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Water Demand Management: Its Concepts and Applications to Nigerian Situations

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ABSTRACT
Water demand management has become a major factor in many parts of the world because of fast population growth and competing demand for water. This is aggravated by high urbanization and pollution-growth. This paper examines the general concepts of water demand management, its applications to Nigerian situations, the country's water resources pattern, and water demand management. The paper proffered recommendation and also conclusion for the way forward.
Keywords: Water demand management, concepts, applications

INTRODUCTION

Water demand management is one of the major factors in the world today. Growing urbanization in most developing Countries has worsened the situation by uncontrolled pollution of both surface and ground water sources. Instead of managing supply by developing new sources for the ever-increasing demand, water conservation and managing the demand for water has become the sensible approach to cope up with.

Some Countries consider water demand management as water conservation in its general sense, while others define it as strategies which improve the efficient equitable and sustainable management and use of water in an urban setting. Whichever definition is used, water need to be conserved and be used efficiently so that the resource is actually available for the future generation and the general ecological balance sake and sustainability.

Nigeria is presently facing critical water shortage because of limitation of water sources both in rural and urban centres. The main reasons for the shortage are it's physical locations, the delay in the development of new sources and the financial constraint. Even if the financial and other sources could be available, it usually takes from 5 to 8 years to develop new sources and deliver water to the users. With no alternative to satisfy domestic supply of water for Nigerian citizens,

maximizing the use of the existing water sources and facilities is the only option available.

The Concepts of Water Demand Management

Historically, unrestricted domestic, institutionally, industrially, fire fighting, and other needs including unaccounted water are the factors used to fore cast water demand. This approach is no more appropriate with the limited water available in the country and the fast growth of the urban population in the present world. This situation is further increased in developing countries by high degradation of the natural ecosystem. The provision of water is not only considered for it's economic and social importance, it is also considered as one of the basic human right for survival in general

WATER DEMAND MANAGEMENT INSTRUMENTS

Some experts generally categorize water demand management methods into two groups, namely as physical and financial. Others prefer to define them by subdividing into economic, technical, legal, institutional and social measures. The second categorization seems more appropriate for practical application for addressing general water conservation issues. The first categorization gives emphasis on technical measures, while the second considers fell aspects of the available

- The economic measures includes charges and water tariff and to provide the basic amount of safe water for basic human needs at an affordable price as other human rights, such as food at no-cost. Water wastage is mostly observed in irrigation, industries, institutions and in general by high consumers. By levying higher charges to such consumers usually helps in reducing wastage of water and at the same time allow social justice.
- The technical measures available for water demand management are wide. They can be classified according to the point of application i.e at source, delivery and the point of use. The measures at source include catchments protection, silt trap, recycling of backwash water and sludge. On the delivery side, measures side, measure such as leakage control by proper material selection and regular system monitoring and maintenance, controlling breakage and pressure regulation. Other conservation measure in the delivery system could be dual water supply system for consumptive and non-consumptive use of water that may require re-use and recycling.

X- Raying the Nigerian Water Resources Pattern

Nigerian is a country that has large green and blue water resources, with subsequent long periods of the year from the water perspective. However, the water sector is unevenly distributed across the different regions of the country with surplus in some regions and heavy scarcity in other regions. This is an indication of the need for efficiency in the use and productivity improvement in the water scare regions. It is observed that in the dry land areas of the north, human habitation relies heavily on ground water resources that are recharged from fresh water percolation and run off during the rainy season. Anything that upsets this balance affects the people who live in such places. The table below show the resources, (Table 1), major inland water resources (Table 2), and sample of water use patterns (Table 3), by available water sources in Nigerian.

Table 1: Water Resources in Nigeria

Water resources	Year	Amount	Unit
Average precipitation	2005	1150	Mm/yr
Total precipitation	2005	1062,336	Km^3/yr
Internal renewable water resource-total	2005	221,000	Km^3/yr
External renewable water resources-water	2005	286,200	Km^3/yr
Total water resources	2005	286,200	Km^3/yr
Irrigation water requirement	2005	1650	Km^3/yr
Water withdrawal			
Agriculture	2000	5507	Km^3/yr
Domestic	2000	1687	Km^3/yr
Industrial	2000	810	Km^3/yr
Total	2000	8000	Km^3/yr

Source: Aqua sat, 2005

Table 2: Major inland water Resources (including brackish and freshwater flood) of Nigeria

Water Body	**Surface Area** (ha)
Major rivers:	
Anambra River	1,401,000
Benue River	129,000
Cross River	3,900,000
Imo River	910,000
Qwa iboe River	910,000
Niger River (less kainji & Jebba Lakes)	169,800
Ogun River	2,237,000
Oshun River	1,565,400

Subtotal	**10,812,400**
Major Lakes and reservoirs:	
Lake Chad	550,000
Kainji lake (man-made)	550,000
Jabba lake (man-made)	127,000
Shiroro lake (man-made)	31,200
Goronyo lake (man-made)	20,000
8 other (man-made)	90,400
Subtoyal	**853,000**
Floodplains	3,221,500
Total, major fresh water resources	14,886,900
Other fresh water bodies	
Delta and estuaries, brackish	858,000
Other (minor reservoirs, fishponds)	104,400
Miscellaneous wetlands suitable for rice	4,108,100
Total, all inland water bodies	**19,958,000**

Source: ita *et al.,* 1985; ita, 1993; Olagunju, 2007

Table 3: Sample of water use patterns by available water sources in Nigeria (FGN,2000).

Spring/ stream	32%
Hand dug well (w/apron)	30%
Hand dug well (w/out/apron)	27%
Rain	20%
River	16%
Pipe borne	14%
Borehole	14%
vendors	6%

Source: Ita *et al.,* 1993,1995, Olagunju 2007

WATER DEMAND MANAGEMENT FOR NIGERIA

Water demand management for Nigeria should be tailored towards the following:-

i. Improving efficiency of water use in the urban areas, both in the productive and domestic sectors through the introduction of water demand management (WDM) measures at city level
ii. Mitigating the environmental impact of urbanization on aquatic ecosystems, through the adoption of integrated approach in management urban water resources, taking cognizance of the links between water urban development and the environment.

iii. Enhancing flow of information and the best practices towards urban water resource management

The above Objectives should focus on the following:

(1) Water demand management, which should incorporate the
   a) Development of water demand management and implementation plan
   b) Establishing a WDM unit
   c) Capacity building and leak detection activities
   d) Promotion of WDM in existing and planned water projects

(2) Environmental impact assessment (pollution control) which should incorporate the
   a) Developing strategy and implementation plan for environmental monitoring of water sources in Nigeria
   b) Developing groundwater management plan for early warning for large population in the country
   c) Community based pollution control by promoting small-scale dislodging technology for pit latrines in densely populated area and providing opportunities for income generating activities

(3) Public awareness campaign:- developing strategy and action plan for public awareness campaign both in water demand management and related environmental issues

RECOMMENDATION

i. With the daily increase in demand for water use in terms of domestic and industrial use in the country, in both cities and villages, it has become imperative that government should implement immediate action in solving the water demand within the country.

ii. The ministry of water resources and other water sectors and regulatory bodies should be saddled with the responsibility of accessing all water sources (e.g Dams, reservoirs) rivers, etc in the country, with an encouragement to expand the various sources of water.

iii. It is also recommended that proper maintenance be afforded to various water storage facilities (eg wells) in local and rural areas in order to obtain maximum yield from those sources, especially during dry season in those areas that are usually proned to scarcity of water.

CONCLUSION

Water demand management is a major factor in many parts of the world. It has indeed contributed to the prosperity of many nations. Nigerian is very rich in both surface and ground water resources, but it is uncleanly, but it is unevenly distributed across the different regions of the country as a result of improper management. The increasing rate of industrialization in the country and also the high rate of population growth have equally affected the water demand management. It is high time a critical action is taken in order to advance the water demand management in the country.

REFERENCES

Gana A.J, Osueke O.C (2012) Integrated Water and Waste Management Published by *World Journal of Applied Science and Technology*, Vol 4, No 2,

UNICEF (2015) 66m Nigerians have no Access to Safe:- Daily sun , 20th August, Thursday, 2015

WHO (1985), Guidelines for Drinking Water Quality, Volume 1-3, Geneva, 1985

WHO (199) Guidelines for Water Quality, Hearth Criteria and other Supporting Information, 2nd Edition, Volume 2Geneva, 1996

WHO (1997) Guideline for Drinking Water Quality:- Surveillance and Control of Community Water Supplies, 2nd Edition, Volume 3, Geneva

FBRE Ministry of Water Resources (1998) Ethiopian Water Resources Management Policy

Larry W. Mays. Ed (2000) Water Distribution Systems Hand Book, Mc graw – hill, new York

Well (1998) Guidance Mantel on Water Supply and Sanitation Programmers, WEDC for DFID.

Abebe –B (2001) Water Demand Management, Ethiopian Association of civil Engineers, Addis Ababa