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Review

POTABLE WATER AND NATIONAL WATER POLICY IN NIGERIA (*A historical synthesis, pitfalls and the way forward*)

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Nigeria is divided into three by rivers Niger and Benue. There are many rivers, streams and lakes in Nigeria. Inspite of abundant water resources in Nigeria, 75% of Nigerians do not have access to safe drinking or domestic water. A number of agencies are vested with responsibility of providing and managing Nigeria's water resources. The Federal Government established the Ministry of Water Resources which is responsible for drafting current national water policy for the nation. The MWR also oversee nation's water resources via smaller regulatory agencies under it like the River Basin Development Authority (RBDA) and National Water Research Institute (NWRI). RBDA is in-charge of irrigation and agro water provisions. RBDA is also in charge of ground water management. The ministry of water resources also has the Nigerian Hydrological Services Agencies (NIHSA) set up to provide services required for assessment of the nation's surface and groundwater resources. There are overlapping and conflicting roles among Federal Government organs like RBDA, NIHSA, Federal Environmental Protection Agency, Ministry of Environment, Standard Organization of Nigeria and National Agency for Food and Drug Administration and Control. These arrangements functioned with frictions but have largely failed in proffering; working national water policy and potable water for Nigerians.

Key Words: Potable water, Nigeria river basin, Water policy, Nigeria standard organization, Water resources, Nigerian water resources, Federal Ministry of Water Resources

INTRODUCTION

Nigeria is a tropical West African country located within latitude of 4° N and 140 N and longitude of 2° 2'E and 14°30'E east. Nigeria is bordered on the east by Cameroun and Chad, in the north by Niger republic and west by Benin republic. The southern border is lined by the Atlantic Ocean. The land mass is 923,768 sq km and population is roughly 140 million people 2006 census figure.

The extent of northern- southern Nigeria is about 1050 km, while the extent of western- eastern Nigeria is about 1150 km. The total mean annual rainfall record for Nigeria is estimated at 1150 mm year $^{-1}$. However annual rainfall for the south of Nigeria is about 3000 mm year^{-1} taking place from March to September. The south east of Nigeria has annual rainfall of about 4000mm year^{-1} (Goldface-Irokalibe 2008), while it is about 500mm year^{-1} in the north within the months of April to October.

Land covers in Nigeria starts from thick mangrove and rainforest of south eastern and parts of south west Nigeria, to the desert conditions of the north. Climatic conditions are semi-arid in the north to humid in the south. In the coastal regions there is almost all year round rainfall about 2000mm year^{-1}. The climatic conditions in these areas are ultra- humid (FAO 2005). Nigeria can be classified into eight agro ecological zones based on rainfalls and temperatures (Table 1).

Table 1: Agro -ecological zones in Nigeria

Zone	% country	Annual	Monthly Temperatures		
	Area	Rainfall (mm)	Minimum (ºC)	Normal (ºC)	Maximum (oC)
Semi Arid	4	400-600	13	32-33	40
Dry Sub-humid	27	600-1000	12	21-31	49
Sub-Humid	26	1000-1300	14	23-30	37
Humid	21	1100-1400	18	26-30	37
Very Humid	14	1120-2000	21	24-28	37
Ultra humid (flood)	2	>2000	23	25-28	33
Mountainous	4	1400-2000	5	14-29	32
Plateau	2	1400-1500	14	20-24	36

In view of the limitation of water resources, role of macroeconomic policies in agricultural water management is very important and undeniable (Valipour 2017). Water is a very important factor in Nigeria. Most Nigerians depends on borehole water, streams, rivers, rains and burrow pit for their water supplies. Water is costly in Nigeria and average Nigerian living in Yenogoa Niger delta region spends about 25% of their income on water (Owho and Abotutu 2014). Regulatory authorities in charge of water in Nigeria seem to have overlapping responsibilities with each other on control and management of water resources.

In 1993 the federal government set up the national agency for food drugs and administration control (NAFDAC) by decree No. 15 of 1993. NAFDAC was vested with many responsibilities including; Compilation of standard specifications and regulations and guidelines for the production, importation, exportation, sale and distribution of food, drugs, cosmetics, medical devices, bottled water and chemicals. NAFDAC was also mandated to, undertake inspection of imported food, drugs, cosmetics, medical devices, bottled water and chemicals and establish relevant quality assurance system, including certification of the production sites and of the regulated products.

NAFDAC undertakes the assessments of production of sachet water and bottled water according to their set standard. However, in 2007 an older organization known as the Standard Organization of Nigeria (SON) established under decree Act 56 in 1971 came up with a gazette they called Nigerian standard for quality clean drinking water. Their regulation noted that series of standard has to be followed in making safe drinking water in Nigeria. SON opined that their standard should be the format to be adopted by NAFDAC. Consequently, SON listed the following organizations as providing regulations for safe drinking water in Nigeria:

Main Normative References/Laws

The following provide the regulatory framework for drinking water quality in Nigeria:

i. Consumer Protection Council Act 66 (1992)
ii. Council for Regulation of Engineering in Nigeria Act 55 (1972)
iii. Federal Environmental Protection Agency- Retained as Cap 131
iv. Food and Drug Retained as Cap 150
v. Food and Drugs (1999-No.19) Changed to NAFDAC Act 11
vi. Institute of Chartered Chemist of Nigeria Act N°91 (1993)
vii. Institute of Public Analyst of Nigeria Act N°100 (1992
viii. National Water Resources Institute Act- Retained as Cap 284
ix. Public Health Act (1958)
x. Standards Organization of Nigeria (SON) - Retained as Cap 412
xi. Water Resources Act N 101 (1993)
xii. International Organization for Standardization (ISO) — Service activities relating to drinking water and wastewater — Guidelines for the management of drinking water utilities and for the assessment of drinking water services.
xiii. National Guidelines and standards for Water Quality in Nigeria.
xiv. Nigerian Industrial Standards for Natural Mineral Water (NIS 345: 2003) and Potable Water (NIS 306: 2.904).

The National Council on Water Resources (NCWR) recognized the need to urgently establish acceptable Nigerian Standard for Drinking Water Quality in 2005. This was because it was observed that the “Nigerian Industrial Standard for Potable Water” developed by Standards Organization of Nigeria and the “National Guidelines and Standards for Water Quality in Nigeria” developed by Federal Ministry of Environment did not receive a wide acceptance by all stakeholders in the country (NIS 2007)

The Nigerian public sector has so far failed in meeting supplies of quality water and sanitation services for residential and commercial users (Kuruk, 2004). The World Bank financed Agricultural Development Program (ADP) pilot projects in 6 States in 1970. The beneficial states are namely Bauchi, Benue, Kano, Plateau, Oyo and Sokoto. The (EU) European Union approved development of potable water for Enugu state at a cost of 102,522.80 Euros (Edike 2009). However, about 65% of Nigerians lack access to potable water while estimated 39% have unstable access in urban areas. Out of 85 million Nigerians dwelling in urban and semi-urban areas, less than half

have access to constant water supply. Municipal water supply is low in Nigerian urban areas. It is estimated that in urban areas the average water delivery is only 32 litres per capita per day and that for rural areas is 10 litres per capita per day (Ajibade et al. 2015). In places with municipal water supply services are they are majorly in serious short supply, unreliable and of poor quality (Abubakar, 2006). Water supplies are not sustainable in Nigeria because of difficulties in logistics, management, operation, pricing and failure to recover costs (Federal Republic of Nigeria, 2000; Federal Ministry of Water Resources, 2000). Poor water supplies are linked to poverty and poor economic activities in communities. However, Namara et al. (2010) discussed the role the of agricultural water management to alleviate poverty in the world as three sources: like, improvement of production, enhancement of employment opportunities and stabilization income and consumption using access to potable water. Valipour (2013 a, b) discussed the status of irrigated and rainfed agriculture in the world, summarized the advantages and disadvantages of irrigation systems. This is very important in Nigerian situation where government have constructed somany irrigation system for agricultural purposes. Valipour 2013 a,b) noted that 46% of cultivated areas in the world cannot be farmed using rain fed water due to climate reasons and other meteorological conditions. In Nigeria there is also the great need of agricultural water for irrigation and fish farming which met least attention (as captured in the obsolete National water policy of 2004). Nevertheless, World bank report based on the outcome of (2010-2012) studies on the assessment of climate change in Nigeria recommended that there is a need to review the National Water Resources Policies of 2004. The review is to be in line with the current weather trends, involving incorporation of the effects of climate change in the policies and guidelines. Climate change affects water flow rate and water volume. These are pivotal in determining the water delivery volumes of dams, lakes and rivers. More so, the menace of cattle herdsmen in mutilating water bodies and polluting every available water source used by locals across Nigeria must be addressed in any future water policy.

In 1981, UNICEF evolved rural water supply and sanitation in Nigeria country programme in Imo, Gongola (now Taraba and Adamawa), Kwara, Cross River, Niger and Anambra States. This number has been expanded to 22 states (UNICEF, 2000). From 1989 - 1992, the UNDP operated the Rusafiya Project focusing on the local government. This was because Local govt. are closer to the to the communities.

Unfortunately issues on water provision in Nigeria were overtaken by production of sachet water and canned water at the expense of potable municipal water supply by Water Authorities. Much energy was directed by NAFDAC, SON and ministry of health at regulating and monitoring private water factories across Nigeria and little was done on provision of municipal water from public water works. However, though there are many regulatory agencies less than 30% of Nigerians have access to safe drinking water. The success of the SON standard is yet to be ascertained. Nevertheless, urbanization, poor coordination and too many regulatory agencies have weakened emergence of unitary national water policy (Goldface - Irokalibe 2008).

This survey seeks to analyze the contributions, strength and weaknesses of the different arms of Nigerian government in charge of water supplies, in making potable water available to Nigerians. There had been no historical synthesis of the origin of the status quo of Nigeria's water problems. This paper also seeks to find the root and present situation report of water policy management in Nigeria and its resultant effects on potable water provision in Nigeria. The importance of agricultural water and water supplies to the local and urban communities are highlighted, achievements, weaknesses and way forward are proffered.

MATERIALS AND METHODS

This report was made through survey methods (Dillion and Hardaker 1993). The survey method was adopted in the present synthesis because based on subject matter it was advantageous, revealing and thought provoking. Survey can be done either by direct field observation, collation and gathering of documented information (secondary sources) and interviewing respondents. This synthesis made use of the secondary sources through acquisition of water related documents from industries and government agencies. Published records of achievements of government authorities that were responsible for water and related matters were acquired and analyzed. Archival materials on the status of Nigerian water supply services were consulted for updating knowledge on the previous state of Nigeria water supplies. Proper care was taken to avoid bias and proffer best management practice on document assessment. In making this paper some relevant individual organizations were highlighted and their roles in potable water provision examined. This analysis is solely advisory and academicals and fills the gaps left by similar previous write ups quoted herein that failed to synthesize the origin of problems and proffer solutions for way forward.

RESULTS AND DISCUSSIONS

Water supplies in Nigeria have been the primary concern of successive administrations. This is notable given the plethora of government agencies set up to tackle the problem by every emerging regime in Nigeria. A

Map of rivers in south east (Abam 2001)

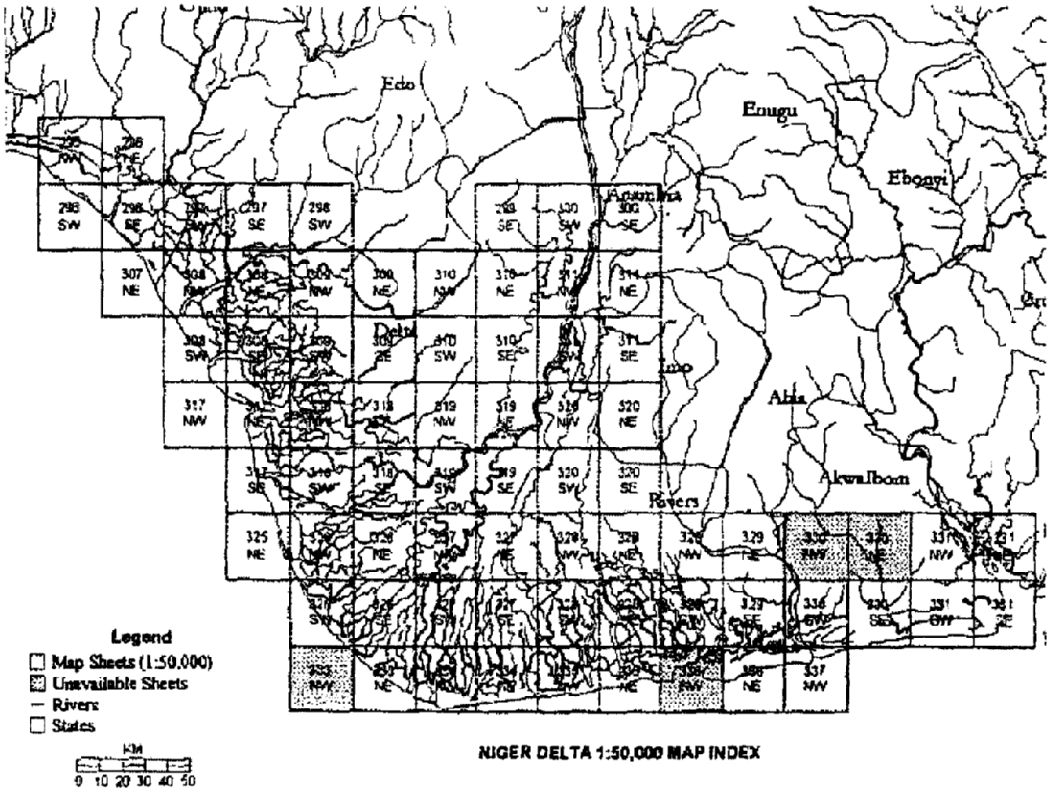


Fig. 1 1:50 000 scale topographical map index of the Niger Delta study area.

Fig 1. This is the map of river systems in parts of southern Nigeria

consideration of the ecological zones in Nigeria and their annual rainfall is pivotal in considering the water provisions and availabilities in the regions. The ecological zones are summarized in Table 1. Annual rainfalls are highest in the humid, sub humid, very humid and ultra humid regions. However, these regions are not majority in landmass and country areas. This gives rise to need to meet up the natural shortfalls in water supplies for sustainable development of the country and agriculture in particular.

Water Resources

Surface Water

Nigeria as a whole is divided into three by two major rivers; these are River Niger and its tributary River Benue. River Niger has many other tributaries like the Anambra River and other smaller rivers. River Benue joined the Niger at Lokoja from where the Niger headed southwards towards the Atlantic Ocean. From Lokoja River Niger transverse the east and mid-western Nigeria before forming extensive delta made up of many rivulets that discharge all their payload into the Atlantic Ocean.

There are several lakes in Nigeria like Lake Chad, Oguta Lake and the manmade Lakes and dams like the Kainji and Shiroro dams meant for hydroelectricity and allied water supplies. There are many rivers all over Nigeria. However, many of the rivers in the northern part of Nigeria are seasonal having water only during the rainy season. Most or all the rivers in the southern parts of Nigeria are perennial like Imo river, Cross river, Anambra river, Adada river, Ebonyi river, Osun river. At the river Niger and Benue confluence at Lokoja there is gauging station. Annual runoff on river Niger at Lokoja station is estimated at 165.80 billion cubic meters (Goldface-Irokalibe 2008).

The surface water of Nigeria can be classified into four principal surface water basins namely:

1. The Niger basin.
   Niger basin has an area of 584,193 km^2 covering mainly north western and central parts of Nigeria. Major rivers includes River Niger, Benue, Sokoto and Kaduna
2. The Lake Chad basin
   This covers major parts of north east with estimated area of 179,282 km^2. The major rivers are Komadougou Yobe and its tributaries Hadejia.
3. The south eastern littoral basins. It has an area of 58, 493 km^2 . This does not take into account the numerous rivers and the delta region. The major surface waters are Imo river, Cross river, Anambra River, Adada river. The south east is generally made up numerous river streams and formation of the Niger delta (see above).

4. The south western littoral basins. This has an area of 101 802 km^2. Most important rivers are Osun Rivers and other originating from hilly areas.

Ground Water

In terms of ground water, Nigeria is divided into eight hydrological areas. There is also local ground water in shallow alluvial (fadama) aquifers close to surface rivers. (FAO 2005). The eight hydrological zones are as follows;

1. South eastern zone: Comprising of Cretaceous sediments in Anambra and Cross river basins. Boreholes in the regions are few.
2. South central zone is made up of Cretaceous and tertiary sediments centered on the Niger delta.
3. South western zone comprises of sedimentary rocks bounded by coastal alluvium in the south and north by basement complex.
4. The basement complex comprising of 60% of crystalline area. This is made of low permeability rocks. Ground water is found in weathered mantle and fractured zones yielding between 1.0-2.0 L S^{-1}
5. Sokoto basin zone comprising of sedimentary rocks in northwestern Nigeria. Yields are 1.0-5.0 L S^{-1}.
6. Chad basin zone comprising of sedimentary rocks. This is made of three distinct aquifer zones. Yields are 1.5-2.2 L S^{-1}.
7. Middle Niger basin comprising of sandstone aquifers yielding between 0.7 and 5.0 L S^{-1}.
8. Benue basin zone comprising of sandstones aquifers. The borehole yield is between 1.0-8 L S^{-1}.

Ground Water Resources

Ground water is estimated to supply up to 90% of water to Nigeria (Offodile 2000). Nigeria has abundant ground water that is under the auspices of River Basin Development Authority (RBDA). Nigerian ground water is divided into eleven zones to cover the whole country. However, it has been noted that this sector received little attention from RBDA although is has enormous potentials (Offodile 2000). The ground water divisions are as follows: (Fed. Atlas 1978) numbered as follows:

1. Coastal Alluvium Mangrove and Fresh Water Swamps.
2. River Course Alluvium.
3. Coastal Sedimentary Lowlands.

4a. Chad Basin (Confined Aquifers)
4b. Chad Basin (Unconfirmed Aquifer)

5. Ken-ken Sandstone

6a. Sokoto Basin (Tertiary)
6b. Sokoto Basin (Cretaceous)

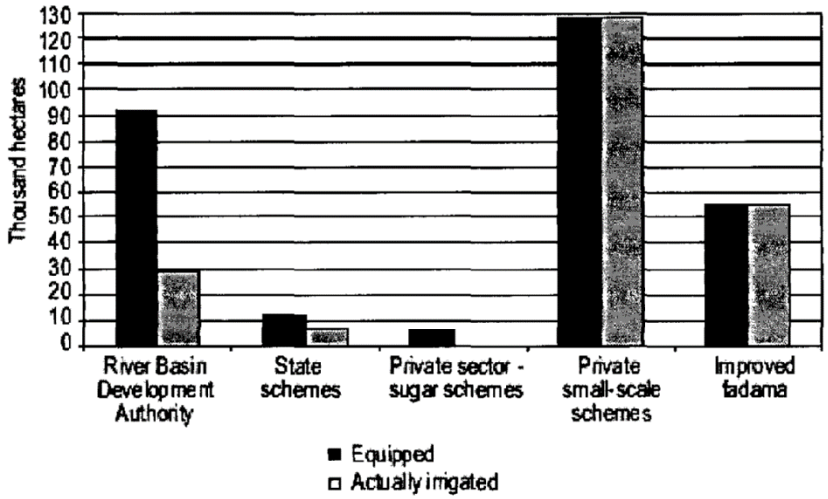
7. Nupe Sandstone of the Niger Basin.
8. Anambra Basin.
9. Cross River Basin.
10. Benue Basin
11. Crystalline Area. (Basement Complex)

So far Nigeria has also constructed over 220 dams mainly for irrigation and domestic water supply and hydroelectricity. Most of these dams are mainly located in the north and were mainly constructed during the 1970s and 80s. There had been new dams constructed in recent times (2016) and these spread across Nigeria's geopolitical zones. Generally, it has been estimated that Nigerian has irrigation capacity of 1.6 million ha from surface water and 0.5 million ha from ground water (FAO 2005). The country has an estimated 2.1 million ha potentially irrigable area, of which over 1 million ha are in the north, and the rest in the south. In 1949 the Northern Nigerian Region under British colonial rule established the first government irrigation agency. The Nigerian main irrigation projects after the mid-1970s are as follows, South Chad Irrigation Project in Borno State, the Bakolori Project in Sokoto State, and the Kano River Project. These projects were all located in the northern parts of the country. Currently the irrigated area in Nigeria is only approximately 2,930 sq km (CIA 2012). Nigeria water resource is still estimated at about 226 billion cubic meters of surface water and about 40 billion cubic meter or ground water (Odigie and Fejemirokun 2005). Most irrigation system in Nigeria is Federal Government owned. Over the years there seemed to be over concentration irrigation projects in the north at the expense of the southern fertile lands. Some of the traditionally known agrarian southern lands are found in Abakailiki, Ezilo and entire Ebonyi state, Akure, Ekiti, Enugu, Oyo, Obodu Cross River, Anambara etc. Agricultural activities like rice, cassava, yam, and cocoyam and plantain production are most prominent in some of these areas (personal communications). The neglected scenario of irrigation in the South East and South West by previous regimes of government in Nigeria is regrettable. The Nigerian Central Bank 2017 January, Economic Report stated "The prevalence of dry weather across the country affected agricultural activities in January 2017. The major farming activities in the Southern States were harvesting of tree crops and clearing of land for the 2017 cropping season, while farmers in the Northern States engaged in the cultivation of irrigated lands" (CBN 2017).

With the constructions of new dams, irrigation capacity has increased tremendously. High productivity is expected from the construction of dams. There had been rather low scale of irrigation and underutilization of available facilities. With the present plan of importation of grass for cattle herdsmen by the federal government, the dams and irrigation have a vital role to play.

The imported grass should be planted in the numerous dams and irrigation locations across the north. For the grass to survive, it needs constant irrigation and water supply. The quest for grazing land and demand for grazing reserves from southern states in Nigeria is rather obsolete, archaic and retrogressive in a modern era. Cattle should be raised in ranches and this is a golden opportunity for

FIGURE 2
Structure of the irrigation sub-sector in Nigeria in 2004
Total equipped: 293 117 ha; total actually irrigated: 218 840 ha



Source (FAO 2005).

the RBDAs in the north to assume greater relevance and attract much needed funding. With the dams constructed and irrigation areas mapped out, there should be no problem for pastures for cattle from the north. Any desirable species of grass found in any part of the country could be easily collected and replanted in irrigated areas where they will be multiplied. A coordinated implementation of these strategies would remove clashes experienced between roaming Fulani herd's men and land owners. The clashes between herd's men and land owners have forced many farmers to abandon agricultural activities in rural areas leading high cost of food across Nigeria. This can be a way forward in the implementation of government plans to provide more water for masses and provide pasture for northern cattle. It's noteworthy that cattle do not like to walk about as they are being compelled by Fulani herd's men in Nigeria.

Institutional frame works and organization

There is no clear cut frame work for management of water resources in Nigeria. However, the task of water quality management is fragmented between the three tiers of government, namely, federal, state and local governments. This fragmentation has led to duplication of duties, lack of cohesion at inter-sectoral coordination, making each segment focusing on their own independent water agenda. There has been no major organization responsible for administration of water resources in Nigeria prior to 1975. However, in 1975 the Federal Government created the Federal Ministry of Water Resources. The Federal Ministry of Water Resources (FMWR) assumed the main national coordinating body in the water sector. The current FMWR was established in 2010, but was offspring of the Water Resources Division established in the 1960s under the Federal Ministry of Agriculture (FMA). In 1976 the Federal Government also set up the Nigerian River Basin Development Authorities (RBDA). The RBDAs is an arm of FMWR responsible for plethora of water duties, irrigation, water resources development, dam construction, and water supply, operation and management of the public irrigation systems. There are about twelve (12) River Basin Development Authorities (RBDAs), established between 1973 and 1984, Among the institutional framework responsible for water resources in Nigeria are the following as stated by (FAO 2016).

Upper Niger River Basin Development Authority (UNRBDA)
Hadejia Jama' Are River Basin Development Authority (HJABDA)
Lower Benue River Basin Development Authority (LBRBDA)
Anambra-Imo River Basin Development Authority (AIRBDA)
Cross River Basin Development Authority (CRBDA)
Benin Owena River Basin Development Authority (BORBDA)
Chad Basin Development Authority (CBDA)

Upper Benue River Basin Development Authority (UBRBDA)
Sokoto-Rima River Basin Development Authority (SRRBDA)
Lower Niger River Basin Development Authority (LNRBDA)
Niger Delta Basin Development Authority (NDBDA)
Ogun-Osun River Basin Development Authority (OORBDA)
The Federal Ministry of Water Resources (FMWR) has four departments with duties related to the water issues as follows:

- The Department of Irrigation and Drainage (DID): among its major responsibilities are the supervision and monitoring of the River Basin Development Authorities (RBDAs)
- The Department of Planning, Research and Statistics
- The Department of Hydrology and Hydrogeology
- The Department of Dams and Reservoir Operations
  The FMWR is also responsible some agencies
- The Nigeria Hydrological Services Agency (NIHSA) created in 2010.
- The Nigeria Integrated Water Resources Management Commission (NIWRMC), created in 2007, is a central coordinating body for the 8 Catchment Management Offices of the 8 hydrological areas (HA listed in section "water resources" and Table 2).
- The National Water Resources Institute (NWRI) established legally in 1985, but began to operate as a training centre on water resources in 1979.
  Upon all these departments and Nigeria is still not able to have adequate services of potable water. The creation of multiple agencies and departments seems to be counterproductive. There is dire need to streamline the institutional frame work and duties of agencies in charge of water provision.
  The list of organizations in Nigeria vested with diverse water and irrigation responsibilities seems to be endless. On the Federal institutions there are in the irrigation subsector:
- The National Council of Water Resources (NCWR). This seems to be the most important water policy formulating body. Its sub-committee, the National Technical Committee on Water Resources (NTCWR) is vested with responsibility of ensuring information exchanges between the Federal and State level agencies.
- The Federal Ministry of Environment (FMEnv) which is vested with the responsibility of setting up policies on water quality, sanitation and pollution control including water quality standards and guidelines.
- National Agency for Foods, Drugs, Administration and Control (NAFDAC) also play somuch role in controlling water production.

There is current institutional duties and overlap between almost all the agencies with resultant effect that potable water is lacking and there is no major overseer of the water provision issue. At present NAFDAC, FMEnv and FMWR have serious overlap in duties. Some of the overlap had been noted (FMWR, 2014).

FAO (2016) noted that at the State level, state agencies involved in water provision, irrigation and agro water provisions are as follows:

- State Ministries of Water Resources (SMWRs) which in some irrigation state host the State Irrigation Department (SID) transferred from the State Ministry of Agriculture.
- State Ministry of Works, especially in some states without a SMWR
- State Ministries of Agriculture (SMAs), which were responsible for irrigation development before RBDAs were established that host SID, if they do not have SMWR.

State Water Agency (SWA), which is usually responsible for drinking water supply and sanitation (FAO, 2013).

International Basins

Nigeria is a member of the Niger basin authority (NBA) which was formed in 1964. This body comprises of nine countries sharing the river Niger basin viz. Guinea, Cote d'Ivoire, Mali, Burkina Faso, Algeria, Benin, Niger, Chad, and Cameroon. NBA role is ensuring the integrated development of the Niger basin like uses of dams, diversions etc. Nigeria is also a member of the Lake Chad basin commission (LCBC). LCBC is made up of Nigeria, Chad, Niger, Cameroon and Central African Republic. The role of LCBC is ensuring rational and sustainable use and development of the Lake Chad.

Water management, policies, and duties

Nigeria does not have a current working National Water Policy. The Water policy in Nigeria is obsolete and needs serious review. There was no water policy for water management in Nigeria till 2004. This must have been due to lack of manpower, understanding of governance and awareness of the role regulatory bodies. In response to this the federal government set up the federal ministry of water resources in 1975. However, the ministry was not in charge of the management of the water resources in the country. There was rather a governmental unit called Federal Inland Waterways Department (FIWD). FIWD was responsible for managing only River Niger and River Benue. This was far beyond the demand of managing the vast water resources in the country. However, before independent the ground water management was under purview of Geological survey department. The task of the Federal ministry of water resources were as follows;

1. Formulate and Implement national irrigation policy.
2. Develop and support irrigated agriculture.
3. Update and implement the water resource master plan

4. Collect store, analyze and disseminate hydro-meteorological, hydrological and other data.
5. Support, monitor and evaluate programs and performances of River basin development authorities (RBDAs) and the National Water Resources Institute (NWRI).
6. Formulate appropriate water resources legislation.
7. Undertake studies and investigations to allow the efficient use of Nigeria's water resources.

In 1976 the federal government set up also the River Basin Development Authority (RBDA). There are presently about 11 RBDAs created to take care of water affairs across Nigeria. RBDA was given enormous task of overseeing the nation's water resources

The RBDAs were mandated to oversee the followings: irrigation, flood control, watershed management, pollution control, fisheries and navigation in Nigerian waters. The RBDAs were also mandated to oversee the followings livestock breeding, food processing, provision of agricultural services and rural electrification (Akamu et al. 2007). The functions of the RBDAs can be seen from view point of Osun –Ogun River basin Development Authourity just like others as follows:)

A. To undertake comprehensive development of both surface and underground water resources for multi-purpose use; with particular emphasis on provision of irrigation infrastructures and the control of floods and erosion and for watershed management.
B. To construct, operate and maintain dams, dykes, polders, wells, boreholes, irrigation and drainage systems and other works necessary for the achievement of the Authority's functions and hand-over all land to be cultivated under irrigation schemes to farmers.
C. To supply water from the Authority's completed storage schemes to all users for a fee to be determined by the Authority concerned, with the approval of the Honourable Minister.
D. To construct, operate and maintain infrastructural services such as roads and bridges linking project sites, provided that such infrastructural services are included in and form integral parts of the lists of approved projects.
E. To develop and keep up-to-date comprehensive water resources master plan, identifying all water resources requirement in the authority's area of operation through adequate collection and collation of water resources, water use, socio-economic and environmental data of the River Basin.

The functions of RBDAs were so enormous that it failed to perform all. Consequently, there were no clear goals, no defined prospects, no mechanism to achieve the aims and coordination was generally in disarray leading to poor management of the Nigeria's water resources.

Nigerian Hydrological Services Agencies

The Nigeria Hydrological Services Agency (NIHSA) is a governmental agency established under the Ministry of Water Resources. The Act for the establishment of the Nigeria Hydrological Services Agency was signed into law by the President on the 27th day of August, 2010. The organization (NIHSA) has similar duties like the RBDA. The vision of the agency is as follows: "To create a dynamic and advanced hydrological service with capabilities of facilitating and supporting the harnessing, controlling, preserving, development and management of Nigeria's valuable water resources in a sustainable manner". The mission statement follows suite as : To provide information on the status and trends of the nation's water resources including its location in time and space, extent, dependability, quality and the possibilities of its utilization and control, through the provision of reliable and high quality hydrological and hydrogeological data on a continuous basis.

Going through the two establishments (NIHSA and RBDAs) one wonders at the separating line of functions of the two bodies. However, upon the establishment of the splinter groups with majorly overlapping functions Nigerians still do not adequate water supplies.

In 1984 the federal ministry of water resources started to draft national water resources master plan with FAO assistance. The plan was submitted in 1985 but failed to address the problems. The draft failed to compile all the issues by sectors and comprehensively. The draft also failed in terms of fund. The federal government therefore officially requested the assistance of government of Japan in updating the original draft, addressing the shortcomings and drawing up a complete plan. This gave birth to the Japanese International Cooperation Agency (JICA) in Nigeria. Following the failure of RBDAs to solve the problems of water resources JICA was vested with the following responsibilities;

1. To formulate a national water resources master plan, this will assure optimum resource use and provide appropriate developmental scenario on a short term by year 2000.
2. On long bases produce a plan to meet predicted socio-economic demands for regions over a wide range of water activities.
3. Quantitative and qualitative assessment of water resources potential projects for water source works, irrigation and drainage, water supply and sanitation and other related components such as hydropower generation, inland navigation and inland fisheries.
4. Integrated management of surface and ground water and rivers; the water shed management and gully disaster control.
5. Water-related environmental management and appropriate water administration.

JICA proceeded in the task and drilled several boreholes around Nigeria. JICA planned a drastic change from large

Table 2: Nigeria's Hydrological Areas (HA)

	Hydrological Areas	Area(km^2)	Precipitation (mm)*	Main related BDAs**	Main related States
HA-1	Niger North	135, 100		Sokoto-Rima	Katsina,Zamfara, Sokoto Kebbi
HA-2	Niger Central	154, 600		Upper Niger, Lower Niger	Niger, Kwara, Kaduna,Kogi,FCT
HA-3	Upper Benue	156, 500		Upper Benue	Adamawa, Taraba, Gombe,Bauchi
HA-4	Lower Benue	74, 500		Lower Benue	Plateau, Nasarawa, Benue,Kogi
HA-5	Niger South	53,900		Anambara Imo Niger Delta	Bayelsa,Delta, Edo, Anambraa, Rivers
HA-6	Western Littoral	99,300		Ogun-Oshun, Benin-Owena	Lagos,Ogun,Oyo, Osun,Ondo,Edo Ekiti
HA-7	Eastern Littoral	57,400		Cross River	Abia, Anambra,Imo, Enugu,Ebonyi,Cross River,Akwaibom,Rivers
HA-8	Lake Chad	178,500		Hadeja-Jamare Chad	Kano,Jigawa,Yobe,Borno Bauchi,Plateau,Adamawa

*total areas is 909,800km2 slightly different from the official total area of the country of 923770km2
** RBDA=River Basin Development Authority
(Taken from FAO Journal)

scale projects to implementation of a series of proposed small scale medium scale water projects. The priority was a shift to middle zone of country for irrigation, southern zone for water supply and northern zone towards management of water resources. JICA also proposed decentralization, privatization and user's participation to get local people involved in water affairs.

Finally, JICA stated the following; That National Water Resources Inventory which was presented during the course of Study should be promptly carried out upon overcoming the inherent defectiveness on database and inventory preparation in each Government agency, and also the entire database should be adequately incorporated into the National Water Resources Databank Centre. Moreover, the JICA Team suggests that the work to revise and upgrade the National Water Resources Master Plan every five year during its implementing period. (JICA study report 1992-1995).

National Water Resource Institute

The National Water Resource Institute (NWRI) was set up by the federal government in 1990 and functioned under enabling legal act the NWRI Act, Cap 284 LFN 1990. Section 2 of the law noted the duties of the organization. NWRI was empowered to carry out engineering research functions related to major water resources projects as may be needed for, flood control, river regulation, land reclamation, drainage, irrigation, domestic and industrial water supply, sewage and sewage treatment. Also included are duties related to planning of water resource management and river basin development. NWRI was also mandated to promote and establish uniform national data collection system relating to surface and subsurface water resources. Till date the NWRI has not fulfilled this mandate (Goldface-Irokalibe 2008).

National Water Supply and Sanitation Policy (NWSSP)

There is no new water management or sanitation policy in Nigeria as of 2016. Nevertheless, several old policies that need to be seriously amended for effectiveness are available. Inasmuch as the existing policies are old and overtaken by contemporary developments and events they exist merely at the federal level. The states do not have unified policy statement nor is there a template of federal policy for states to follow. The lack of direction and regulation of state water programs resulted in almost total neglect of this area by different states in Nigeria. A contrast to the federal water authorities' lack of regulation of states can be seen in activities of national agency for food drug and chemical control (NAFDAC). The regulatory activities of NAFDAC were nationwide. The organization under leadership of late Prof. Dora Akunyili enforced strict compliance to sachet water producing companies in every state of Nigeria. Irrespective of location, affiliations or financial capability manufacturers were forced to be hygiene conscious, standard oriented and produce quality water for the local market. In as much as organization with over lapping roles in water management with NAFDAC tried to interfere with activities, NAFDAC stood out as apex sachet water regulating body ensuring strong compliance to their stipulated water and sanitation policies. Lack of regulation and conflicting or overlapping roles among arms of government are some of the major reasons for poor water provision and sanitation situation in Nigeria. A quick amendment of the old policies is mandatory and a major step in provision of safe water. Among of existing policies are 1989 National policy on environment, 1993 water resources decree No 101, Rural water supply and

sanitation policy 2000, National water supply and sanitation policy 2000, National water resources management policy 2003 and the National water sanitation policy 2004. In the year 2000 the national water Supply and sanitation Policy (NWSSP) was introduced. NWSSP stipulates guidelines on urban and rural water supplies. NWSSP is aimed at making sure that by year 2007 private sectors operators will be responsible for 35% or urban water supplies (UWS), 40% of small town's water supplies (SWS) and 25% of the water supplies in rural areas (RWS). A retrospect at Nigeria's water scheme from 2007 till date (2016) shows that the project was a failure.

It is entrenched that federal government has right to use inter state water resources. The state government should set up and control state water authorities that will be responsible for UWS and SWS. Local government can as well set up local water supply as department of water and sanitation in the rural water supply (RWS). NWSSP is also meant to implement privatization of the water authorities to ease burden on the government. However, there is weakness in implementation of water policies in Nigeria (Odigie and Fajemirokun 2005, Irokalibe 2008). Water supplies should be free from politics, corruption and other salient national vices plaguing Nigeria. Lack of professionalism and insincerity in following laid down policies must be avoided if Nigeria will successfully achieve proficiency and regular water and sanitation targets.

Present state of affairs

There had been important development in Nigerian water resource development. The Ministry of Water Resources noted recently that RBDAs have failed in achieving se goals and have set up committee to review their operations. The Ministry of Water Resources in her 2013 mid -term report stated that the water sector achieved 422 million cubic meters increase in the volume of stored water in Nigerian reservoirs. This was made possible by completion of 9 new dams. The completed dams, according to her, are Ibiono Ibom Dam, in Akwa Ibom; Sulma Dam, Katsina; Mgbowo Dam, Enugu; Owena Dam Treatment Plant, Ondo; Dutsi Dam in Katsina; Inyishi Dam in Imo; Mashi Dam in Katsina; Amauzari Dam, Imo; and Galma Multipurpose Dam in Kaduna (Obande 2013). Many dams had been built in Nigeria in time past. One could ask, would construction of more dams under same old management system provide more water for Nigerians? Where the old dams successful in water provision? The answer is simply NO. RBDA in Nigeria have centered on few out of their many objectives and largely failed in most. Poor management and poor maintenance culture crippled previous project and must be checkmated in new and old dams. The federal government under President M. Buhari reduced number of federal ministries through merger and separations. This is a good move in right direction. There has been a separation of Federal Ministry of Water Resources from the federal ministry of agriculture. This gave rise to the Federal Ministry of Agriculture and Rural Development and FMWR. The Ministry of Water Resources has cardinal targets of producing the national water policy. Nigerian government delineated water resources duties for the three tiers of government are as follows.

1. Federal Government under auspices of FMWR (Federal Ministry of Water Resources) with the RBDA, NIHSA and NWRI, is responsible for formulating and coordination of the national water policies, development and management of large water resources infrastructure, dams' reservoirs, irrigation, and water supply.
2. The State Government is responsible for provision of potable water supplies through state water boards (SWA).
3. The Local government is responsible for provisions of rural water and sanitation facilities.

Suggested ways forward

Privatization of water corporations and RBDA:

The laudable goal of the RBDA may never be fully achieved till they are privatized. The responsibilities and importance of the RBDA is so enormous that in their failure most Nigerians have forgotten about their existence. The establishment of NIHSA and allied agencies and departments within FMWR should be revisited to ascertain relevance instead of duplication of duties. There must be a renewal of interest and zeal in water management among the stake holders and communities. There must be revitalization of the activities of RBDA such that the workers could see themselves working to provide services and not for salaries at the end of the month. There is much apathy in the system and decay that the original vision is completely lost and almost forgotten. RBDA in Nigeria should be privatized and tasked to provide water and irrigation in their domains. More so the northern RBDA should be tasked to irrigate over 1.2 million acres of land for agriculture and cattle grazing. This would stop infiltration of northern cattle herds' men to southern states in search of pasture. Recently the infiltration of the Fulani cattle rarer into southern Nigeria communities has resulted in destruction of farm lands, struggle over grazing fields, struggles over control and management of streams and rivers. There had been incessant cases of mayhem, arson and killing of hundreds in their host communities.

The privatization should have done such that experts, communities and groups of interested business men should be involved in owning the dams. If the users of dams are involved in its management they would make sure it is working to meet their needs.

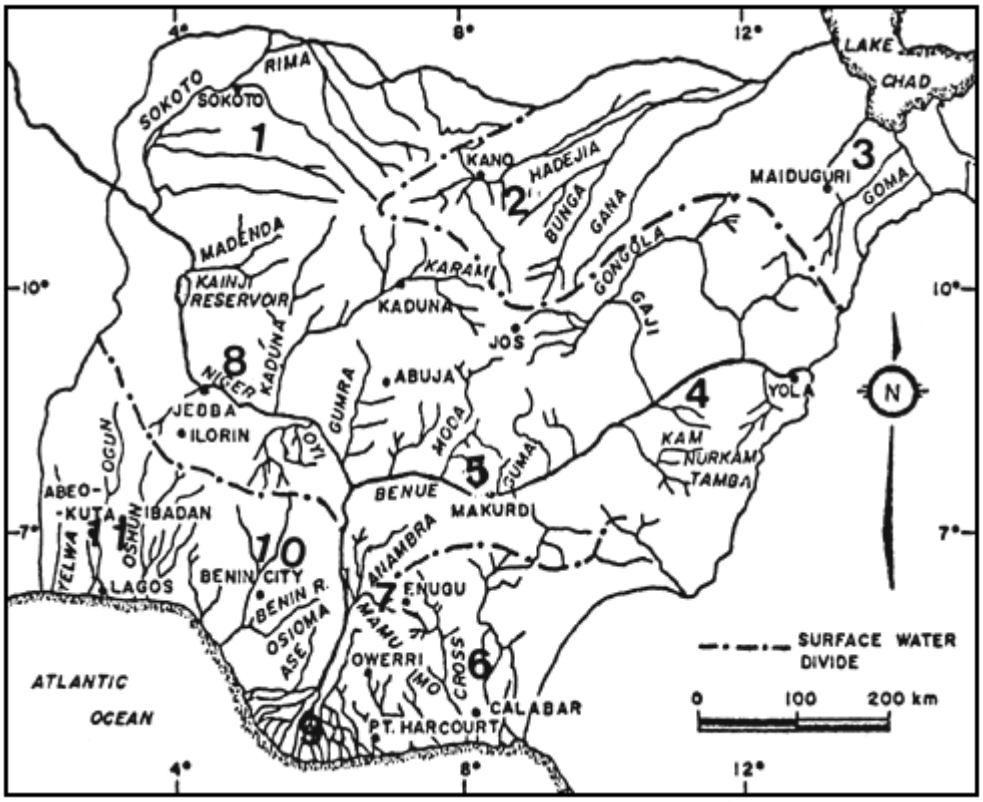


Fig 3. Some River Basin Authorities in Nigeria

Merger of RBDA and NIHSA

There are no major differences between functions of RBDAS and NIHSA. There should be a decentralization of the organizations and merger of the two to achieve laudable objectives. NIHSA and RBDA should exist together in their different domains and integrate their expertise to achieve potable water supplies and control water related issues in the country.

Harnessing and exploiting the ground waters.

There is enormous quantity of ground water available in Nigeria. Ground water table level may be certainly low in low rainfall zones but periods of rain could be used in storing much water for use in dry seasons. Establishment of national water resources solely concerned with water issues could do the magic. Based on the quantity of rainfall per year in the SE and SW Nigeria one can speculate abundant of ground water in the region. Billions of tons of water could be harnessed from these regions, treated, exploited and stored or pumped to places of need. In the North East and North West of Nigeria, many rivers and streams are perennial and go dry during dry seasons. Possibly ground water could be very low in same dry seasons. This can necessitate supplies of potable water to the regions. The rainy periods could be used in harnessing the ground water, not as splinter community bore hole as is presently the case. There should be mass storage system that can contain billions of cubic liters of water. This can be treated and pumped all year round to affected communities. Nigeria is a multi-state and multicultural society, therefore water provision must follow available resources within the localities and their cultural values. Nigerian ground water has not been exploited enough to provide water needs of the communities. Ground water provision should pass the level of establishing bore hole to setting up water works stations supplied by ground water. The water works would have to treat and distribute the water to the affected communities via pipelines.

Harnessing and storage of Surface water

Nigeria is blessed with billions cubic meters of surface water. This becomes disaster in many occasions, only for same areas to lack water afterwards. Surface water can be stored in wells and distributed after proper treatment. Surface water can be channeled to where it is most needed at specific times via canals and underground pipes. This necessitates establishment of organization working only water provision for gain and not charity. The commercial aspect would create the incentive which becomes the drive to succeed for a gain.

Decentralization of RBDAs, NIHSA and NWRI

There is urgent need to decentralize the management of Nigeria River Basin Development Authority. This could be regionalized so that each region would have lesser responsibility than is current for RBDA in Nigeria. The regionalization should further be followed by localization of

the activities and jurisdiction. The reduction of area of jurisdiction and regionalization would make operation more directional and result oriented. There should be a division of the RBDA into the six political zones of Nigeria. Division of RBDA will make each of the six entities (NORTH EAST, NORTH CENTAL, NORTH WEST, SOUTH EAST, SOUTH WEST and SOUTH SOUTH) RBDAs autonomous. Water resources are local and best known by locals and managed best also by locals. For example in some southern tribes of Nigeria like the Igbos and Yorubas, their traditional communities have surface water areas which are designated no trespass zone for the masses. These locations are used for drinking water, serve as ancient reserve and places for reserving ancient fish species. The decentralization of functions of NIHSA, NWRI and RBDA would bring services home and water would be made available in line with cultural values. There is no harm in cooperation between states and federal government in water provision.

CONCLUSIONS

The sole aim of any policy is to have uniform scheme and method of approach in achieving targeted aims. A working national water policy is needed in Nigeria. However, a working national water policy with matrix of present water provision authority's organogram will still be ineffective. For Nigeria to achieve breakthrough in water provision in all field, a complete overhaul of the agencies of Ministry of Water Resources is imperative. The overhauling should involve creation of new organization of government solely responsible for water provision. The decentralization of RBDA and NIHSA, NWRI and allied organizations in FMWR. The present organs of FMWR should be regionalized to enable the six geo political regions to tap into their water resources and bring management of RBDA, NIHSA, NWRI etc closer to host communities. Community participation is important because they are stake holders. Community participation would lead to private partnership and eventual full privatization and stability of water provision by host states and communities. The present arrangement has workers working for salary and without any stake on the project.

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