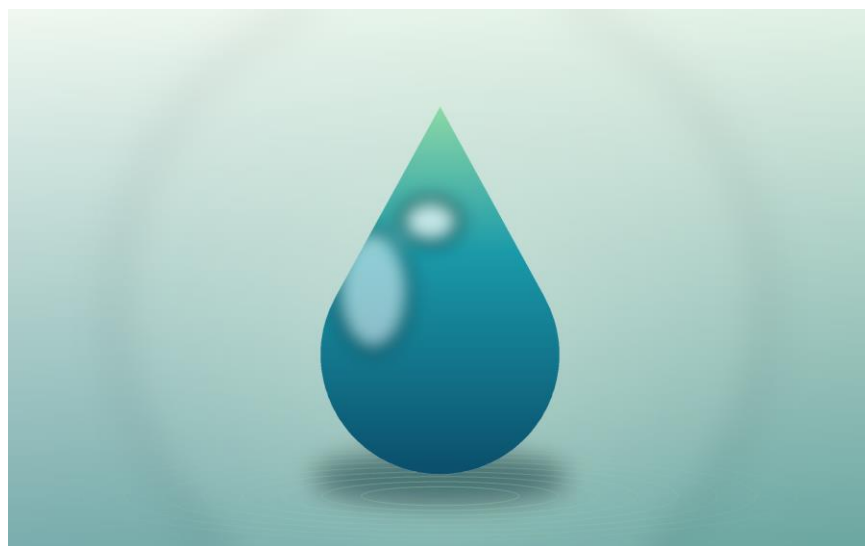


Water

is Life.



Critical Issues of the Water Resources of Nigeria

An overview of evolution, governance, sub-sectors and the road to transformation

by

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Minister of Water Resources, Nigeria (2015–2023)

OVERVIEW OF CRITICAL ISSUES OF THE WATER RESOURCES OF NIGERIA

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EXECUTIVE SUMMARY

Nigeria is not a water-poor country, but it is increasingly water-stressed. With an estimated 375 billion cubic metres of renewable water resources annually, more than 400 dams, a hydropower potential of about 14,000 MW, and 3.14 million hectares of irrigable land, the country has the natural endowment to secure water for drinking, agriculture, energy, industry and the environment. Yet, on the eve of the 2030 Sustainable Development Goals deadline, only about 11 per cent of Nigerians use safely managed drinking water, no major city achieves 100 per cent water coverage, more than 48 million people still practise open defecation, and the 2022 floods caused an estimated US\$ 6.7 billion in direct economic damage. The gap between potential and performance has become the defining challenge of the sector.

This paper argues that the gap is institutional and political rather than hydrological. The diagnosis rests on six observations. First, a coherent policy architecture exists on paper — the National Water Resources Policy, the National Water Resources Master Plan (1995), the National Water Supply and Sanitation Policy, the National Irrigation and Drainage Policy, the WASH Action Plan, and a constellation of standards — but execution has been steadily eroded by short funding cycles, political interference and the encroachment of constituency projects on agency budgets. Second, the key parastatals (RBDA, NIHSA, NIWRMC, NWRI) are under-resourced and, in several cases, professionally diminished. Third, the regulatory framework is fragmented across at least four separate statutes and friction is endemic between federal agencies and between the federal and sub-national tiers. Fourth, climate change is intensifying the hydrological stresses already present: shifting rainfall, dam siltation, salt-water intrusion in coastal aquifers, and the depletion of Lake Chad. Fifth, the country is far short of the World Meteorological Organization minimum of 482 hydrological stations, with about 279 currently operational. Sixth, financing for strategic, long-gestation water infrastructure remains a structural weakness.

The paper proposes a recovery agenda built around three pillars: (i) a legal and institutional reset — consolidating the Water Resources Act 2004, the NIHSA Act, the RBDA Act and the NWRI Act into a single statute, and giving NIWRMC genuine independence on the model of the Nigerian Electricity Regulatory Commission; (ii) a programmatic reset — updating and adopting the National Water Resources Master

Plan, requiring every state to prepare an aligned master plan, expanding the hydrological station network to the WMO minimum, completing the conversion of the National Water Resources Institute into a University of Water Resources, and operationalising the 2023 National Flood Action Plan; and (iii) a financing reset — designating water resources a Priority Sector, ring-fencing capital allocations from constituency-project incursions, and using public–private partnerships to unlock the greenfield and brownfield hydropower pipeline (Mambilla, Gurara II, Dasin Hausa, Katsina Ala).

The case for urgency is concrete. At current rates of progress, sub-Saharan Africa as a whole would need a twenty-fold acceleration to meet SDG 6 on safely managed drinking water (WHO and UNICEF, 2022). Nigeria is well below the regional average. Climate models project an intensification of both droughts in the Sahel and floods in the Niger–Benue corridor. The cost of inaction is no longer hypothetical: the 2022 floods alone displaced 1.4 million people and damaged more than 650,000 hectares of farmland (NEMA, NBS and UNDP, 2023; FGN, 2023). What is required now is not a new diagnosis but the political will to implement what is already, in large measure, known.

Recommended first-year actions: (1) re-table a consolidated Water Resources Bill, after further wider and transparent stakeholder consultation that explicitly reaffirms federalism and land-rights concerns; (2) commission a fully resourced review and update of the National Water Resources Master Plan with a binding implementation framework; (3) ring-fence the budgets of FMWRS, NIHSA, NIWRMC, NWRI and the RBDAs against constituency-project encroachment; (4) approve and fund Phase 1 of the 2023 Comprehensive Action Plan for Preventing Flood Disasters; and (5) launch a national groundwater assessment, anchored at NIHSA, to map abstraction, recharge and contamination across the country.

1.0 INTRODUCTION

Water is life. The best testimony to this statement lies in how ancient civilisations developed and thrived around fresh water sources. The importance of water to all forms of life — and its impact on humanity through agriculture, energy and industrial activity — is self-evident. Every aspect of water resources, in Nigeria and globally, is critical to human survival and to the sustainability of our planet.

2.0 SECTOR EVOLUTION

The earliest “scientific” interest in Nigeria’s water resources can be attributed to Mungo Park and the Lander Brothers in their quest to explore and map the River Niger in the 1800s. Domestically, there is evidence of substantial assessment of the country’s water resources during the colonial period, especially for the provision of potable water through modern, treated pipe-borne municipal facilities in urban areas and open wells in rural areas. A comprehensive evaluation of the River Niger was conducted in the 1950s by the Dutch consulting engineering consortium NEDECO, leading to the planning, design and construction of Kainji Dam and Hydro Power Project in the 1960s (Adeoti and Senzanje, 2007). There has also been extensive assessment of groundwater potential in Northern Nigeria, in view of its dismal surface water hydrology, where rainfall is limited and most rivers are seasonal.

Following the severe drought of the early 1970s, the water resources sector began to receive greater prominence, given the importance of water to agriculture. This led to the creation of River Basin Development Authorities (RBDAs) — first the Lake Chad Basin Development Authority and the Sokoto-Rima River Basin Development Authority in 1973, with ten more added from 1976 (FAO, 2016).

The colonial administration, to its credit, established a network of hydrological data-collection stations across the country that would later prove invaluable to water resources infrastructure development. The first comprehensive national water resources master plan, however, did not emerge until 1995 (JICA and FMWR, 1995).

The creation of a full-fledged Federal Ministry of Water Resources in 1979/80 — a function that had previously been a department under the Federal Ministry of Agriculture — was a turning point for the sector. With a seat in the Federal Cabinet, substantial investment was now witnessed in water resources infrastructure, including the construction of dams and irrigation schemes across the country. In addition to the RBDAs, which eventually grew to twelve, the National Water Resources Institute (NWRI) and the Nigeria Hydrological Services Agency (NIHSA) were established in 1984 and 2010 respectively. Further international engagement and refinement of objectives led to Nigeria’s adoption of the principles of Integrated Water Resources Management (IWRM) and the subsequent creation of the Nigeria Integrated Water Resources Management Commission (NIWRMC) in 2007. It is worth noting that even before the establishment of NWRI, many tertiary institutions had recognised the importance of water resources to national development and established dedicated departments and courses in various aspects of water resources, especially from the 1980s.

3.0 NIGERIA'S WATER RESOURCES SECTOR AT A GLANCE

3.1 Hydrology

With a population of over 200 million and a landmass of 923,768 km², Nigeria is endowed with substantial water resources. The long-term average annual precipitation is approximately 1,150 mm (UN-Water, 2020), ranging from more than 4,000 mm in the south to less than 350 mm in the far reaches of the northern region. The total water resources potential is estimated at about 375 billion cubic metres (BCM) per year — approximately 287 BCM/year generated internally and 88 BCM/year from trans-boundary sources (FAO AQUASTAT, 2016). Nigeria's two major rivers, the Niger and the Benue, define the country's principal drainage system. Several smaller rivers, especially those originating from the Jos Plateau and the Mambilla Highlands, serve as their tributaries.

Nigeria is not a *water-poor country*. However, owing to inequitable distribution, weak sector investment and other impediments, it is more accurately described as a *potentially water-stressed country* (World Bank, 2017).

3.2 Sector Governance

The principal general legislation regulating the water resources sector is the Water Resources Act 2004, formerly Decree 101 of 1993. The Act recognises the importance of the water sector and vests some regulatory powers in the Minister of Water Resources. In addition, Item 64, Part I of the Second Schedule of the 1999 Constitution (Exclusive Legislative List) vests legislative powers in the Federal Government to make laws on inter-state water bodies and rivers throughout the Federation — “water from such sources as may be declared by the National Assembly affecting more than one State.”

For effective basin management, the country is divided into eight Hydrological Areas. By virtue of the Water Resources Act 2004 there exists a Federal Ministry of Water Resources and Sanitation (FMWRS) to govern the sector. Its mandate is to develop and implement policies, projects and programmes that will enable sustainable access to safe and sufficient water to meet the social, cultural, environmental and economic development needs of all Nigerians.

Its core operational departments are: Water Supply; Water Quality Control and Sanitation; Dams and Reservoir Operations; Irrigation; Public–Private Partnerships; Hydrology; River Basin Operations and Inspectorate; and Water Resources Planning and Technical Support Services.

The sector is further governed through twelve RBDAs, the Nigeria Hydrological Services Agency (NIHSA), the Nigeria Integrated Water Resources Management Commission (NIWRMC) and, for capacity building, the National Water Resources Institute (NWRI). Most states of the Federation have also established state ministries of Water Resources, chiefly dealing with concurrent legislative and governance issues such as water supply, irrigation and small hydropower.

At the trans-boundary, regional and international levels, Nigeria is a strong member of the Niger Basin Authority (NBA), the Lake Chad Basin Commission (LCBC), the African Ministers' Council on Water

(AMCOW), the United Nations Economic Commission for Europe (UNECE), and UNESCO, and partners with several leading international water advocacy, scientific and non-governmental organisations.

4.0 THE WATER RESOURCES SECTOR TODAY

Although considerable progress has been recorded in the development of the sector since independence, much remains to be desired. The sector received tremendous support in the 1980s, owing in part to the cardinal programme of the government in power then, but water has not retained the recognition it deserves, either nationally or internationally. Even at the level of individuals and communities, the importance of water as an ingredient of life and as an economic good is not fully recognised or respected. At the international level, there is much talk and less action. In order to appreciate the dynamics of the sector, an assessment of general and specific issues is required, together with a look at the workings of the various governing agencies and sub-sectors.

4.1 Policies and Plans

At the Federal level there has been commendable effort over the years to establish sound policies and strategies to guide the management of Nigeria's water resources. Significant policies developed and adopted include the National Water Resources Policy, the National Irrigation and Drainage Policy, and the National Water Supply and Sanitation Policy, along with several guidelines and standards on water quality, dams and reservoir operations. The National Water Resources Master Plan (NWRMP) was launched in 1995 to run through 2010, with a review and update initiated in 2016 (FMWR, 2016).

FMWRS has, over time, developed strategies to enable the implementation of these policies and plans, including the design and execution of specific programmes and projects. However, these otherwise laudable initiatives have often been derailed by inadequate planning, delayed procurement, poor budgetary allocation and misplaced priorities. The NWRMP that was to be implemented from 1995 to 2010 was largely abandoned in favour of shorter-term projects that fell outside its strategic framework. The Ministry's annual budget has, over many years, been encumbered by Constituency Projects added at the National Assembly, often at the expense of critical and strategic water resources programmes. The most persistent limitation is the lack of continuity in the execution of projects and programmes: many viable initiatives commence but are disrupted by succeeding administrations, leading to a long inventory of abandoned projects and wasted investment.

4.2 Legislation and Governance

4.2.1 Legislation

The sector is regulated by the Water Resources Act 2004, the Nigeria Hydrological Services Agency Act, the River Basin Development Authorities Act and the National Water Resources Institute Act. The Nigeria Integrated Water Resources Management Commission, established following Nigeria's adoption of the principles of IWRM, is not yet backed by a substantive statute of its own. It operates on the basis of certain

powers delegated by the Minister of Water Resources under the Water Resources Act, as an interim measure.

A recent effort to merge these existing laws into a single consolidated Water Resources Bill, and to give effective legal backing to NIWRMC, attracted strong public controversy when it was reintroduced in 2020 and 2022. The objections were not uniform. Some critics argued that vesting expanded federal authority over inland waters could erode state and community rights of access, particularly in the riparian zones of the Niger Delta. Others raised concerns about its interaction with the Land Use Act and with grazing-related conflict in the Middle Belt. A third strand of opposition was political, expressed by several southern state governors and civil-society coalitions who saw the timing of the Bill as an attempt to centralise control over natural resources (Punch, 2021; BusinessDay, 2022).

These concerns were substantially responded to and explained through several channels of engagement, but sadly ignored and dismissed. The federal regulatory role over inter-state water bodies is in fact a constitutional matter, settled by the 1960 Constitution and reaffirmed by Item 64 of the Exclusive Legislative List in the 1999 Constitution. Within that constitutional space the Bill and the Water Resources Act 2004 had, indeed, already accommodated the legitimate concerns raised: clearer carve-outs for state and community water use, explicit safeguards for traditional riparian rights, and an independent NIWRMC with an open licensing regime and a published tariff methodology. The Bill was prepared way back in 2008, and had gone through transparent stakeholder consultation including with state governors, communities, civil-society groups and a public hearing in the Federal House of Representatives. Ironically, many of the communities that stand to benefit most from a stronger NIWRMC are among those who were misled into opposing the intended important amendments to the four existing legislations.

4.2.2 Governance

4.2.2.1 Federal Ministry of Water Resources and Sanitation (FMWRS)

Water resources issues are governed by FMWRS, but functions overlap with those of other ministries and agencies, including Agriculture, Environment, Power and Health, as well as the National Inland Waterways Authority and the sub-national governments. Cooperation at the top largely depends on the personality of the ministerial leadership, but within the bureaucracy of governance inter-agency rivalry and territorial tendencies are rife. These tendencies often impede the implementation of programmes or lead to duplication of effort. Operational guidelines and regulations exist to avoid such conflicts but are not consistently observed. The most challenging difficulty is the cascading of policies and programmes from Federal level to sub-national level: water resources issues transcend territorial and political boundaries, and it is difficult for 36 states and 774 LGAs to align with Federal policy at the same pace.

4.2.2.2 River Basin Development Authorities (RBDAs)

Since the 1990s the RBDAs, which had built hundreds of dams and irrigation schemes and supported farmers across the country, have been progressively reduced in scope, with their senior management positions occupied by political appointees rather than experienced technocrats. They have continued to

suffer from inadequate funding for their core responsibilities, while receiving disproportionate appropriations for constituency projects outside their core mandate. As a result, existing dams and irrigation systems have continued to fall into disrepair, and strategic projects that would expand RBDA activities and improve the lives of farming and rural communities are increasingly overlooked.

4.2.2.3 Nigeria Hydrological Services Agency (NIHSA)

Until recently NIHSA was probably the most technical and professional of the water resources agencies. Responsible for hydrological and hydrogeological data management and flood forecasting, the agency is best known for its Annual Flood Outlook (NIHSA, 2022). It currently manages approximately 279 hydrological measurement stations nationwide, against a recommended minimum density of 482 stations consistent with World Meteorological Organization guidance (WMO, 2008). In recent years the RBDAs were directed to support NIHSA by establishing additional hydrological stations from their own budgets. Today, however, NIHSA is a diminished version of its former self: technical manpower shortage and recent retirements of experienced senior leadership cast a bleak shadow over the future of an agency that should be at the centre of the sector's climate-adaptation response.

4.2.2.4 Nigeria Integrated Water Resources Management Commission (NIWRMC)

The Commission has, over the years, made notable progress in advancing IWRM principles and in processing licences for water use and setting water tariffs. However, it operates on the basis of delegated ministerial powers rather than as the independent commission it ought to be, on the model of the Nigerian Electricity Regulatory Commission. This limitation is one of the issues the proposed consolidated Water Resources Bill is intended to address. The Commission also suffers from inadequate budgetary provision and lacks the legal authority to apply some of its income from licensing and tariffs to fund its operations. Without effective statutory recognition, NIWRMC can issue guidance, but it cannot enforce.

4.2.2.5 National Water Resources Institute (NWRI)

NWRI was established to complement the initiatives of various tertiary institutions and, specifically, to provide practical capacity building in water resources management. The Institute has been a success story in many respects, although at some point it suffered from limited patronage even by its parent Ministry and its parastatals. In recent years, efforts have been put in place to transform it into a full-fledged University of Water Resources, with the application pending with the National Universities Commission (NUC). The Institute hosts the UNESCO Category 2 IWRM Centre for the region, collaborates effectively with several universities in developing their water resources curricula, and conducts research and development in various aspects of water resources. Like other parastatals in the sector, the Institute lacks adequate funding and its budget is regularly burdened by constituency projects that are outside its core mandate.

4.3 Key Water Resources Sub-Sectors

4.3.1 Water Supply and Sanitation

Drinking water is the most important requirement of life, after oxygen. In the past, water supply was the purview of sub-national governments. However, in view of water supply being on the concurrent list of the Constitution, the Federal Government adopted a National Water Supply and Sanitation Policy in 2000 that apportions responsibility for funding water supply projects and operations across the Federal Government, the states, the LGAs and communities.

For urban water supply, state governments are obliged to establish and operate state water agencies (SWAs), while LGAs run rural water supply facilities through rural water supply and sanitation agencies. Nigeria has failed substantially to provide adequate water supply to its citizens, especially in urban areas. As at the time of the most recent national assessment (FGN and UNICEF, 2021), no Nigerian city or town achieves 100 per cent water coverage. According to the WASHNORM survey of that year, only about 11 per cent of Nigerians had access to safely managed drinking water, and an estimated 70 per cent of households consumed water from sources that were not safely managed. In addition, approximately 48 million Nigerians still practise open defecation and 55 million people lack basic sanitation services (FGN and UNICEF, 2021; WHO and UNICEF, 2022).

Although the Federal Government has initiated several Water, Sanitation and Hygiene (WASH) programmes to address the situation — including the declaration in 2018 of a State of Emergency on WASH and the launch of the Partnership for Expanded Water Supply, Sanitation and Hygiene (PEWASH) programme — state governments, which carry primary statutory responsibility, have given WASH issues limited priority. As the population continues to grow, weak planning and inadequate financial commitment continue to worsen the situation. Even where Federal interventions have taken place, many states have failed to take ownership and have allowed projects to decay through poor operations and maintenance by their SWAs. Under current conditions, Nigeria is unlikely to meet SDG 6 by 2030; the WHO/UNICEF Joint Monitoring Programme has noted that sub-Saharan Africa as a whole would need a twenty-fold acceleration in current rates of progress on safely managed drinking water to reach the SDG target (WHO and UNICEF, 2022).

4.3.2 Irrigation

Nigeria has an estimated irrigation potential of approximately 3.14 million hectares, of which barely 10 per cent has been utilised in a formal sense (FAO, 2016). Most of the large irrigation schemes are still owned and managed by the Federal Government through the RBDAs. State governments and LGAs have invested negligibly in formal irrigation, leaving many existing dams unutilised and constituting wasted investment on a colossal scale.

4.3.3 Dams and Hydropower

Nigeria has over 400 dams and reservoirs scattered across the country (FMWR, 2019). Most are multi-purpose, providing raw water for potable supply, irrigation, hydropower, tourism and recreation. However, several years after construction, and never optimally utilised, a substantial number have silted up with considerably reduced useful storage and some now constitute a safety hazard. In recent years a

number of dams were poorly planned and designed, some procured more on the basis of political influence than sound engineering judgment.

The country has an estimated hydropower potential of about 14,120 MW, of which only approximately 2,062 MW — roughly 15 per cent — has been developed (IHA, 2018; energypedia, 2022). The principal existing schemes are Kainji, Jebba, Shiroro and Zungeru, complemented by mini and midi schemes such as Kashimbila (40 MW), Gurara I (30 MW) and Dadin Kowa (40 MW). A growing pipeline of greenfield and brownfield projects is being developed on public–private partnership and foreign-loan bases, including Gurara II (360 MW), Mambilla (3,050 MW), Katsina Ala (460 MW) and Dasin Hausa (150 MW).

4.4 Hydrological and Technical Issues

4.4.1 Climate Change

Climate change is the single most consequential medium-term threat to Nigerian hydrology, and it is no longer prospective. Nigeria experiences unusual variations in climate that have reached alarming proportions globally. Variations in rainfall patterns, together with rising temperatures, have direct impacts on hydrology — depleting reservoir storage, distorting agricultural production and causing excessive flooding. It was estimated under the 1995 NWRMP that only about 24 per cent of annual rainfall constituted surface runoff, while 76 per cent was consumed by evapotranspiration, infiltration and sundry hydrological losses. That balance has shifted in recent years.

The Intergovernmental Panel on Climate Change (IPCC, 2022) projects that West Africa will experience higher temperatures, more variable rainfall, and an intensification of extreme events — droughts in the Sahel and the dry north, and heavier seasonal rainfall in the south and the Niger–Benue corridor. For Nigeria specifically, the implications are six-fold: (i) reduced reliable inflows into northern reservoirs (Tiga, Challawa Gorge, Goronyo, Kiri, Dadin Kowa); (ii) more severe and more frequent flood events in the lower Niger–Benue system; (iii) accelerated dam siltation due to higher-intensity rainfall on degraded catchments; (iv) salt-water intrusion in coastal aquifers from sea-level rise; (v) the further desiccation of Lake Chad, the surface area of which has shrunk by approximately 90 per cent since the 1960s (ESA, 2019; UNEP, 2018; FAO, 2009); and (vi) growing groundwater stress as surface supplies become less reliable and urban populations rely more heavily on private boreholes.

An effective climate-adaptation programme for the water sector is long overdue, and should include a national climate-and-water vulnerability assessment by hydrological area.

4.4.2 Deforestation and Soil Erosion

Decades of deforestation have led to excessive soil erosion. Runoff from rainfall transports vast quantities of eroded soil into streams and rivers, impairing their hydraulicity and allowing river beds to be colonised by stubborn vegetation such as *Typha* grass. This has caused rapid siltation of dams, especially in the Sahel and Savannah regions. Recent bathymetric surveys indicate that Tiga dam has lost about 400 million cubic

metres of its 2 billion cubic metre storage, and Sabke dam has lost approximately 40 per cent of its useful capacity, due to siltation (Federal Ministry of Water Resources, 2019).

4.4.3 Drought and Flooding

Nigeria has not experienced a drought worse than that of the early 1970s, or at least the impact of subsequent droughts has been contained through interventions such as the construction of dams and irrigation infrastructure, the issuance of early warnings, and changes in farming practices and seed varieties. Flooding, however, has in recent years become a national catastrophe, with severe loss of lives and substantial economic damage. The 2012 and 2022 floods are on record as the most severe in living memory. The 2022 floods alone affected all 36 states and the FCT, killed more than 600 people, displaced over 1.4 million, damaged more than 650,000 hectares of farmland, and caused estimated direct economic damages of US\$ 6.68 billion — with the upper-bound estimate at US\$ 9.12 billion (NEMA, NBS and UNDP, 2023; FGN, 2023; OCHA, 2022).

Much of the flooding is generated within the country, as approximately 80 per cent of Nigeria's runoff occurs internally. Many tributaries of the River Benue, which are largely undammed, are major contributors to the annual flood regime. To date, only Kashimbila Dam has been constructed with flood prevention and mitigation as an explicit purpose. Siltation has reduced the carrying capacity and flow efficiency of rivers, inundating riparian communities and farmland. Municipal floods, however, are mostly caused by the deliberate human encroachment of water courses and flood plains, and by inadequate urban drainage.

4.4.4 Groundwater

As at 1995 the National Water Resources Master Plan identified that Nigeria had abundant groundwater resources, of which only about 5 per cent had been exploited, mainly for rural water supply. Today, groundwater abstraction has expanded well beyond drinking water supply to include large-scale industrial use. The failure of states to provide adequate municipal water supply has driven uncontrolled and unregulated borehole proliferation; reports suggest there may be more than 100,000 boreholes within Abuja city alone (Premium Times, 2022). The current status of Nigeria's groundwater is, therefore, of grave concern and warrants a national assessment with regulatory follow-through.

4.4.5 Coastal Salt-Water Intrusion

Rises in sea level associated with climate change are beginning to be observed in Nigeria's coastal areas, affecting drinking water quality, aquatic life and navigation within creeks and inland waterways. The effect is particularly noticeable in groundwater sources in coastal cities and towns (Akpan and others, 2019).

4.4.6 River Pollution

Nigeria's rivers are heavily polluted, primarily from human activity. The most notable causes are the uncontrolled discharge of urban human and industrial wastes, agriculture, mining and other commercial activities around river banks. A 2020 study concluded that approximately 56 per cent of water courses are

heavily polluted with various chemical and bacteriological contaminants (Olukanni and others, 2020). Recent cases of kidney disease in communities around the River Hadejia have been attributed to upstream untreated waste discharges from industries within the Challawa Industrial Area in Kano. The ongoing Ilesha Water Supply project has been disrupted by gold-mining activity that has degraded the quality of its raw water source. Oil pollution in the Niger Delta has had debilitating effects on human lives and on flora and fauna for several decades (UNEP, 2011).

4.4.7 Trans-boundary Waters

The shrinking of Lake Chad in recent decades — by approximately 90 per cent of its 1960s surface area — is well documented globally (ESA, 2019; UNEP, 2018; FAO, 2009). The lower River Niger and its Delta are also under threat from upstream desertification and from the decision of some Niger Basin Authority member countries, notably Guinea and Niger, to construct dams on certain tributaries; Kandadji Dam in Niger Republic is at an advanced stage of completion. Human activity around the banks of the river, particularly within Mali, also poses a danger to the river's health. The River Niger characteristically has high siltation, which makes dredging a highly capital-intensive endeavour. Lagdo Dam in Cameroon was constructed on a tributary of the River Benue, and the controlled and uncontrolled spillage from it is a recurrent source of concern downstream, particularly for riparian communities in Adamawa, Taraba and Benue states. Approximately 60,000 square kilometres of Nigeria's northern region lies within the Lullemeden Trans-boundary Aquifer System, which is shared with Algeria, Mali, Benin and Niger.

4.5 Water Resources Management Issues

4.5.1 Governance and Politics

The federal structure of the country can impede water resources development in a sector whose nature and characteristics transcend political boundaries. Policies and programmes emanating from the Federal Government remain unimplemented or are derailed at state level. Without holistic collaboration, the three tiers of government often work at cross purposes. Katsina State, for example, several years ago embarked on the construction of earth dams across the state without an interface with the Federal Government. Today, many of the Federal Government's dams have been affected by new dams that the state subsequently built upstream. Kano State, a decade ago, decided to develop hydropower schemes at Tiga and Challawa Gorge dams without the express permission of, or consultation with, the owner FMWR. In that case Kano State lost substantial sums to gross over-design by a turnkey contractor who relied on data not obtained from the appropriate federal agencies. This corrosive politicisation of water issues became more pronounced when some state governors campaigned against the proposed consolidated Water Resources Bill in the National Assembly. Even at Federal level there are several overlaps of function between ministries, departments and agencies (MDAs); for example, the Federal Ministry of Environment in recent times began to issue its own annual flood forecast alongside NIHSA/FMWR. Lack of continuity of programmes and policy reversal by succeeding governments also impede progress. A comprehensive

plan to address perennial flood disasters approved in April 2023 appears to have been set aside by the succeeding administration.

4.5.2 Population Growth

Nigeria's population, at well above 200 million, and its high growth rate place increasing pressure on natural, human and economic development. The water resources sector is not immune. The challenges of providing drinking water, food and energy rise exponentially as the population grows. Poor planning and constrained finance make it difficult for the water sector to keep pace.

4.5.3 Data Collection

Nigeria remains far below the minimum number of hydrological stations specified by the World Meteorological Organization, with approximately 279 in operation against the WMO recommendation of 482 (WMO, 2008). Climate forecast and early warning mechanisms exist — principally through NIHSA, the Nigerian Meteorological Agency (NIMET) and the Federal Ministry of Environment — but the ability of these agencies to carry out adequate hydrogeological data collection is constrained by inadequate budgetary appropriation.

4.5.4 Water Resources Planning

A comprehensive National Water Resources Master Plan was launched with Japanese Government support in 1995. Outside of FMWR, however, the plan was never effectively adopted by sub-national governments, nor have succeeding administrations at Federal level adhered closely to its principal provisions, particularly those relating to the strategic infrastructure projects identified and recommended in the plan. Many water projects have been procured without the basic prerequisites of feasibility studies and detailed engineering designs — a recipe for cost overruns, poor delivery and abandonment. As at November 2015, there were approximately 116 FMWR projects either on-going, suspended or abandoned. The situation is far worse at state and local government level: with very few exceptions, most states have no strategic or long-term water resources or water supply plan, and are averse to long-term programmes in favour of short-term solutions tied to the next election cycle.

4.5.5 Water Infrastructure Financing

The cost of financing water infrastructure is high worldwide. Nigeria's fragile macroeconomic environment, particularly an unstable currency exchange rate, makes it especially difficult for government to invest at the scale required. As a result, dams remain idle for decades without the intended value addition — water supply, irrigation and hydropower facilities. At several points in the recent past, international financing institutions such as the World Bank have suspended major loans for large water-infrastructure projects (municipal water supply, dams, irrigation). NGOs and international aid agencies support projects across the country, but their interventions are typically below scale relative to the size of Nigeria and the magnitude of the challenges. Public-private partnership financing is gaining traction, particularly for "bankable" greenfield and brownfield hydropower projects, while water supply and irrigation are still treated as social services to be funded by government. National Assembly appropriations

continue to give little priority to strategic, long-term water-resources interventions, in favour of short-term and often non-sector-related procurements.

4.5.6 Institutional Capacity, Operations and Management of Infrastructure

There is now a shortage of expertise and a dedicated workforce across data collection and management, planning, design, operations and maintenance of water resources infrastructure. The combination of weak institutional capacity and inadequate funding for operations and maintenance has rendered water-related agencies inefficient and unattractive as career destinations. Several past efforts to corporatise the state water agencies have failed for lack of political will and because of the over-politicisation of water resources agencies and services.

4.5.7 Communal and Security Issues

The prevailing security situation, frequent communal agitations and persistent vandalism are a serious concern. Even data collection stations and safety installations around dam sites are not immune. Insecurity renders project sites and field stations inaccessible, impeding operations. Communal clashes over water are infrequent compared to herder–farmer conflicts, but they could escalate. The Boko Haram insurgency has been associated, by a number of analysts, with the collapse of agricultural and pastoral livelihoods following the contraction of Lake Chad (UNDP, 2017), although the causal chain is multifaceted. An otherwise potentially beneficial project for communities downstream of the proposed Kafin Zaki Dam in Bauchi State has, for years, been resisted by Yobe State and remains only on the drawing board.

5.0 STRATEGIC RESPONSE: THE ROAD TO TRANSFORMATION

The foregoing assessment of the water resources sector implies that addressing the issues identified would lead to improved development and management of this vital sector — “to meet the social, cultural, environmental and economic developmental needs of all Nigerians.” The challenges are many, but the sector would benefit substantially from political will, deliberate prioritisation and a number of strategic interventions.

5.1 Suggested Priority Actions

The following actions are recommended, organised by horizon.

First 12 months — institutional and planning reset

1. Re-introduce the consolidated Water Resources Bill, after wider transparent stakeholder consultation and upholding existing safeguards for state and community rights as is already provided in the Water Resources Act 2004, along with an impact assessment, and provisions granting NIWRMC genuine statutory independence on the model of NERC.
2. Commission a fully resourced review and update of the National Water Resources Master Plan, with a binding implementation framework and clear inter-governmental adoption process. The

plan should incorporate an effective climate-adaptation programme for the water sector, preceded by a national climate-and-water vulnerability assessment for each hydrological area.

3. Ring-fence the budgets of FMWRS, NIHSA, NIWRMC, NWRI and the RBDAs against constituency-project encroachment through a National Assembly framework appropriation order.
4. Implement the 2023 Comprehensive Action Plan for Preventing Flood Disasters in Nigeria, including the proposed flood-classification scheme and emergency-response architecture.
5. Launch a national groundwater assessment, anchored at NIHSA, that maps abstraction, recharge and contamination, with mandatory borehole registration across the country.

Years 2–3 — scale-up and structural change

6. Require every state, in collaboration with FMWRS, to prepare a long-term water resources/water supply master plan aligned with the NWRMP.
7. Increase financing and budgetary allocation, commensurate with a renewed designation of water resources as a Priority Sector in the medium-term expenditure framework.
8. Commission a comprehensive coastal protection and salt-water intrusion strategy linking the federal ministries of Water Resources, Environment and Coastal States of the Federation.
9. Expand the hydro-meteorological data network from approximately 279 to the WMO minimum of 482 stations.
10. Conclude the conversion of NWRI to a national University of Water Resources.
11. Establish an effective framework for inter-governmental collaboration to safeguard and monitor fresh water sources against deliberate acts of pollution, including tougher enforcement of statutory regulations and penalties.

Continuing — cross-cutting

12. Re-examine and enhance inter- and intra-governmental collaboration on water resources matters, with a standing inter-ministerial coordination mechanism chaired at Vice-Presidential level.
13. Ensure continuity of existing policies, projects, programmes and other forms of intervention — the water resources sector, by its nature, has long gestation periods and is uniquely vulnerable to administration-cycle disruption.

5.2 Complementary Strategic Projects

Certain strategic interventions are long overdue, while others are in the pipeline or have been started and stalled. The following projects merit urgent re-engagement:

- Mambilla Hydropower Project, 3,050 MW — Federal Ministry of Power.
- Gurara II Hydropower Project, 360 MW — FMWRS.

- Dasin Hausa Dam and Hydropower Project, 150 MW — FMWRS.
- Hawul Interbasin Water Transfer Project — FMWRS.
- Nasarawa Integrated Irrigation Project — FMWRS.
- Donga–Suntai Irrigation Project — FMWRS.
- Master Plan for the River Niger — flood control, navigable waterways and river-based sustainable economy — FMWRS.
- Feasibility studies for improving the hydraulicity of the Chari and Logone Rivers — Lake Chad Basin Commission.

6.0 CONCLUSION

Several decades ago, Nigeria’s water resources sector received the recognition, support and funding that drove appropriate institutional reform and the provision of world-class water infrastructure across the country. The foresight and commitment of many public servants, professionals and academics transformed a federal department into a full-fledged ministry, with fifteen subsequent spin-off agencies at the national level today. Challenges, both human and natural, have always existed and will continue to exist; what matters is how strongly we respond, as the country did during the “golden years” of water resources development in Nigeria.

In recent years, however, our collective inattention and loss of focus have weighed heavily on the water resources sector. If this trend continues, what may be witnessed is stagnation and even a substantial reversal of the institutional and technical gains achieved in the first three post-independence decades. A renewed commitment, and an urgent response to the concerns raised in this paper, can yet take the sector to an advanced level in the not-too-distant future.

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