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SUSTAINABLE URBAN WATER SUPPLY: AN INDISPENSABLE PROGRAMME TOWARD REALIZING THE TARGET 7 OF THE MILLENNIUM DEVELOPMENT GOALS IN NIGERIA

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ABSTRACT

Access to safe drinking water and adequate sanitation are part of the Millennium Development Goals of reducing poverty by the year 2015. Existing literatures have revealed that large population of the world have a low level of access to safe water. Several reports have also indicated that Africa is the region that suffers most from this lack of access to sustainable water supply. The paper explored the importance of sustainable urban water supply toward realising the target 7 of the Millennium Development Goals (MDGs) by the target date of 2015. From the results of the case study the supply from functioning boreholes was found to be inadequate based on the guidelines of the World Health Organization (WHO) and the International Reference Centre for Community Water Supply. This further indicated that unless serious measures are undertaken by concerned authorities in ensuring sustainable water supply, realizing the MDGs would be a difficult task.

INTRODUCTION

Urban water supply is an essential scheme put in place to provide sustainable water supply to urban communities. Urban water infrastructure typically includes water collection and storage facilities at source site, water transport via aqueducts (canals, tunnels, pipelines, e.t.c) from source sites to water treatment facilities, storage and distribution systems (UNESCO, 2005). Most urban water users require high quality water in which the natural surface and groundwater supplies called raw water often cannot meet the quality requirement of domestic and industrial users. In such situations water treatment is required prior to its use. Access to safe drinking water and adequate sanitation are part of the Millennium Development Goals of reducing poverty by the year 2015. Safe water has been described as water that meets the National Standard for Drinking Water Quality for Nigeria (FMWR, 2004). However, abnormally low levels of access to clean water by a large proportion of humanity have been reported (Chovmen et al., 2009). Several reports have in the past emphasise the non performance of responsible authorities towards the implementation of development programmes especially water supply as indicated by Ray and Ali (2011). WHO-UNICEF (2000) revealed that in the year 2000, nearly 1.1 billion people still remained without access to improved source of water and that about 2.4 billion had no access to any form of improved sanitation facilities. Considering the population growth, these figures are expected to increase unless appropriate and sustainable measures are undertaken to reverse the trend. The millennium development goals are series of eight time-bound development goals that seek to address issues of poverty, education, equality, health and the environment, to be achieved by the year 2015. They were agreed by the International community at the

United Nations Millennium Summit, held in New York in September 2000. To address these challenges, all member countries of the United Nations signed the Millennium Declaration in September 2000, which laid out quantified, targeted goals-the Millennium Development Goals (MDGs) – to halve extreme poverty in its many forms by 2015 (Chovwen et al., 2009). By the seventh Millennium Development Goal (MDG), proportion of people without sustainable access to safe drinking water must be halved by 2015. Reaching this target implies inter alia tackling both the quantity (access- scarcity) and quality (safety) dimensions of drinking water provision (WHO, 2010).

In developing countries where over 70% of the population live in rural environments, the MDGs will be reached only if a serious effort is made to ensure sustainable water supply in both urban and rural areas (Binder, 2008). Bourrigault (2006) stated that many countries of the world have a challenge in reaching the target 7 of the millennium Development Goals which is to halve the proportion of people without access to safe drinking water by 2015. According to WHO-UNICEF (2000) 28% of the unserved population for water supply live in Africa. Therefore, Nigeria which is the most populated country of the continent will be central as to whether or not Africa realizes the MDGs (DFID, 2004). The government of Nigeria as stated by Bourrigault (2006) has to cope with extreme poverty, low human development, corruption and decentralisation of responsibilities for water and sanitation from central and local government (Wateraid 2005). These constraints according to Bourrigault (2006) are partially responsible for the poor performance in the provision of safe water supply to its citizens.

Water Demand

The water demand of a community depends on various factors such as climate, standard of living, type of water supply system, type and extends of sewerage system used, water pricing, availability of private supply and method of distribution among others. Depending on the climate and workload, the human body needs about 3 to 10 L of water per day for normal functioning (IRC 1981). While a minimum of 70 to 100 L per capita per day may be considered adequate for the domestic needs of urban communities, the non-domestic needs of urban communities would significantly push this figure up. The non-domestic needs basically depend on standard of living of the community. The non domestic requirements of developing countries estimated by (IRC, 1981) are given in Table 1. It is difficult to estimate the amount of water needed to maintain acceptable or minimum living standards. Moreover, different sources use different figures for total water consumption. According to Gleick, (1996) a range of 20 - 40 litres of fresh water per person per day is generally considered to be a necessary minimum to meet needs for drinking and sanitation alone. If water for cooking and bathing is included as well, this figure varies between 27 and 200 litres per capital per day. Gleick (1996) proposes that international organizations and water providers adopt an overall basic water requirement of 50 litres per person per day as minimum standard to meet the four basic needs of drinking, sanitation, bathing and cooking.

Table 1: Non-Domestic Water Requirement for Developing Countries

Category	Typical water use
Schools	
Day Schools	15-30 L/day per pupil
Boarding Schools	90-140 L/day per pupil
Hospitals with Laundry facilities	220-300 L/day per/bed
Hostels	80-120 L/day per student
Restaurants	65-90 L/day per seat
Cinema Houses	10-15 L/day per seat
Offices	25-40 L/day per seat
Railway and Bus stations	15-20 L/day per seat
Livestock	
Cattle	25-35 L/day per animal
Horse and mule	20-25 L/day per animal
Sheep	15-25 L/day per animal
Pigs	10-15 L/day per animal
Poultry – chicken	15-25 L/day per 100

Source: IRC (1981) Small Community Water Supplies, International Reference Centre for Community Water Supply and Sanitation, The Hague, Netherlands

Water Supply and Health

The availability of a clean and safe water supply is essential for public health. A sufficient amount of safe drinking water is important in the control of many diseases. The World Health Organization (WHO, 2003) has estimated that as many as 80% of all infectious diseases in the world are associated with insufficient and unsafe water. This is particularly established for diseases such as diarrhoea, cholera and typhoid fever (WHO, 2003). Domestic water supply is one of the fundamental requirements for human life. Without water, life cannot be sustained beyond a few days and the lack of access to adequate water supplies leads to the spread of diseases. Children bear the greatest health burden associated with poor water and sanitation. According to the report of the World Health Organisation, WHO (2003) diseases attributed to poor water supply, sanitation and hygiene account for 1.73 million deaths each year. As of the year 2000, WHO-UNICEF (2000) estimated that one-sixth of humanity (1.1 billion people) lacked access to any form of improved water supply within 1 kilometre radius of their home. Lack of access to safe and adequate water supplies contributes to ongoing poverty both through the economic costs of poor health and in the high proportion of household expenditure on water supplies in many poor communities, arising from the need to purchase water and time and energy expended in collection.

Water Requirement in Emergencies

In extreme emergency situations, there may not be sufficient water available to meet basic needs and in these cases, supplying a minimum level of safe drinking water for

survival is of critical importance (WHO, 2011). The amount of water required in supporting life and health in emergencies usually varies with climate, the general health of the people affected and the level of physical fitness (WHO, 2011). Having a few litres of water to drink everyday for example is more important than having water for personal hygiene or laundry, but people will still need to wash for the prevention of skin diseases and meeting other needs. The need of water decreases with hierarchy as shown in figure 1 (WHO, 2011).

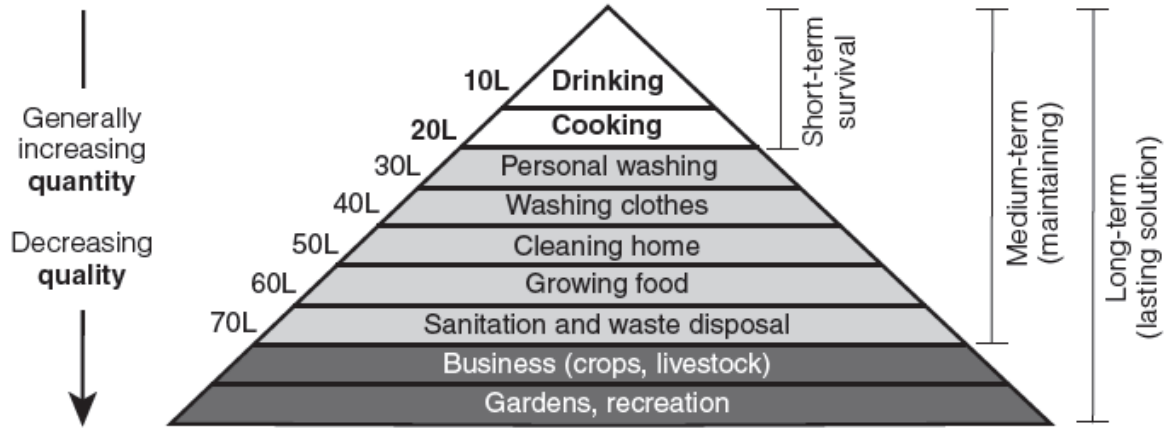

Fig.1 Hierarchy of Water Requirement after Maslow's Hierarchy of needs
Source: WHO (2011)

Determination of Per Capita Water Use

According to the Florida Department of Environmental Protection (FDEP, 2010) the concept of per capita water use is often used for comparing water use over time or among groups of people. Per capita water use is the average amount of water each person in a particular area uses on a daily basis expressed as litre per capita per day. Per capita measurements are used for a number of purposes including assessing water demand and identifying use patterns. Per capita estimations are influenced by numerous factors including seasonal population variations. Commuters can also change per capita rates, increasing the water use of the cities they commute to and decreasing the water use of where they live (FDEP, 2010). Facilities that use large amount of water per day in their manufacturing process can also raise per capita water use rates even though residence in the same service area do not use high quantity of water. The FDEP (2010) indicated that the total water withdrawn can be used to determine the water use which refers to the amount of water actually pumped from the water source. FDEP (2010) further stated that sometimes it is necessary to use what is referred to as the 'finished water' which is the water withdrawn plus any water imported from another utility, minus losses that occur during transport and treatment. The standardized per capita measurements as indicated by FDEP (2010) are the uniform gross per capita (UGPC) which considers all water use in a service area including large quantity of users such as industries, commercial or institutional users and the uniform residential per capita (URPC) which evaluates household water use only.

$$Uniform\ Gross\ per\ capita = \frac{utility\ service\ area\ finished\ water\ use}{utility\ service\ area\ residential\ population} \quad (i)$$

$$Uniform\ residential\ per\ capita = \frac{utility\ service\ area\ finished\ water\ used\ by\ dwelling\ units}{utility\ service\ area\ residential\ population} \quad (ii)$$

Where; Utility Service Area Finished Water Use is the sum of finished water used by all sectors (residential, industrial, commercial, etc.) served by a utility.
Utility Service Area Finished Water Use by Dwelling Units is the sum of finished water used by all dwelling units served by a utility.
Utility Service Area Residential Population is the number of dwelling units served, multiplied by an estimate of persons per household.

The Case Study

To complement the research an investigation in to the water supply system of Bama Town in North Eastern Nigeria was undertaken. The population of the study area which was used to estimate the consumption and water requirements was based on estimated figure of 2006. This figure was projected using the growth rate of 3% to estimate population figure of 2009 using the Geometric method of population forecast (Waziri, 2009). The projected 2009 population figure is 99,352.

Water Supply

The supply estimate from nine functional boreholes as at the time of the research was 892,800 litres per day.

Consumption estimates

The water requirement for a community is normally made up of the domestic and non domestic demand. The domestic demand refers to those requirements for cooking, bathing, drinking and sanitary purposes. While the non domestic demand include those for boarding schools, restaurants, hostels e.t.c. The domestic and non domestic requirements were estimated using the guidelines of the International Reference Centre for Community Water supply and Sanitation technical notes for developing countries (IRC, 1981). Based on the domestic requirement of $75\ l/c/day$ (IRC, 1981) the requirement for a population of 99,352 (2009) was calculated to be 6,699,525 1/day. The non domestic requirement for the study was calculated based on the requirements for developing countries provided by the International Reference Centre for community water supply IRC (1981) in Table 1.

Table 1: Non-domestic water requirement in Developing Countries

Category	Typical water use
Schools	
Day Schools	15-30 L/day per pupil
Boarding Schools	90-140 L/day per pupil

Hospitals with Laundry facilities	220-300 L/day per/bed
Hostels	80-120 L/day per student
Restaurants	65-90 L/ day per seat
Cinema Houses	10-15 L/day per seat
Offices	25-40 L/day per seat
Railway and Bus stations	15-20 L/day per seat
Livestock	
Cattle	25-35 L/day per animal
Horse and mule	20-25 L/day per animal
Sheep	15-25 L/day per animal
Pigs	10-15 L/day per animal
Poultry - chicken	15-25 L/day per 100 birds

Source: IRC (1981), *Small Community Water Supplies, International Reference Centre for Community Water Supply and Sanitation, The Hague, Netherlands*

Taking into account various populations of schools, hospitals, hostels, offices and requirement for livestock the non domestic water requirement was estimated to be 160,600l/day. Therefore the total water requirement for the study area is 6,860,125 1/day.

Deficit

The deficit in supply was determined by comparing the water requirement to the total supply from functional boreholes, the deficit was calculated as:

- Deficit = quantity required – quantity supplied

$$= 6{,}860{,}125 - 892{,}800$$
$$= 5967325 l/day$$

Since the total water demand is greater than the total supply, it implies that the supply from the functional boreholes is not adequate. From the result only 13% of the requirement is met by the supply. This implies that only 13% of the population can be adequately served by that supply. Therefore serious efforts need to be made in meeting the deficit in order to provide sustainable water to the community.

CONCLUSION

By the Seventh Millennium Development Goal proportion of people without sustainable access to safe drinking water must be halved by 2015. The study revealed that this can only be realized if the government and other responsible authorities would make serious efforts toward the provision of sustainable water to both urban and rural communities. Extant literatures have indicated the efforts been made by various international institutions toward providing clean water to the deprived population in the world. In Nigeria efforts made by authorities concerned in meeting this target of providing safe drinking water to some urban and rural communities is not adequate as evident from the findings where only 13% of the requirement is provided. This may be attributed to technical, administrative and political problems. In order to meet the seventh Millennium Development Goal by the target date of 2015, water supply systems across the country

need to be evaluated for appropriate improvement and adequate maintenance in order to meet the target.

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