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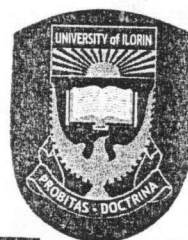
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CHALLENGES OF WATER RESOURCE DEVELOPMENT AND MANAGEMENT IN NIGERIA

By

Iroye, K. A. Ph.D.

Department of Geography and Environmental Management

University of Ilorin

E-mail. iroyekayode@yahoo.com

Abstract

Water is finite and vulnerable resource, essential in maintaining life, environment and development. This vital resource is of vital importance in meeting practically, every developmental challenges of the 21st century such as food production, energy generation and supply, environmental protection, adaptation to climate change and management of the consequence of rapid urbanization. Despite the importance of the resource; its development and management in Nigeria is being confronted with a number of problems that have been broadly categorized into five groups in this study. These are physical/environmental problems, data problem, cultural problem, institutional/political problems and management problem. The study subsequently put forward a number of recommendations towards meeting the increasing water demand in the country.

Keywords: Challenges, Development, Water Resources, Climate Change and Management

1.0 Introduction

Water is indeed, one of the most peculiar substances created by nature. It is essential for both life and livelihood. Water is not only required for consumption by human and animal, bringing with it essential micronutrients such as iron and fluoride, it is also required for personal hygiene needs such as washing, bathing and general cleaning. According to Sule (2003), healthy people and good environment flourish where water is available in adequate quantity and acceptable quality. Water is also essential for agricultural production, industrial activities wildlife conservation, HEP generation, recreation, pollution abatement and control. Because of the several avenue water is required there is a close relationship between its availability and economic development of a nation. As man's standard of living increases, so does his need for and consumption of water (Faniran et al, 1981, Ezenwaji, and Anyaeze, 2014).

In recognition of the importance of water to man, the United Nations as far back as almost four decades ago declared the 1980s as water and sanitation decade and directed the World Health Organization to carry out necessary actions to ensure that people were provided with water and sewage faculties. In the same vein, United Nations through the adoption of resolution AIRES/47/193 of 22nd February, 1993, declared the 22nd March of each year as World's Water Day to create awareness of the benefits of making water accessible to the people.

Till date however, large areas of the world and most of the world's population still lack access to water. Population and water needs of the world have also continue to grow and also placed great stress on existing water supply facilities and sources (Akinbamijo 2007). According to Dan (1988) there is no more fresh water supply today on earth as there was some 2000 years ago, when the global population was no more than three percent of its current size. United Nations (2010) observed that more than 1.2 billion people which represents 20% of the world's population are without safe water while another 500 million people are approaching this situation. Another 1.6 billion of the world population also face economic water shortage; a situation which usually develop when countries lack the necessary infrastructure to abstract water from rivers and aquifers.

Nigeria as a country is classified as water-short country, whose water resources is expected to reduce from 2,506 cubic meters per year in 1995 to 1,175 cubic meters in 2025, if not properly managed (UN Water Report 2012). Reports and statistics on water supply situation in the country shows that as at 2008 the national water coverage for access to safe water was estimated at 58% (UNICEF 2010). The remaining 42% which amounts to over 70 million people depend on a variety of polluted waters from surface water sources and shallow wells. This has greatly increased morbidity and mortality patterns of water related diseases (Ayoade, 2003, WHO 2011). Today, prevalence of Schistomiasis among children of school age (4-14 years) in Nigeria has consistently been about 20 percent and the rate is usually higher during the dry season. So also, the 10-20 percent prevalent rate of hydrocoele found the northeast, southeast, and north central zones of Nigeria depict a high morbidity pattern occasioned by filariasis. According to CNN Report (2011), 1,555 deaths resulting from cholera outbreak were recorded in Nigeria in the year 2010. WHO (2011) reported that 4 percent of global disease burden could be prevented by improving water supply, sanitation and hygiene.

In the light of these problems, government at different levels in Nigeria and various international organizations such as UNICEF, FAO, UNDP, USAID, World Bank etc have over the years, made frantic efforts to improve water supply situation in the country. For example, between 1980 and 1990, several international loans were taken to address the problem. In 1992, the federal government launched the National Water Rehabilitation Scheme in all the states of the federation with US$ 1.12 billion foreign loan. The World Bank has also since 1979 been giving loans and grants to address water supply problems in the country. All these efforts have however failed to achieved the desired result. According to International Evaluation Group (IEG) of the World Bank (2000), intervention made by the organization in Nigeria has been highly unsatisfactory. This study thus investigates those factors which can be held responsible for this abysmal performance in water supply situation in the country.

2.0   Needs for Water Resources Development and Management

Though water remain one of the most abundant natural resource on earth, the amount available for man's use is very limited. 97 percent of global water is contained in the oceans and saline bodies of water which are not in usable form for man's activities while just 2.5 percent is fresh water.

However within this small fraction of fresh water, only 0.26 percent is accessible for man's use though lakes, reservoirs and river systems (Engelman and LeRoy, 1993). Not only that, the global amount of earth water resources are largely characterized by gross inequality interms of distribution and its quality vary over space and time (Ayoade, 2003). And because there is continued increase demand for water in different parts of world, there is need for proper management of the resources. This is to achieve a convergence in demand and supply in both space and time. This factor accounts for the reason why water resources management has continued to attain a high security status and national interest (Tafesse, 2001) even to the extent of being treated as a strategic resource worth fighting over especially in water- scarce regions (Gleick, 1998; Saliu, et al 2011). Though water can be collected, diverted purified, packaged, transported and transformed; it cannot be manufactured (World Bank, 1995). This observation depict the significance of handling and managing water as a resource which according to Centre for Food and Nutrition (2010) represents one of the greatest challenges that society faces today on a global scale.

Water resources management can be considered as a man environment system that transforms input of physical resources into desired output of water services (Porter, 1978). Need for water resources management arises mainly because the hydrological cycle does not adapt itself to man's requirements for water over space and time (Ayoade, 2003). The management of water resources thus entails man intervening in the natural hydrological cycle to increase the quantity of usable water and to modify its spatial and temporal patterns of occurrence. However, for water resource within a given area to be successfully managed a number of factors must be understood. These factors according to Ayoade (2003) include:

i.   the flow characteristics of such an area.
ii.   the natural linkage between groundwater and stream flow which cause for joint management of the sources
iii.   the uneven distribution of water resources over space caused by spatial and temporal variations in precipitation and occurrence of aquifers.
iv.   the spatio-temporal incongruence of water resources and water demands

3.0   Water Resource Development in Nigeria

Traditional methods of water exploitation in Nigeria consist of direct collection of rainwater and extraction from springs, streams, ponds and wells. Most of these sources, apart from being highly polluted usually dry up during the dry season, thus making the people to trek long distance in search of water.

Modern water supply in the country however begun with the establishment of the first water-works in Lagos in 1915. However, by 1953, twenty seven other water works had been built in various part of the country, either by native authorities or colonial government (Mabogunje, 1965). Ayoade (1975) observed that by 1960, the number of towns having modern water supplies had increased to 67. The total water consumed per day according to him had also risen from 13.8 million gallons in 1953 to over 57 million gallons in 1960.

Since 1960, there has been tremendous growth in the member of water schemes in the country as various dams have been constructed to provide water for the increasing population. Despite this growth however, water resource management remained grossly uncoordinated as federal and state governments acted more or less independently in the task of water provision during this period (Oyebande, 2011).

Between 1962 and 1968, when the First National Development Plan was rolled out, the total allocation for water supply was N46.8 million; an amount which represents about 3.6 percent of the planned capital expenditure in public sector. In the Second National Development Plan (1970-75), N103.4 million which represents 5 per-cent of the total expenditure for the plan period was allocated to water supply and provision of modern sewerage systems. The proportion of total expenditure earn-marked for water resources development from state to state however varied during this period. The figure ranged from 6.9 percent in the south-Eastern State to 20 percent in the North-Central. The relatively high proportion of total expenditure allocated to water during this period may not be unconnected with the Sahelian drought of early 1970s which shocked the nation into the awareness of the need for a coordinated and integrated approach to water management. Hence, the Federal Government formally established the Chad Basin Development Authority and Sokoto River Basin Development Authority by Decree Nos 32 and 33 in August, 1973. By 1976, the whole country has been covered by ten such River Basin Development Authority. In 1982, the Niger Delta was added to make eleven while Niger Basin was subsequently split into Upper and Lower Basins, thus giving the present twelve RBDAs.

The RBDAs which were given 16 functions including hydrology and water resource management have however fallen short of the high expectations of the federal government. According to Oyebande (2011), the RBDAs have been below par in their primary function of hydrological and water resource data generation through sustainable monitoring and information systems.

In the Third National Development Plan (1975-1980), N930.038 million which represents 2.8 percent of the total expenditure in the public sector was earmarked for water supply schemes. Though this amount increased in absolute term from the allocation in the preceding National Development Plan, the amount reduced in comparative terms. This drop in the proportion of total expenditure earmarked for water supply schemes according to Ayoade (1975) was unwarranted. According to him, Nigeria's per capita expenditure on water resource was very low and compares unfavourably with situation in advanced countries where pipe borne water supply is already a ubiquitous amenity. However, the tempo of water supply in the country according to Onugba and Sara (2003) was raised in 1980 with the preparation for and the campaign in favour of the United Nation's International Drinking Water Supply and Sanitation Decade (1981-1990) whose goal was to provide water for all by year 1990. Other government efforts that have been directed towards the development of water resources in the country include the preparation of Water Resource Management Strategy (WRMS), establishment of Federal Ministry of Water Resources, establishment of National Council of Water Resources, and the establishment of National Water Resources Institute amongst others.

The responsibilities for water resource development and management has not been solely bore by the federal government; the 36 state governments in the country through their State Water Agencies (SWA), 774 Local Government Authorities and non-governmental or donor agencies such as Water Aid, EU, UNICEF, USAID, World Bank among others have also been responsible for water resources development and management. Other government agencies such as Federal and State Ministries of Agriculture and

Environment, though not directly concern with water supply also carryout water resource development in the country.

The World Bank has been providing assistance on water resource development Nigeria since 1979. The first generation of assistance was directed at strengthening investments in water institutions at the state level. Amengo- Etego and Grusky (2005) listed state that benefitted from this assistance to include Kaduna Anambra, Borno and Lagos State. The second generation of assistance which came in from of a loan of US$ 256 million was used in rehabilitation of water projects nationwide between 1991 and 2001. Within this same period (1992-2001), the World Bank also supported the First Multi-State Water Supply Project in Kaduna and Katsina States with a loan of US$ 101 million. The third generation of assistance from World Bank came under the Small Towns Water and Sanitation Pilot Project between 2000 and 2004. This was aimed at improving water supply situation in 16 towns.

Inspite of all these assistance, and the realization on the part of government to develop and manage the resource in a comprehensive manner through the setting up of the RBDAs and other agencies, problems of water supply still persist in Nigeria. Faniran (1991) observed that water supply situation in Nigeria is still largely pathetic despite the huge expenditure. The Independent Evaluation Group (IEG) of the World Bank (2000) observed that the organization interventions in the country have been highly unsatisfactory.

4.0   Challenges of Water Resources Development and Management in Nigeria

Though plan for development of water resources remain conspicuous in socio-economic programme of government at various levels in Nigeria, the execution of the programme has pose a lot of problems in the country. Such problems have been grouped and discussed under five major classifications in this study. These are physical or environmental problems, data problems, cultural problems, institutional or political problems and management problems.

4.1   Physical/Environmental Problems

In water resources development, environmental problems are sometimes many and may include weather and climates, geology, stream network, topography etc. The physical/environmental problem of water supply can best be examined within the concept of a drainage basin. A drainage basin is an unambiguous topographical unit.

It is a catchments area defined as the total areas contributing water into a particular river (Ogunlela, 2013). If a particular catchments is small, then the intercepted rainfall will be small, and the consequent effect will be low discharged of river in such an area and vice vassal. Thus, when a large city is located within a small drainage basin, then such a city will have problem of water resources meeting its needs.

In the same vein, where climate elements are erratic, such as in northern fringes of Nigeria, the water problem there will be perennial. This is because precipitation is very low in the area, most times less than 250mm spread over just between 3 to 4 months. (Oguntoyinbo, 1978). The condition of low rainfall in the zone is further worsen by high evapotranspiration rate, which in places such as Yola and Maiduguri may rise to 375 and 550mm respectively (Ayoade, 2003). Hydrological significance of evapotranspiration in water resources development and management cannot be overemphasized. It represents water loss, water unavailable for exploitation by man. Ayoade (1975) observed that the rate of water loss by evapotranspiration in a tropical country like Nigeria are enormous; so effectiveness of rainfall is considerably reduced especially in the northern parts of the country.

Geological relevance in water resources management mainly relates to knowledge of quantity, quality and pattern of distribution of ground water. This is far from being satisfactory in Nigeria (Faniran, 1991). Geologically, Nigeria is located in an area that comprises broadly, sedimentary and basement complex rocks with small area of alluvium deposit in the south. The two main rock groups occur in an equal proportion (Ige, 2014). While the sedimentary rocks are mainly upper cretaceous to recent in age, the basement complex rocks are thought to be Precambrian (Offodile, 1992). The basement complex rocks are generally hard, with low permeability and non water bearing. This rock type which is usually crystalline does not encourage infiltration. Where such rocks have been disintegrated into porous permeable and water bearing rock, borehole yield in such an area usually decreases with increasing depth. This is due to the effects of the overburden weight which closes up the fracture with depth (Ige, 2014). The remaining areas in the country are made up of sedimentary rocks such as sandstones, clays, shale and limestone. These rocks types do not encourage ground water development. While Shale, Mudstones, Silstones are very poor aquifers or at best act as aquiclude, argillaceous and fine grained materials limit water infiltration and acts as barrier to groundwater replenishment. Geological factor can thus be held responsible for the high failure rate of boreholes in the country (Oyegun, 1983; Faniran, 1991; Oyegun et al, 2007).

4.2   Data Problem

One great factor militating against water resources development in Nigeria is scarcity of data. This problem is not only peculiar to Nigeria but throughout the developing countries. Nigeria as a country is blessed with abundant rainfall which feeds a close network of rivers of various sizes over large parts of the country (Water Profile 2010). Unfortunately, accurate information that is crucial for proper assessment, utilization and management of this valuable resources is lacking (Iroye, 2008., Oluwaseminire, 2012 Ige, 2014). This has made the construction of many water structures in the country to be largely based on guess work; a reason which accounts for their higher failure rate.

According to Faniran (1991) information needed for good water resource development scheme include not only those on hydrological and hydrogeological attributes (spatial and temporal variations in quality and quantity), but also on the environmental attributes including geology and soil, vegetation and land use, settlement and human activities, as well as other factors that may affect the spatial and temporal quality and quantity patterns

of the water. Ayoade (1971) observed that less than 25 percent of the 1, 058 rain gauging stations established in 1965 by Nigerian Metrological Services were found to have, as of 1971, any form of reliable records extending for up to 10 years. This thus gave a network density of 1 to almost 900sq km instead of the recommended 1:50. He further observed the problem with evaporation measurement to be greater than that of rainfall at that time where just about 70 recording stations were known to exist all over the country, many of which were poorly operated and maintained. This very bad situation has not feared better (Iroye, 2008).

One other feature of Nigeria hydrological/hydro meteorological records which affects their usefulness relates to their uncoordinated, ad-hoc nature (Faniran 1991, Olaniran 1983). Hardly can one get above 60 years river guage record in the country. Even when such data are available, there is problem of data analysis due to lack of personnel or facilities to handle such data. While lack of data constitute constraints to efficient water resources development and distribution (Barrow, 1987; Faniran, 1987; 1991), lack of consistency in discharge measurement poses interpretation problems (Olaniran, 1983). According to Barilla Centre for Food and Nutrition (2009), the collection, management and communication of data regarding water availability and demand remains one of the essential requirements for water resources development and management.

4.3   Cultural Problems

The land tenure system in Nigeria for example has been regarded as an hindrance to meaningful landuse hence an attempt by the government to take over the land despite much opposition. The problem of cultural attachment to land has many times hindered the development of water schemes in different parts of the country. This is because developments of such project do require people being resettled in other places. Apart from the fact that resettlement issues do incure huge cost on the government (Ayoade, 2003; Agnihotri, 2008), communities most times often turn down appeal to relocates elsewhere because the process often tears apart their social fabrics and create risks of impoverishment (Tan and Yao, 2006) hence the abandonment of such water projects (Agba et al., 2010).

4.4   Institutional/Political Problems

Government of the day often have priorities in areas of development and sometimes, water may not be one of them. In different parts of the country water projects that are unviable, but started as result from one pressure group or as political rewards are often commissioned. Oyegun (1983) observed that there are several weirs, flumes and boreholes in Kwara State that were constructed for political reasons.
According to him such project have since died. A number of raised tanks can be seen all around the city of Ilorin today. They do not give water; they belong to group of abandoned projects because of change of government.

Other institutional problems relating to water resource management may be inform of finance. Government may have competing priorities and decision on which one to execute may not be based on technical knowledge but rather on political convenience or financial capability. For example the sinking of shallow well where borehole is required because of geology and depth to water table and the sinking of borehole where micro dam is required.

4.5   Management Problems

This is a major problem in water resource management in the Nigeria. Proper management of resources is dependent on skilled manpower and attitude to work by the people. Most water corporations and various water management boards in the country are wanting in these two areas (Faniran, 1991; Sule, 2003). For example, the Kwara State Water Corporation, the organization incharge of water resource management in the state cannot boost of up to five Geo-hydrologist and there is no Geo-physist in the organization (Oyegun et al, 2007). Therefore, explorative fieldwork on underground water resources by unskilled staff do mostly result in sitting of deep wells in wrong places. At the various water treatment plants in the country, a lot of skilled personnel are needed for water analysis, such personnel are lacking (Lohdip, 2014).

It is also necessary to monitor the quality of water being served, not only at the various treatment plants, but also at taps within the various cities, this has not been possible also because of inadequate staffing. The monitoring of water quality is so important that in 1977, the World Health Organization (WHO), United Nations Environment Programme (UNEP), United Nations Educational Scientific Cultural Organization (UNESCO) and World Meteorological Organization (WMO) jointly launched a water monitoring programme to collect detailed information on the quality of global ground and surface water (Taiwo, et al, 2012). Since then, significant progress has been made by some countries such as Germany, USA and Japan, to build on this effort to save guard the quality of the water bodies within their territories from deteriorating. Nigeria and some other developing country are found wanting in this area (Lawal and Lohdip, 2012; Lohdip et al, 2012; Lohdip and Gongden, 2013). Though the Federal Environmental Protection Agency (FEPA) which later transformed to the Federal Ministry of Environment has been given the mandate to regulate the discharge of effluents into Nigerian waters, the impact of this organization is yet to be felt (Lohdip, 2014).

Water producing bodies should be able to either generate their own power or have standby generating set. In Nigeria, such generation is forbidden by law. But generators can be bought so that it should not be the case of no light, no water as being currently experienced in the country. Issue of water resource management in Nigeria is perhaps the most critical. This according to Faniran (1991) is because Nigeria, as hinted earlier, is endowed with vast resources of both surface and underground water. Most of the resources, is at present being allowed to waste through unabated evaporation, transpiration and flowage into the adjoining seas and lakes, while large areas of underground reservoirs are also yet to be exploited.

5.0   Conclusion and Recommendations

Water resource problems arise from the simple fact that the hydrological cycle does not adapt itself to man's space, time and quality requirements for water (Ayoade; 2003). This thus create situations whereby in a given location, available water may be insufficient for man's use, while in another location, the problem is excess water manifesting inform of floods. With increasing global climate change coupled with existing un-sustainability factors and risk inherent in conventional water management, residents in Nigeria in near future will experience difficulties in efficiently managing scarcer and less reliable water resources unless something drastic is done right now.

The main purpose of water resource development and management is to make water available at the time and place it is required, and in suitable quantity and quality. And in-order to achieve these goals, the following recommendations are being put forward towards improving people's standard of living, as according to that Greek philosopher, Thales (640-540BC), "all life is water". The government at various levels should;

(I)   device a means of pricing water marginally to sustain maintenance,

(ii)   make adequate use of numerous regolith acquifers for borehole and well water supply,

(iii) develop at strategic locations, surface reservoirs to serve the hinterland,

(iv) look into the possibility of retailing water especially in water stress rural areas by means of pumps similar to that of petrol stations,

(v)   find means of conserving excess water especially during the rainy season through the use of big and micro dams,

(vi) device ways of redistributing water to low rainfall areas in the north through the use of pipelines and canals, and

(vii) resuscitate and establish more water banks to enable them perform their roles of data generation, collation and dissemination of information for water resource planning and management in country.

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