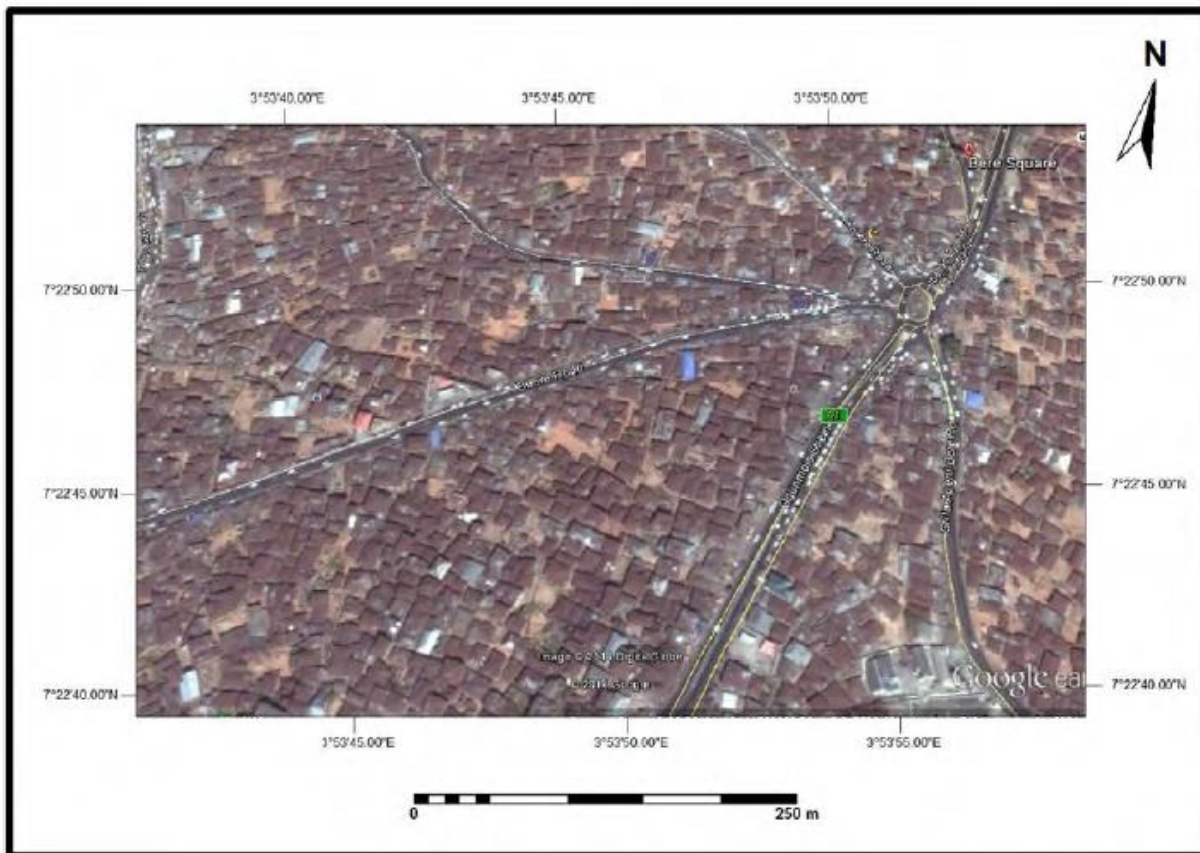


Plate 1: Google Image of Bere

Source: Author (s), 2014

The aim of this paper is to assess the availability of portable water and sanitation practices in Bere, Ibadan and the focus is on the physical availability, accessibility, sufficiency and safety of water and sanitation efforts in Bere. Specific objectives include:

- To identify the existing sources of water at Bere,
- To assess the problems of water and sanitation at Bere,
- To give recommendations that would address the problems of water and sanitation at Bere.

1.2 Methodology

Both primary and secondary data were used for the purpose of the study. Questionnaire was used to obtain primary data. This was randomly administered to about 2 percent of the entire population and those retrieved were analyzed using the Statistical Package for Social Sciences

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20 (SPSS 20) software. Also, interview was carried out involving the Chief Engineer of the Agodi Water Booster Station and some workers at the Oyo State Water Corporation. The Google image of the study area was also acquired from Google Earth to give a spatial overview of the area under study.

The secondary sources of data include map showing the water distribution network within the study area obtained from the Agodi Water Booster Station as well as data from published and unpublished works of other authors.

1.3 National efforts at providing portable water to inhabitants of the country

Accurately assessing the status of Nigeria's progress towards its Millennium Development Goal (MDG) targets is difficult, due to inconsistent data. For instance, the United Kingdom's Department of Foreign and International Development (DFID, 2014) classified Nigeria as "one of the four most off-track MDG countries in Africa." In May 2005, the Nigerian Minister of Water Resources reported that increased spending on water programmes resulted in a huge increase in access to safe water supply, from 35 percent in 1999 to 65 percent in 2004. A year later, the Ministry revised its access figure upwards to 68 percent. The World Health Organization (WHO), however, estimated that the figures are closer to 58 percent for improved drinking water and 32 percent for improved sanitation (WHO, 2008).

While the total volume of water available in surface and groundwater resources is sufficient to meet current drinking water demands in Nigeria, the lack of distribution capacity, coupled with highly variable rainfall patterns, has led to water scarcity in some areas. In addition, the water infrastructure has suffered from years of poor maintenance (World Bank Report, 2010).

To address these problems, Nigeria launched a National Water Supply and Sanitation Policy. Efforts and initiatives have included the completion of hydro-geological mapping of the country, establishment of water-quality laboratories, encouraging private-sector development, and expanding rural water and sanitation systems. However, numerous other factors hamper efforts to expand sanitation and drinking water access, including weak and inefficient institutions, unsustainable public sector spending, poor water quality, and conflicts over water use and management (World Bank Report, 2010).

Water supply coverage rates in Nigeria are amongst the lowest in the world. Access to an improved water source stagnated at 47% from 1990 to 2006, but increased to 54% in 2010. In urban areas access actually decreased from 80% to 65% in 2006, but it then recovered to 74%

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in 2010. However, in urban areas access to standpipes substituted to a large extent to piped water access (Oyebande, 2011).

According to the World Bank, in 2010 water production facilities in Nigeria were "rarely operated to capacity due to broken down equipment, or lack of power or fuel for pumping." The operating cost of water agencies is pushed up 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. As of 2000, about 80% of all government-owned water systems in small towns were non-operational. Through investments and capacity building for communities, the functionality of water points can be increased in the short term. For example, in focus communities supported by UNICEF in Kwara State, functionality has improved from 53% to 98%, and in Kebbi State the functionality of boreholes has improved from 12% to 88%. However, it is not clear what the long-term functionality of these facilities is (World Bank Report, 2010).

1.4 A Glimpse into Water Management in the Country

Three tiers of government share responsibility for managing the country's water resources. At the national level, the Federal Ministry of Water Resources (FMWR) is responsible for developing policy, collecting data, monitoring and coordinating water supply development, and funding research and development. FMWR also collaborates with the Ministry of Environment on water sanitation activities including sewage, storm water control and quality control of water supply sources. The 12 River Basin Development Authorities (RBDAs) are responsible for the development, operation and management of reservoirs for the supply of bulk water in their areas of jurisdiction. RBDAs report to the FMWR on the quantity of water harnessed, sold or released for water supply.

At the State level, the state water agencies (SWAs) are responsible for the establishment, operation, quality control, and maintenance of water supply in urban and semi-urban areas. There are 37 SWAs in the country – one for each State and one in the Federal Capitol Territory. Most are established as corporate bodies that are fully owned by their respective State government, but run according to civil service rules. SWAs are intended to be autonomous and self-accounting, but they often find it difficult to be operationally and financially autonomous from the State government.

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At the local level, Nigeria has 774 Local Government Authorities (LGA), which are administered by local councils. The LGAs are responsible for rural water schemes in their areas and for establishing local Water, Sanitation and Hygiene (WASH) departments. However, only a few LGAs have the resources and skills to address local needs and construct small water systems, and the majority of the LGAs have not established WASH departments (Oyebande, 2011).

In 2000, Nigeria's federal government launched a National Water Supply and Sanitation Policy. The policy encourages private-sector participation, expansion of rural water supply systems, and reform of urban water service providers (Oyebande, 2011).

Table 1: Key Government Agencies Involved in Water Management in Nigeria

AGENCY		DESCRIPTION
Federal Water Resources (FMWR)	Ministry of Resources	<ul style="list-style-type: none"> • Formulation and implementation of policies for overall water resources management; • Monitoring and coordination of water resources development.
Rural Sanitation (RUWASA)	Water and Agency	<ul style="list-style-type: none"> • Improve the quality of life through a sustainable reduction in water related diseases by the provision of clean water, promoting sanitation facilities and hygienic practices.
State Water Agencies (SWAs)		<ul style="list-style-type: none"> • Manage and operate systems for water service delivery in urban areas; • License and monitor private water supply and monitor water quality; • Provide technical assistance to the LGAs.
Local Authorities (LGAs)	Government	<ul style="list-style-type: none"> • Rural WSS service; • Establish, fund, and equip Water and Environment Sanitation (WES) departments.
River Development Authorities (RBDAs)	Basin	<ul style="list-style-type: none"> • Suppliers of bulk water in 12 jurisdictions. • Reservoir and water resources management.

Source: Adapted from Oyebande, 2011; Overview of Water Sector Development in Nigeria

2.0 Findings and Discussions

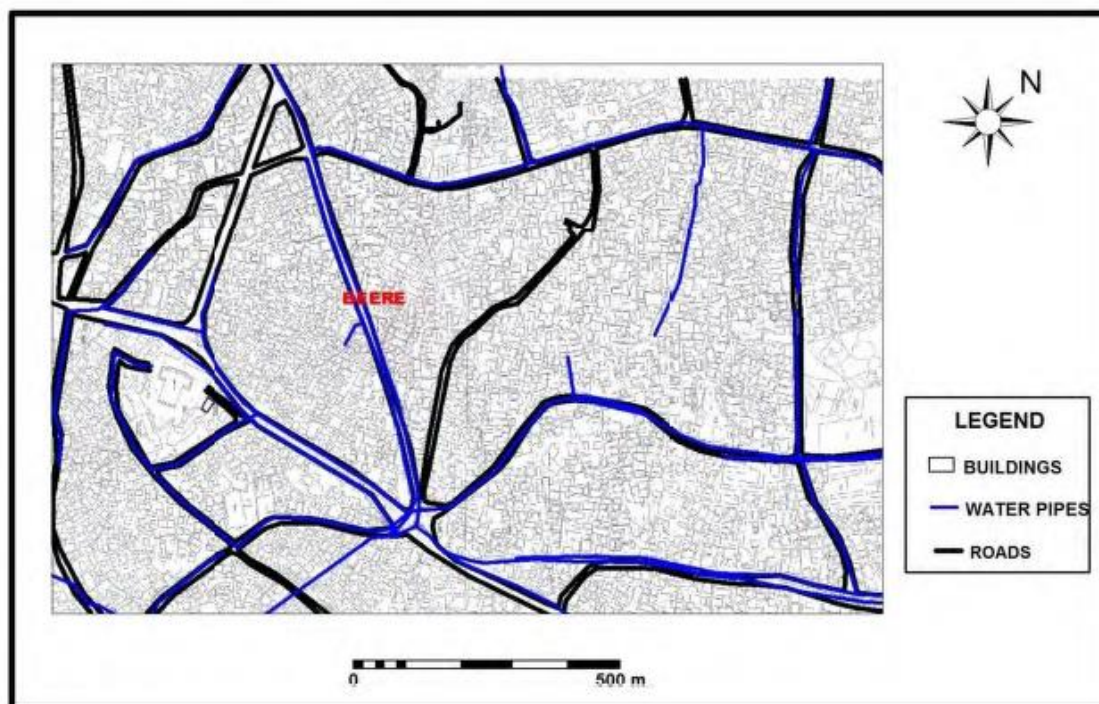


Figure 2:

Ibadan Water Pipeline Network

Source: Agodi Booster Station, 2014

2.1 *Portable water: Source, Need, and Availability*

Safe water is a precondition for health and development and a basic human right, yet it is still denied to hundreds of millions of people throughout the developing world (UNICEF, 2008). The supply of portable water to Bere is handled by the Agodi Booster Station under the Oyo State Water Corporation. The aim of the corporation is to supply water to the nooks and cranny of Oyo State. The Asejire waterworks which takes its source from the Osun river is responsible for the supply of water to the Agodi Booster Station which in turn supplies water to some areas in Ibadan such as Basorun, Iwo road, Molete, Challenge, Apata, part of Eleyele and Bere. The booster station houses two reservoirs with a capacity of 450,000 cubic meter each (Agodi Booster Station records). Water travels the underground pipe over 25km from the Asejire waterworks to reach the Agodi Booster Station which in turn distributes to consumers using gravity, based on available power supply and the state of distribution pipelines.

The inhabitants of Bere require water simply for their daily basic needs like drinking, cooking, bathing and cleaning, yet, the supply and demand rate are yet to be at par. Of the respondents

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who participated in the questionnaire administered, only about 20% have access to tap water. The water pipelines linking some areas within the study area are damaged and even the collection points within the households and neighborhood have been cut off. According to the respondents, this problem has lingered for over 10 years now and no effort has been noticed on the part of the Government and private organizations to remedy this problem. The residents therefore depend on water from wells, and water vendors and occasionally bore-holes. About 80% of the population travel about 11 to over 30metres distance to fetch water while only about 20% assess water within the range 1-10m distance from their abode.

The United Nations suggests that each person needs 20-50 litres of water a day to ensure their basic needs for drinking, cooking and cleaning. About 75% of households in Bere use three kegs of water, equivalent of 60 litres daily and the remaining 25% use between 4 and 6 kegs of water (80- 120 litres), sources of which cannot be adjudged potable. It should be noted that household comprise between 6 to 12 persons in the study area which further implies that the UN standard is far from being met in the area under study.



Plate 2: Household Disconnected Tap

Source: Author (s), 2014



Plate 3: Billboard of Promises

Source: Author (s), 2014

The picture shown in Plate 3 was captured around the Bere roundabout and it shows the present State Governor drinking water from a glass and with the inscription: "Our People Will Never Lack Potable Water Again". It is however noteworthy that this promise has not been in any way matched with adequate effort to achieving it. Most times, on the part of the government, promises of this nature are made during campaign activities, targeting the major needs of the community in question to encourage maximal support from these people to acquire a Political

portfolio but it is painful that when these men get to power, they rarely fulfill their promises, and when they do, the effects are at minimal compared to the population of the people expected to be provided for. At the foot of the billboard are litters whose sight also negates the inscription on the board.

The role of private Organizations and NGOs is likewise not distinct in water provision in Bere. For adequate provision of water infrastructures and water supply in Bere, government may have to collaborate with the Private Organizations and concession some responsibilities to achieve a notable result.

2.2 Water Infrastructures and Distribution

The Agodi Booster Station was officially commissioned in 1996 during the regime of General SanniAbacha, the then President of the Federal republic of Nigeria. The station stands as the phase II of the Ibadan Water Supply Scheme, Asejire. The station's control room houses four pumps responsible for pumping water from the two reservoirs to areas of lower elevation like Bere and Molete and areas of higher elevation like Iwo road and Basorun in Ibadan. Two surge tubes/ tank lie just outside the control room, with each of it attached to two pumps. The Surge tank is an air filled safety device that resists pressure to protect the pumps when water rushes back towards the pump due to power outage.

According to the interview carried out with the Chief Engineer at the Booster station, the infrastructures on ground are enough to service the population that the water supply is directed at, but the people at the receiving end (people in the study area) do not agree with this affirmation as little or no water is supplied to their community. Many inhabitants from Bere fetch tap water from their neighboring settlements. The BereBooster Station stands as an intermediary between the Agodi Booster Station and the consumers.



Plate 4 : Surge tanks

Plate 5: Water pumps

Source: Author (s), 2014

Source: Author (s), 2014

2.3 Availability and Distribution Problems

The problems associated with portable water availability and its efficient distribution range from damaged/old/evacuation of pipelines due to road dualization, to irregular power supply, insufficient operational vehicles, poor equipment maintenance, insufficient personnel, few boreholes, shallow wells, poor sector monitoring and accountability, inadequate monetary support from the government, lack of political will to support the cause and the unwillingness of consumers to pay for water supply- this is because water is seen as a social service by the inhabitants of this area rather than as an economic good.

2.4 Water and Sanitation

Sanitation literally means measures necessary for improving and protecting health and well-being of the people. Sanitation is any system that promotes proper disposal of human and animal wastes, proper use of toilet and avoiding open space defecation. The term sanitation as defined by United Nations Children Fund (1997) refers to a process whereby people demand, effect, and sustain a hygienic and healthy environment for themselves by erecting barriers to prevent the transmission of disease agents. Such an approach is needed not only to prevent disease and promote health, but also to lay the foundation for sustainable development. 2008 was declared International year of sanitation by the United Nations General Assembly because Sanitation had been neglected for a long time and this has resulted into high level of sickness and death especially among infants. Sanitation facilities must be culturally acceptable, affordable and assessable by people.

Bere is a notable slum in Ibadan with a poor sanitary condition; also, the area is not well connected with drainage facilities and where there are, they often end abruptly. About 88% of respondents throw their sanitary waste to the open space and which promotes the spread of excreta-related diseases such as typhoid, cholera, diarrhea and dysentery; majority of the houses lack toilet facilities. Water and sanitation go hand in hand as the availability of one enhances the other and the lack of one equally tells on the other. For an effective improvement in Water and Sanitation, there is need to consider the following options for strategic planning: community identification; community participation; technology options; financing, institutional arrangements; and political will. Poor drainage network, poor sanitary condition and insufficient portable water contribute to the health issues experienced by the residents.

Lack of basic sanitation indirectly inhibits the learning abilities of millions of school- aged children who are infested with intestinal worms transmitted through inadequate sanitation facilities and poor hygiene (World Health Organization/ United Nations Children Fund, 2004). Safe drinking water, good hygiene and sanitation are fundamental to health, survival, growth and development.

2.5 Effects of Poor Sanitation Practices/Water Quality

The consequences of poor water quality go beyond health. Poverty alleviation and the other Millennium Development Goals will be difficult to achieve without improvements in water quality (UNICEF, 2008).

Poorly controlled waste also means daily exposure to an unpleasant environment. The buildup of faecal contamination in rivers and other waters is not just a human risk: other species are affected, threatening the ecological balance of the environment. Poor Sanitary condition exposes people to diseases; Child Abuse is heightened as children and women are mostly responsible for fetching portable water from the source (far or near) or selling water- Water Vendors; Lack of access to basic services is also promoted by the rate of water insufficiency as children are sometimes denied the opportunity to go to school.

Table 2: Bradley classification system for water-related diseases

Category	Example	Intervention
Water-borne	Diarrhoeal disease, cholera, dysentery, typhoid, infectious	Improve drinking-water quality, prevent

	hepatitis	casual use of unprotected sources
Water-washed	Diarrhoeal disease, cholera, dysentery, trachoma, scabies, skin and eye infections, ARI (acute respiratory infections)	Increase water quantity used Improve hygiene
Water-based	Schistosomiasis, guinea worm	Reduce need for contact with contaminated water, reduce surface water contamination
Water-related (insect vector)	Malaria, onchocerciasis, dengue fever, Gambian sleeping sickness	Improve surface water management, destroy insect breeding sites, use mosquito netting

Adapted from UNICEF, 2008 handbook on water quality

The discharge of untreated wastewater and excreta affects human health by different means; by polluting drinking water, entry into the food chain via fruits, vegetables and fish, bathing and other contacts with contaminated water and by providing breeding sites for insects that cause diseases. The major health challenges in Bere range from malaria, dysentery, diarrhea, fever and typhoid courtesy of incumbent portable water supply and poor sanitation efforts and facilities.

2.6 Combating strategies

□ Water Need Planning and Management

The greatest opportunity to influence project outcomes, minimize risk and reduce costs exists in the early stage of an initiative. For the optimal achievement of a financial, social and environmental result in addressing the water need of people in Bere, good planning is paramount. Planning should be an iterative process which attempts to balance service needs with infrastructure, operation and maintenance, financial and environmental options.

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- Key stakeholders should be identified and involved up-front in the planning stage as their involvement can beneficially influence the planning process as well as the project outcome and they should be supplied with the appropriate information suitable for their overall involvement and responsibilities.
- Non-asset solutions, full lifecycle costs, risk and maximising existing infrastructure capability should be considered before deciding to either construct new assets or replace assets.
- The components of water loss should be identified and actions required minimizing or ruling out the identified components embarked upon. For example, leakages.

Existing and future water demand should be separated into internal and external components so that the impact of demand management changes can be properly assessed.

It is essential that planners examine the underlying basis for current and future water demand particularly in terms of the many variables affecting internal and external demand components. Effective planning outcomes can only result from rigorous analysis, the application of strategic thinking skills and the adoption of an integrated approach to urban water planning which considers, where appropriate, water supply, sewerage and management of storm-water as a single system (Queensland Department of Energy and Water Supply, 2014).

☐ Effective water supply planning

Planning should include a comprehensive and rigorous identification of all options to meet the defined service levels, including options based on non-asset solutions. In Planning for an effective water supply for Bere, the following should be included:

1. Protect the quality of ground- and surface-water supplies.
2. Inform the people of Bere about the importance of water-resource stewardship.
3. Manage withdrawals from water sources to protect long-term productive yields.
4. Foster intergovernmental communication for water conservation and planning.
5. Meet data collection needs so as to continue informed and effective water supply planning.
6. Improve integration of land use and water use planning and management.

☐ Integrated Water Resource Planning (IWRP)

IWRP evolved from a growing recognition of the interconnection of environmental systems and society's impacts within them (Beecher, 1995). In many areas, increasing populations and water demands have exceeded regionally-minded planning; by sharing resources with neighboring areas, planners have found more cost-effective solutions to water scarcity. Multiple stresses on areas have also necessitated multidisciplinary responses.

Integrated Water Resources Planning (IWRP) is a holistic approach to the management of water systems combining water supply, water demand, water quality, environmental protection and enhancement, rate structures, financial planning, and public participation which if adopted for Bere will help address the problems earlier identified in this study as relating to water availability, supply, demand and management. IWRP was created because of the growing recognition that water resources planning is a complex activity and that society's needs are changing. IWRP emphasizes consideration of the feedbacks that exist in water resource management, and uses new techniques to cost-effectively balance system side and demand side needs (Palmer & Lundberg, 2003).

There are numerous characteristics of IWRP, but the most important are:

- 1) Public involvement is emphasized throughout the planning process,
- 2) Water demands are forecasted with care and with attention to the impacts of price, water policy, and water law,
- 3) Water supply is forecasted recognizing the role of synergistic gains and the role that operations play in system yield,
- 4) Reliability is considered a parameter to be evaluated rather than a constraint and management alternatives are considered in defining reliability,
- 5) Source strategies encourages consideration of unique combinations of solutions and careful consideration of planning objectives,
- 6) Financial planning always considers the impacts the rate structure, and
- 7) Drought contingency planning is included as an essential element of the IWRP process.

An integrated Water Resource Planning adopted and practiced as due might just be a key answer to the water demands and needs of the inhabitants of Bere, the capital city of Ibadan and Nigeria at large.

Guidelines must be appropriate for national, regional and local circumstances, which requires adaptation to environmental, social, economic and cultural circumstances and priority setting.

The WHO Guidelines outline a preventive management "framework for safe drinking water" that comprises five key components:

- health-based targets based on an evaluation of health concerns;
- system assessment to determine whether the drinking-water supply (from source through treatment to the point of consumption) as a whole can deliver water that meets the health-based targets;
- operational monitoring of the control measures in the drinking-water supply that are of particular importance in securing drinking-water safety;
- management plans documenting the system assessment and monitoring plans and describing actions to be taken in normal operation and incident conditions, including upgrade and improvement, documentation and communication; and
- a system of independent surveillance that verifies that the above are operating properly.

3.0 Recommendation

The quality of drinking-water may be controlled through a combination of protection of water sources, control of treatment processes and management of the distribution and handling of the water. The following recommendations can be adopted for effective water distribution and management in the study area as well as in similar communities:

- Preparation of a Water and Sanitation Plan for Bere for a sustainable demand and supply program.
- Improve and increase portable water sources including rainwater harvesting, protected dug-well, bore-holes, public taps and tapped water into dwellings should be introduced.
- Introduce improved sanitation systems including flush sewer system, pit latrine with slab and composting latrine.
- Alternative energy source should be adopted by the water cooperation board in Ibadan so as to address the problem of incessant power outage. This will go a long way in ensuring constant water supply by the water cooperation.
- GIS Mapping of urban water distribution network & leakage detection;
- Repair, laying and monitoring of pipe bursts, and pipes in filthy drains;
- Water users associations and their training- rural and semi-urban areas.

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- Role of NGOs, Civil societies & private sector in water sector. Private (NGOs) and public sectors should be encouraged to invest in the water and sanitation sector to achieve laid down targets.
- Stakeholders and community heads should be integrated in the preparation of a water and sanitation plan for Bere for sustainability of the plan.
- Collaboration of the Government and Private Organizations (Concession) on Water Supply or Privatization of Water Corporation.

4.0 Conclusion

About one-third of the world's population lives in countries suffering from moderate-to-high water stress — where water consumption is more than 10 per cent of renewable freshwater resources.

In the course of this research, it was established that over 50% of the residents of Bere do not have access portable water supply and sanitation facilities. With this prevailing need gap, the people of Bere are often forced to trek for miles in search for portable water, more so the untidy nature of the neighbor-hood can be attributed to poor drainage system, uncollected waste, inadequate waste bins and lack of adequate sanitation facilities. On this basis a water and sanitation plan will be a good start-up option to address these problems; where additional water sources and sanitation facilities will be introduced so as to meet the needs of the people/residents.

It is important to note that access to portable water and sanitation facilities will go a long way in promoting the public health and ensuring good hygiene which will in turn reduce water borne diseases more so, Improved water supplies will lead to reduced expenditure on the part of the residents (purchase of water from vendors).

Having adequate Knowledge about water consumption is a prerequisite to establishing a sustainable water policy and protection (E-Source, 2011). This Information is pertinent to evaluate the water needs of the residents of Bere in creating new facilities. To assure the durability of water resources, integrated suitable water management should be the priority of the government so as to meet the need of the future population.

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