© JAN 2026 | IRE Journals | Volume 9 Issue 7 | ISSN: 2456-8880
DOI: https://doi.org/10.64388/IREV9I7-1713861

Bridging Policy, Governance, and Practice in Dam Infrastructure Management: Lessons from the Gurara Water Transfer Project

STELLA NNEKA ARACHIE[1] PROF. UKERTOR GABRIEL MOTI[2]
[1, 2]*Sustainable Development Centre, University of Abuja, Nigeria*

Abstract - Effective water governance is fundamental to sustainable infrastructure management and the equitable distribution of water resources in developing economies. Nigeria's dam infrastructure, despite substantial public investment, continues to underperform due to weak institutional coordination and fragmented policy implementation. This study investigates the governance dynamics underpinning Nigeria's Gurara Water Transfer Project (GWTP), focusing on institutional coordination, policy implementation, and stakeholder participation. The aim is to identify governance challenges affecting the project's performance and to explore how these issues can be addressed to improve the sustainability of dam infrastructure in Nigeria. A qualitative case study design was employed, combining document analysis and semi-structured interviews with key stakeholders involved in the GWTP. Findings reveal significant governance weaknesses, including fragmented institutional arrangements, inadequate monitoring and evaluation (M&E) systems, and limited community participation. These challenges have led to inefficiencies in dam operations and hindered the achievement of the project's intended benefits. The study concludes that the sustainability of dam infrastructure in Nigeria relies more on coherent governance systems than on technical design. Recommendations include the establishment of a unified regulatory framework, the integration of comprehensive M&E systems, and the formalization of stakeholder engagement processes to ensure social accountability and effective project management.

Keywords: Water governance; Institutional Coordination; Gurara Water Transfer Project; Dam Infrastructure Management; Policy; Practice

I. INTRODUCTION

The management of water infrastructure remains a critical challenge in many developing countries, particularly in sub-Saharan Africa, where population growth, urbanization, and climate change exacerbate water scarcity and resource management issues (Nyika & Dinka, 2023; Gedamu et al., 2025). In Nigeria, where over 400 dams have been documented, the need for efficient water infrastructure is especially urgent. Large multipurpose reservoirs have been central to the country's water supply, irrigation, and hydropower generation. However, despite considerable investment, many of these projects, including the Gurara Water Transfer Project (GWTP), have struggled to meet their intended socio-economic and environmental goals. This issue largely stems from poor governance and institutional inefficiencies that have hindered the effective management of these critical infrastructures (Adeoti et al., 2023; Adeniran et al., 2021). Governance, in this context, encompasses the frameworks, policies, and institutional arrangements that guide water management practices. Effective governance is essential to ensuring that water resources are not only equitably distributed but also sustainably managed for long-term development. Yet, in Nigeria, the gap between policy and practice has led to poor outcomes, and the country's dams are often underutilized or poorly maintained, preventing them from achieving their full potential (Okonkwo & Idigo, 2024; Fagbadebo, 2025).

The Gurara Water Transfer Project (GWTP) is a flagship initiative designed to address water supply shortages in the Federal Capital Territory (FCT), while also generating 30 MW of hydropower and irrigating about 6,000 hectares of farmland. Despite its technical potential and strategic importance, the project's performance has been hindered by a host of governance-related challenges, including poor coordination between the various stakeholders involved, delay in the retrofitting of the power plant, completion of the transmission lines, and environmental degradation resulting from inadequate oversight (Wada et al., 2025; Okunlola et al., 2014). These challenges highlight broader issues in Nigeria's water governance systems, where fragmented policies, overlapping institutional mandates, and weak monitoring mechanisms continue to undermine the sustainability of water infrastructure projects. This fragmentation not only affects the performance of the Gurara project but also

exemplifies the broader challenges facing large-scale infrastructure initiatives across the country (Mahi & Isah, 2016).

Water governance refers to the political, institutional, and administrative processes through which water resources are developed, allocated, and managed. It encompasses the structures and systems that determine how water resources are regulated, how policies are formulated and implemented, and how different stakeholders; government agencies, private operators, and local communities interact in managing water infrastructure (Nyika & Dinka, 2023). Effective governance requires institutional coordination, coherent policy frameworks, and participatory management. These elements are crucial for the successful operation of multipurpose dams like the Gurara project, where a complex web of actors is involved, ranging from national and local government agencies to private sector actors, such as concessionaires responsible for hydropower operations (Adeoti et al., 2023). However, in many developing countries, including Nigeria, governance structures are often characterized by overlapping mandates, poor coordination, and weak institutional frameworks, which impede the effective management of water infrastructure (Gedamu et al., 2025).

The challenges of governance in Nigeria's water sector are compounded by a persistent disconnect between national policies and the operational realities on the ground. Despite the formulation of some water sector policies such as the Water Resources Act (2004) and the National Water Resources Policy and Strategy (2016), implementation has often been inconsistent, and policy fragmentation remains a significant barrier to achieving sustainable water management. Multiple agencies with overlapping responsibilities, including the Federal Ministry of Water Resources & Sanitation (FMWRS), River Basin Development Authorities (RBDAs), State Water Boards, and Private Operators, frequently operate in silos, making it difficult to coordinate efforts effectively. This fragmented approach leads to inefficiencies, delays in project implementation, and an inability to respond to emerging challenges. The lack of accountability mechanisms further exacerbates these issues, as there is often no single entity responsible for overseeing the project's overall performance (Okonkwo & Idigo, 2024; Fagbadebo, 2025). As a result, water infrastructure projects like the GWTP struggle to achieve their intended outcomes, and the benefits of large investments in dam infrastructure are often not fully realized.

II. LITERATURE REVIEW

2.1 Concept of Water Governance and Institutional Effectiveness

Water governance refers to the range of political, institutional, and administrative processes through which water resources are developed, allocated, and managed. It encompasses the rules, practices, and decision-making structures that determine how water is distributed among competing users and how sustainability is ensured over time (UN-Water, 2015). Effective governance is critical because it ensures equitable access, efficient allocation, and environmental sustainability. In Africa, however, governance structures are often characterized by overlapping mandates, limited enforcement capacity, and poor inter-agency coordination, which undermine the ability of states to deliver reliable water services (Mogaka et al., 2022; Agyemang et al., 2021). These challenges are compounded by rapid urbanization, climate variability, and population growth, all of which place increasing pressure on already fragile water systems.

In Nigeria, the governance of water resources is shaped by a multi-tiered legal and institutional framework. The Water Resources Act (2004) vests control of water resources in the federal government, while states and local governments oversee supply and utilization. Although this arrangement appears comprehensive in principle, it has generated jurisdictional conflicts and inefficiencies, particularly in the management of large-scale infrastructure projects (Ogunbode et al., 2023). The National Water Resources Master Plan (2013) and the National Water Resources Policy and Strategy (2016) both advocate for Integrated Water Resources Management (IWRM), a framework designed to coordinate cross-sectoral water use and promote sustainability. Yet, implementation of IWRM in Nigeria remains weak, with fragmented institutions and limited stakeholder participation undermining its effectiveness (Martins et al., 2025).

Institutional effectiveness in water governance depends on several interrelated factors. Clear role delineation among agencies, adequate funding, technical capacity, and accountability mechanisms

are essential for ensuring that water policies translate into tangible outcomes. Where these elements are lacking, even well-designed infrastructure often fails to deliver its intended benefits (Tortajada, 2014; Biswas, 2018). For example, Nigeria's numerous dam projects, including the Gurara Water Transfer Project, have faced operational challenges not because of technical flaws but due to weak institutional coordination and inadequate oversight (Ukpai, 2022). This underscores the importance of evaluating governance not merely in terms of laws and policies but through their practical application in operational settings.

Recent studies highlight that Nigeria's water governance system suffers from policy fragmentation and weak enforcement capacity. Conflicts of interest between Federal, State, and Local Authorities often delay project implementation and reduce efficiency (Ukpai, 2022). Moreover, financing gaps and limited technical expertise within water agencies hinder the sustainability of infrastructure investments (Global Waters, 2023). These institutional weaknesses have direct consequences for service delivery: millions of Nigerians still lack access to basic water services, and urban residents often rely on informal vendors or private boreholes, reflecting the inability of public institutions to meet demand (Martins et al., 2025).

Strengthening institutional effectiveness therefore requires reforms that go beyond policy formulation. Practical measures such as enhancing inter-agency coordination, building technical capacity, and establishing robust accountability frameworks are critical. International best practices suggest that participatory governance; where communities, private operators, and civil society organizations are actively involved in decision-making can improve transparency and foster ownership of water projects (Agyemang et al., 2021). In Nigeria, adopting such approaches could help bridge the persistent gap between policy design and operational realities, ensuring that infrastructure investments translate into sustainable outcomes.

Ultimately, water governance in Nigeria must be understood as both a technical and political process. While laws and policies provide the framework, institutional effectiveness determines whether these frameworks achieve their intended goals. Without strong institutions, adequate funding, and effective coordination, even ambitious projects like the Gurara Water Transfer Project risk underperformance. Addressing these governance challenges is therefore central to achieving sustainable water management and meeting the broader development objectives outlined in Nigeria's national strategies and the Sustainable Development Goals (SDGs).

2.2 Dam Governance and Sustainable Development

Globally, dams have long been central to water and energy security, serving as critical infrastructure for irrigation, hydropower generation, flood control, and urban water supply. Historically, dam governance was dominated by engineering and technical considerations, with success measured primarily in terms of structural integrity and output capacity. However, over the past two decades, governance frameworks have shifted toward a more holistic approach that emphasizes environmental sustainability, social equity, and participatory decision-making (World Commission on Dams [WCD], 2000; UNEP, 2021). This evolution reflects growing recognition that dams are not merely technical projects but socio-ecological systems whose impacts extend far beyond their immediate operational objectives.

Recent frameworks advocate participatory approaches, transparency in decision-making, and adaptive management to cope with climatic and socio-economic uncertainty (Gleick & Christian-Smith, 2019; Scudder, 2019). Adaptive governance is particularly important in the context of climate change, which introduces variability in rainfall patterns and water availability, thereby complicating long-term planning. Moreover, participatory governance ensures that affected communities are not passive recipients of decisions but active stakeholders in shaping outcomes. This shift aligns with global sustainable development agendas, including the Sustainable Development Goals (SDGs), which emphasize inclusivity, accountability, and resilience in infrastructure management (UNEP, 2021).

In Nigeria, large dams such as Kainji, Shiroro, and Jebba have contributed significantly to power generation and water supply. Yet, these projects have also triggered resettlement issues, ecological disruptions, and financial inefficiencies (Aliyu & Bose, 2022; Musa et al., 2021). The recurring theme is that governance deficiencies, rather than technical

failures, often determine project outcomes. For instance, inadequate compensation for displaced communities, weak environmental safeguards, and poor coordination among agencies have undermined the long-term sustainability of dam projects (Eteh et al., 2024). These governance gaps highlight the importance of institutional reforms that embed accountability, transparency, and inclusivity in dam management.

The Gurara Water Transfer Project (GWTP) exemplifies these contradictions. While the project has improved water access to the Federal Capital Territory (FCT) by transferring water from Gurara Dam to the Lower Usuma Dam, its hydropower component remains un-utilized, and local communities continue to report inadequate compensation for displacement (Arachie, 2025). Environmental concerns, such as downstream ecosystem disruption and land degradation, further complicate the project's sustainability profile. These shortcomings illustrate how governance failures, rather than engineering limitations, can compromise the effectiveness of large-scale infrastructure.

Sustainable dam governance in Nigeria therefore requires a paradigm shift from infrastructure-centric management to people and environment-centered approaches. Institutional reforms should prioritize transparency in compensation processes, participatory stakeholder engagement, and robust monitoring mechanisms to ensure compliance with environmental standards. Strengthening inter-agency coordination is also critical, given the overlapping mandates of Federal Ministries, State Water Boards, and Private Operators. Lessons from international best practices suggest that multi-level governance, where local communities, civil society, and private actors are integrated into decision-making, can enhance accountability and foster trust (Scudder, 2019; Gleick & Christian-Smith, 2019).

Ultimately, the sustainability of Nigeria's dam infrastructure depends not only on technical design but also on governance effectiveness. Embedding accountability, transparency, and inclusivity into dam management will help ensure that projects like the Gurara Water Transfer Project deliver on their intended socio-economic and environmental goals. By aligning dam governance with broader sustainable development principles, Nigeria can transform its water infrastructure into a driver of resilience, equity, and long-term prosperity.

2.3 Theoretical Framework: Integrated Water Resources Management (IWRM)

This study adopts the Integrated Water Resources Management (IWRM) framework as its theoretical foundation. IWRM emphasizes the coordinated development and management of water, land, and related resources to maximize social and economic welfare equitably, without compromising the sustainability of ecosystems (Global Water Partnership, 2010). The framework has become a cornerstone of global water governance discourse, particularly in contexts where competing demands for water, energy, and food require integrated solutions.

A critical dimension of IWRM is its integration of the Water–Energy–Food (WEF) Nexus, which highlights the interdependence among resource systems. Water is essential for agriculture and energy production, while energy is required for water treatment and irrigation, and food systems depend on both water and energy inputs. This interconnectedness underscores the need for governance approaches that transcend sectoral silos (Hoff, 2011; D'Odorico et al., 2018). By situating the Gurara Water Transfer Project (GWTP) within the WEF Nexus, this study highlights how inefficiencies in one sector, such as underutilized hydropower can undermine broader sustainability goals.

Applied to the GWTP, IWRM provides an analytical lens for examining how policy fragmentation, institutional overlap, and stakeholder exclusion limit the project's sustainability. Nigeria's water governance system is characterized by multiple agencies with overlapping mandates, including the Federal Ministry of Water Resources and Sanitation, State Water Boards, and Private Operators. This institutional complexity often results in poor coordination and weak accountability, which directly affects dam performance and water transfer efficiency (Martins et al., 2025).

The framework also aligns with Nigeria's National Water Resources Policy and Strategy (2016), which explicitly advocates for multi-level coordination, participatory decision-making, and adaptive management (Federal Ministry of Water Resources, 2016). However, despite these policy commitments, implementation remains inconsistent. Studies show

that Nigeria's adoption of IWRM principles has been hindered by weak institutional capacity, inadequate financing, and limited stakeholder engagement (Grigg, 2024).

By employing IWRM as a theoretical framework, this study situates the GWTP within a broader discourse on sustainable water governance. It allows for a systematic evaluation of how governance failures, such as exclusion of local communities from decision-making or neglect of environmental safeguards, translate into operational inefficiencies. Moreover, IWRM underscores the importance of adaptive management, which is crucial for projects like GWTP that must respond to climatic variability, urban growth, and shifting socio-economic demands. IWRM provides a robust framework for analyzing the governance-performance nexus in Nigeria's dam infrastructure. It highlights the need for integrated, participatory, and adaptive approaches to ensure that projects like the GWTP achieve their intended socio-economic and environmental objectives while contributing to national development and the achievement of the Sustainable Development Goals (SDGs).

III. METHODOLOGY

3.1 Research Design

This study employed a qualitative case study design to investigate the governance, policy, and institutional dynamics shaping dam infrastructure management in Nigeria, with specific focus on the Gurara Water Transfer Project (GWTP). A qualitative approach was considered most appropriate because governance challenges are embedded in complex institutional relationships and socio-political contexts that cannot be fully captured through quantitative metrics alone. Following Yin's (2018) guidance on case study research, the design enabled an in-depth exploration of how overlapping mandates, fragmented policies, and stakeholder interactions influence project outcomes. The research combined document analysis with semi-structured stakeholder interviews, thereby integrating policy perspectives with lived experiences of actors directly involved in the project.

3.2 Study Area

The Gurara Water Transfer Project is located in Kaduna State, Nigeria, with its conveyance system extending approximately seventy-five kilometres to the Federal Capital Territory (FCT), Abuja. Commissioned in 2007, the dam has a storage capacity of 880 million cubic metres and was designed to deliver water to Lower Usuma Dam, which supplies Abuja's urban population. In addition, the project incorporates a 30-megawatt hydropower plant and irrigation infrastructure covering about 6,000 hectares of farmland. Its governance structure reflects Nigeria's multi-layered institutional arrangements: the Federal Ministry of Water Resources and Sanitation (FMWR) provides overarching policy direction; the FCT Water Board manages urban supply; the Infrastructure Concession Regulatory Commission (ICRC) oversees PPP compliance; North-South Power Limited operates the hydropower component; Gams and Abel Limited has the mandate of the operations and management of the dam, irrigation infrastructure, camp and the water transmission pipeline to Lower Usuma dam. Local government authorities and host communities in Kaduna and the FCT play peripheral roles in social and environmental management. This institutional complexity makes GWTP a representative case for examining governance-performance linkages in Nigeria's dam sector.

3.3 Data Sources and Collection

Data were drawn from both primary and secondary sources. Primary data consisted of fifteen semi-structured interviews conducted between June 2024 and March 2025. Respondents included senior officials from the FMWR, the FCT Water Board, the ICRC, North-South Power Ltd., Gams and Abel Ltd. and representatives of host communities and local councils. Selection was purposive, targeting individuals directly involved in policy design, regulation, or operational management of the GWTP. Interviews explored themes such as institutional coordination, monitoring and evaluation systems, stakeholder participation, and policy coherence.

Secondary data were obtained from national policy documents, official reports, and scholarly publications. Key sources included the Water Resources Act (2004), the National Water Resources Master Plan (2013), the ICRC Act (2005), the National PPP Policy (2009), and the National Water Resources Policy and Strategy (2016). Project evaluation reports from FMWRS, World Bank and related agencies were also reviewed. This combination of sources allowed for triangulation, ensuring that institutional perspectives were

corroborated with documented evidence of policy performance.

3.4 Data Analysis

Data analysis followed thematic content analysis as outlined by Braun and Clarke (2019). Interview transcripts and documentary sources were systematically coded to identify recurring themes related to governance, institutional coordination, monitoring systems, and stakeholder engagement. The analysis emphasized both convergence and divergence in perspectives: government officials often stressed technical and budgetary constraints, while private operators highlighted regulatory delays and unclear institutional boundaries. Coding was iterative, allowing insights from interviews to inform the interpretation of policy documents and vice versa. This integrative approach enhanced the credibility and validity of findings by linking governance discourse to operational realities.

IV. RESULTS

This section presents findings from interviews, document analysis, and secondary data, organized around four thematic areas: institutional coordination, monitoring and evaluation (M&E), stakeholder engagement, and policy reforms. Tables and extrapolated statistics are included to illustrate governance-performance linkages in the Gurara Water Transfer Project (GWTP).

4.1 Institutional Coordination and Overlapping Mandates

The governance structure of the GWTP reveals significant fragmentation in institutional arrangements. Although the Federal Ministry of Water Resources and Sanitation (FMWR) provides overarching policy direction, Gams & Abel, the FCT Water Board manages urban water supply, and North-South Power Limited operates the hydropower component, these entities generally function in silos, with limited coordination between them. Interviews with key stakeholders from these institutions indicated that while there is a high level of technical specialization within each entity, there is minimal interaction or collaboration across these boundaries. This lack of coordination has resulted in operational inefficiencies, including duplication of responsibilities, delays in maintenance, and failure to effectively monitor the project's performance.

Table 1: Institutional
Roles and Overlaps in GWTP

Institution	Mandate/Role	Observed Challenges	Coordination Score*
FMWR	Policy formulation, oversight	Limited enforcement authority, inadequate cross-agency communication	2/5
FCT Water Board	Urban water supply management	Weak integration with hydropower and irrigation operations	3/5
North-South Power Ltd	Hydropower generation (30 MW capacity)	Hydropower generation was yet to commence. Retrofitting and rehabilitation works were almost completed.	1/5
ICRC	PPP regulation and compliance monitoring	Regulatory reviews not synchronized with environmental audits	3/5
Local Governments/Communities	Social and environmental management	Marginalized in decision-making and accountability	1/5

Coordination Score derived from interviews (1 = very weak, 5 = strong).

Key Finding: Only 40% of respondents rated institutional coordination as "adequate," while 60% described it as fragmented or ineffective. The fragmentation results in inefficiencies and delayed responses to operational challenges, which directly impacts project performance.

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DOI: https://doi.org/10.64388/IREV9I7-1713861

4.2 Weak Monitoring and Evaluation (M&E) Systems

Monitoring and evaluation were identified as one of the most significant weaknesses in the governance of the GWTP. Hydrological and operational data are collected intermittently, often without systematic integration into decision-making. Additionally, there is no centralized platform that consolidates these data, resulting in missed opportunities for effective management and proactive interventions. Officials attributed the lack of integration to financial constraints, insufficient budget allocations, limited technical capacity, and absence of a unified data management system. The revenues that should be generated from power generation, commercial farmers and other users are still pending due to the under-utilization of the project. The failure to conduct regular environmental and social audits exacerbates this gap in monitoring, hindering the ability to track long-term project sustainability.

4.3 Stakeholder Engagement and Accountability

Stakeholder engagement in the GWTP has been described as largely top-down, with limited involvement of local communities, particularly in the early stages of project development. Many of the communities benefited from the access road from Katare junction to the dam site, irrigation farms, employment opportunities especially during the construction phase and to some extent operations phase. However, the relocation and resettlement of communities from the reservoir area and dam site with the attendant disruption of their lives and property has been a sour experience for many. Many in the communities strongly feel that they were not adequately compensated for their losses and many grievances were addressed informally rather than through structured redress mechanisms. Moreover, some of the benefits expected from the project such as power supply, employment etc. have not yet materialized. These experiences led to mistrust and frustration among local populations, undermining the project's social license to operate.

Table 2 outlines the levels of stakeholder involvement and satisfaction with engagement processes:

Table 2: Stakeholder Engagement Indicators

Stakeholder Group	Level of Involvement	Satisfaction (%)	Key Issues Reported
Local communities	Low	25%	Poor compensation, lack of consultation
Private concessionaire	High (technical role)	70%	Regulatory delays, unclear mandates
Government agencies	Medium	55%	Coordination gaps, funding constraints
Civil society organizations	Very low	20%	Limited access to project data

Key Finding: Only 25% of community respondents expressed satisfaction with engagement processes, compared to 70% of private operators. This disparity highlights accountability gaps and mistrust between project authorities and host communities. The minimal involvement of civil society organizations further limits transparency and public access to critical project data.

4.4 Policy Reforms and Emerging Opportunities

Despite the persistent governance challenges, several policy reforms are gradually reshaping the operational environment for dam management in Nigeria. The National Water Resources Policy & Strategy (2016) explicitly advocates for the principles of Integrated Water Resources Management (IWRM), aiming to enhance coordination across water, land, and environmental management sectors. However, while IWRM principles have been acknowledged in policy documents, their practical implementation has been slow.

Table 4 below outlines the impact of key policy reforms on the governance of the GWTP:

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DOI: https://doi.org/10.64388/IREV9I7-1713861

Table 4: Policy Reform Impact on GWTP Governance

Reform/Policy	Intended Impact	Current Status (2024)	Effectiveness Rating
National Water Resources Strategy & Policy (2016)	Promote IWRM, cross-sectoral coordination	Partial implementation	3/5
National Policy on Public-Private-Partnership (2009)	Introduce private sector participation, efficiency	Implemented (hydropower concession)	3/5
ICRC Act (2005)	Regulate PPP projects	Active, weak social audits	2/5
Proposed Water Resources Bill	Establish unified regulatory framework	Pending legislation	N/A

Effectiveness rating derived from interviews (1 = very weak, 5 = strong

Key Finding: While policy reforms are underway, their full impact on governance remains to be seen. The National Water Resources Policy & Strategy and the PPP framework have introduced more structured governance, but their implementation at the operational level continues to face significant challenges.

V. DISCUSSION

The findings of this study underscore a critical misalignment between Nigeria's water policy frameworks and the operational realities of dam management. Despite significant investments in large multipurpose infrastructure like the Gurara Water Transfer Project (GWTP), performance outcomes have remained constrained by fragmented institutional arrangements, weak monitoring and evaluation (M&E) systems, and limited stakeholder engagement. These results reflect broader governance challenges in developing countries, where technical competence alone is insufficient for achieving sustainable water infrastructure management. Effective governance requires not just technical expertise but also a coherent institutional design, political will, and robust regulatory frameworks to ensure that policies are effectively implemented at the operational level. This aligns with findings in the literature, which highlight the importance of governance structures that integrate technical and social dimensions for successful infrastructure management (Biswas & Tortajada, 2019; Landaverde et al., 2023).

One of the key issues identified in the study is the institutional fragmentation and overlapping mandates in the governance of the GWTP. The Federal Ministry of Water Resources and Sanitation (FMWR) provides policy direction, but lacks the enforcement capacity to ensure compliance across all levels of government and private operators. Gams and Abel Limited has the mandate of the operations and management of the dam, irrigation infrastructure, camp and the water transmission pipeline to Lower Usuma dam. Gams and Abel Limited operates and manages the dam, irrigation infrastructure, camp and the water transmission pipeline to Lower Usuma dam. The FCT Water Board manages urban water supply, while North-South Power Limited operates the hydropower component. However, these agencies largely function in isolation from each other. The result is a governance system that is administratively complex but operationally inefficient. The lack of coordination and clarity in institutional roles undermines accountability and impedes the efficient operation and maintenance of the dam. These findings are consistent with those in other African countries, such as South Africa, where institutional fragmentation and unclear roles have hindered effective water governance (Mlula, 2025). This suggests that reforms in Nigeria's water sector must go beyond policy drafting and focus on creating legally empowered, functionally autonomous institutions with clear lines of accountability to ensure better coordination and efficiency in dam operations.

The absence of an integrated and effective M&E system is another critical issue identified in the study. The lack of centralized data collection and analysis has limited the ability of project managers to track performance, identify emerging risks, and respond to operational or environmental challenges in a timely manner. While hydrological and operational data are collected, these efforts remain fragmented, with no

coherent system to integrate this information across different sectors. This fragmented approach to M&E is compounded by weak institutional capacity and insufficient budget allocations for data collection and analysis. The findings highlight the importance of adaptive management, which has become central to sustainable governance practices globally. Adaptive management emphasizes the need to monitor not only technical performance but also social, environmental, and economic impacts. In the case of the GWTP, the lack of such an approach has meant that key issues, such as sedimentation and vandalization of infrastructure have not received the needed urgent intervention.

The Sustainable Power and Irrigation for Nigeria Project's (SPIN) initiative to centralize dam performance data through a digital asset management system offers a potential solution to these challenges. The centralization of dam and reservoir data through a digital asset management system under the SPIN project will enhance operational efficiency, safety, and risk management by providing real-time monitoring and predictive maintenance capabilities. It will support evidence-based regulatory oversight, policy development, and integrated water resources management, while promoting multi-purpose utilization of reservoirs for irrigation, hydropower, and local livelihoods. Additionally, the system will increase transparency, attract private sector investment, and maximize the socio-economic benefits of Nigeria's dam infrastructure. However, for the system to be successful, it must be backed by strong institutional frameworks, adequate resources, and continuous training.

Stakeholder engagement also emerged as a significant gap in the governance of the GWTP. The findings from the study revealed that community involvement in decision-making processes was minimal, particularly during the planning, compensation, and resettlement phases. Host communities were often excluded from important decisions, which has contributed to social tensions and a sense of mistrust toward the project authorities. This exclusion from decision-making is detrimental not only to the project's legitimacy but also to its long-term sustainability. As Lema (2025) argue, participatory governance can enhance operational sustainability by fostering local ownership and ensuring that community needs and concerns are addressed. The study's findings resonate with the literature, which highlights that inclusive stakeholder engagement is essential for mitigating project risks and improving post-construction outcomes. The lack of formal grievance redress systems and the absence of structured consultation mechanisms further exacerbate these accountability gaps, undermining the project's social license to operate. Strengthening stakeholder engagement requires not only institutional will but also capacity at the local level to engage with technical and regulatory actors effectively. The Public-Private Partnership (PPP) model, which has primarily focused on financial and technical performance, could be adapted to include social performance metrics, ensuring that community development indicators are integrated into PPP contracts. This approach would help transform PPPs from purely financial instruments into vehicles for broader social accountability and sustainability.

Finally, the study highlights the role of policy reforms in shaping the governance of the GWTP and other water infrastructure projects in Nigeria. The National Water Resources Policy & Strategy (2016) has introduced principles of Integrated Water Resources Management (IWRM), which promote cross-sectoral coordination, efficiency, and environmental sustainability. However, while these reforms are conceptually aligned with global best practices, their implementation has been weak. Policies are often drafted with donor support but are hampered by limited domestic capacity for execution and insufficient financial backing. This gap between policy formulation and implementation has been a recurring theme in the literature, where reforms are slow to translate into tangible outcomes on the ground (Biswas & Tortajada, 2023). The proposed National Water Resources Bill, if enacted, could reduce institutional overlap and enhance coordination among agencies by establishing a unified regulatory framework. However, as the study suggests, the full impact of these reforms will depend on political commitment, capacity-building, and sustained funding. Bridging the gap between policy and practice requires not only regulatory alignment but also the creation of incentives for collaboration among agencies and stakeholders. As emphasized by the OECD (2015), effective governance in water resources management must be underpinned by transparency, data-sharing, and evidence-based decision-making, principles that are crucial for the long-term success of dam projects like the GWTP.

In conclusion, the findings of this study reflect the ongoing challenges in Nigeria's water governance, particularly in the management of large-scale infrastructure like the GWTP. While policy reforms, such as the adoption of IWRM principles, offer promising pathways for improving governance, their successful implementation requires overcoming significant institutional and operational barriers. Strengthening institutional coordination, enhancing M&E systems, ensuring inclusive stakeholder engagement, and fully implementing policy reforms are crucial steps for bridging the gap between governance and practice in Nigeria's water sector. These efforts will be essential not only for improving the performance of existing infrastructure but also for ensuring that future investments in water projects are more effective, sustainable, and socially inclusive.

VI. CONCLUSION

This study concludes that the sustainability of Nigeria's dam infrastructure, including the Gurara Water Transfer Project (GWTP), hinges more on governance systems than on technical design. The persistent gap between policy formulation and operational realities, characterized by weak institutional coordination, inadequate monitoring, and limited stakeholder participation, continues to undermine project performance. The lack of effective governance has eroded public confidence in state-led infrastructure initiatives, highlighting the need for a more integrated and coherent approach to dam management. To address this, Nigeria must establish a unified regulatory framework that clearly defines institutional roles and ensures accountability across all levels of water governance.

Integrating monitoring systems that capture technical, environmental, and socio-economic indicators within a centralized platform is essential to improving project oversight and enabling adaptive management.

The National Water Resources Policy and Strategy (2016) is not adequate to carter for the dams and reservoir sub-sector. The Federal Government should facilitate the production of a National Policy on Dams and Reservoirs to optimize the utilization of impounded dam reservoirs across the country. Some of the challenges experienced in the Gurara Water Transfer Project would have been identified and addressed given the availability of a National Policy on Dams.

The creation of the proposed National Water Resources Regulatory Commission is very crucial in facilitating the sustainable management and utilization of dams and reservoirs for sustainable development.

The study also emphasizes the importance of social accountability and stakeholder engagement in the governance of water infrastructure. To ensure the long-term success of projects like the GWTP, community participation should be formalized through consultative mechanisms, grievance redress systems, and benefit-sharing programs that guarantee equitable access to the socio-economic benefits of water resources. Furthermore, Nigeria's experience with Public-Private Partnerships (PPP) in the Gurara project suggests that private sector involvement can improve efficiency, but it must be complemented by robust regulatory oversight and transparent public engagement. In conclusion, bridging the divide between policy, governance, and practice through institutional reform, participatory governance, and evidence-based decision-making is vital for achieving the sustainable management of water infrastructure. These measures are essential not only for enhancing the performance of existing projects but also for ensuring that future investments are aligned with national development goals and the Sustainable Development Goals (SDGs).

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