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Achieving the UN Sustainable Development Goal 6 in Nigeria: Lessons from Bangladesh's 'Nature Based Solution' Approach

Dr. Olugbenga Damola Falade[1]
Dr. M Jashim Ali Chowdhury[2]

The United Nations Sustainable Development Goal (SDG) No. 6 is about ensuring adequate and quality water for all by 2030. However, there are concerns that Nigeria will not achieve SDG 6 as its efforts to ensure quality water have proved abortive. Nigeria does not recognize the people's access to potable water as a constitutional right either. Bangladesh, one of the UNSDGs' Global Champions, is a successful case study. There is, of course, a shortage of drinkable water in Bangladesh due to problems like those of Nigeria. Still, the country's governmental actions, laws, and policies promote a Nature Based Solution (NBS) which includes eco-friendly strategies such as rainwater harvesting and other eco-sustainable approaches to conservation that benefit both human beings and the environment. Most importantly, it puts the people at the forefront of all conservation efforts. In this paper, we propose to examine the laws, regulations, and strategies that bring both Bangladesh's people and nature into one collective action and consider whether Nigeria could use it to redress its communities' lack of potable water. We argue that Bangladesh's NBS approach should be seen, with some structural and cultural precautions, as the most sensible strategy for Nigeria, if the country is willing to achieve SDG 6 by 2030.

"Equitable access to drinking water...is not only the foundation of health and development for children and communities. Water is life, Water is development, Water is peace."

Marie-Pierre Poirier
UNICEF Regional Director for West and Central African States[3]

[1] Dr. Olugbenga Damola Falade is a Lecturer in Law, Osun State University, Nigeria. He was awarded his doctorate in law by the University of Hull in 2024. Dr Falade takes interest in International Human Rights, Humanitarian Law, Refugee Law, and Public International Law in general. He may be reached at gbengafalade@yahoo.com.

[2] Dr. M Jashim Ali Chowdhury is a Lecturer in Law at the University of Hull. Prior to joining Hull, Dr Chowdhury was an Associate Professor of Law at the University of Chittagong, Bangladesh. His research interest includes constitutional law of Bangladesh, South Asian Constitutionalism and Comparative Constitutional Law in general. He may be reached at j.chowdhury@hull.ac.uk.

[3] UNICEF, "Africa to Drastically Accelerate Progress on water, Sanitation and Hygiene-Report" (2022) https://www.unicef.org/senegal/en/press-releases/africa-drastically-accelerate-progress-water-sanitation-and-hygiene-report.

Introduction

Water consumption has sharply increased due to population expansion worldwide. The global population expanded by three times over the past century, and water consumption has increased by more than six times.[4] Not only is there a greater number of water consumers than there was a century ago, consumers are using greater quantity of water too.[5] Every year, two-thirds of the human race faces a shortage of water,[6] while 411 million people lack basic drinking services in Africa.[7] Approximately 844 million people worldwide lack access to clean water sources, with 79% of them living in rural areas.[8] Simultaneously, 2.1 billion people lack access to a system of safely controlled potable water supply, which indicates that 45.2% of people in rural areas and 14.9% of people in urban areas require better services.[9]

The United Nations Sustainable Development Goals (UNSDGs) aim to guarantee that all underserved communities have access to safe drinking water and sustainably managed water resources.[10] Nigeria, the most populous nation in Africa, is finding it challenging to meet the SDG 6 targets. Nigerian populations rely heavily on groundwater sources, including borehole water. There is a worrying trend of non-functional water delivery infrastructure and borehole failures,[11] which hinders the country's progress towards SDG 6. As of today, just 67% of Nigerians have access to basic water services leaving 33% of the population without access, highlighting the large unmet demand for sustainable access to safe drinking water.[12] Furthermore, around 47% of tap water points are not in use,[13] while only 39% of households live in rural areas without access to a basic water supply[14] forcing the Nigerian government to declare a state of emergency in 2018 and introduce a National Action Plan (NAP). It aimed to guarantee that everyone has safe, sustainable access to water by 2030, a key deadline for the UNSDG 6.[15] However, the progress is too slow and achieving the SDG 6 by 2030 seems unlikely.

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4 J Terry L. Anderson, Brandon Scarborough, Lawrence Reed Watson, "Water Crises, Water Rights, and Water Markets," Encyclopaedia of Energy, Natural Resource, and Environmental Economics 2, (2013): 248.

5 ibid.

6 Mesfin M Mekonnen, Arjen Y Hoekstra "Four Billion People Facing Severe Water Scarcity" *Science Advances* 2, no. 2 (2016): 2.

7 WHO/UNICEF JMP, *Progress on Drinking Water, Sanitation and Hygiene in Africa 2000-2020: Five Years into SDGs* (New York: United nations Children's Fund (UNICEF) and World Health Organisation (WHO) 2022).

8 World Health Organisation (WHO), "Progress on Drinking Water, Sanitation and Hygiene: 2017 Update and SDG Baselines" (2017) https://iris.who.int/bitstream/handle/10665/258617/9789241512893-eng.pdf;jsessionid=757602F8D9B75D5B8CADFFBF91CED5C2?sequence=1.

9 World Health Organisation (WHO) and United Nations International Children's Emergency Fund (UNICEF) "JMP Methodology: 2017 Update & SDG Baselines," (2018) https://washdata.org/sites/default/files/documents/reports/2018-04/JMP-2017-update-methodology.pdf.

10 Tara Grillos, Alan Zarychta, Jami Nelson Nunez, "Water Scarcity and Procedural Justice in Honduras: Community-based Management meets Market-Based Policy," *World Development* (2021): 142.

11 Luis Alberto Andres et al, "Why are so many Water Points in Nigeria Non-Functional? An empirical Analysis of Contributing Factors" *World Bank Policy Research Working Paper* (2018): 8388.

12 UNICEF, 'Water, Sanitation and Hygiene (WASH)' (2020) <https://www.unicef.org/nigeria/water-sanitation-and-hygiene> accessed 27 August 2024.

13 National Population Commission and ICF Rockville USA, Nigeria Demographic and Health Survey 2018 (NPC, 2019).

14 The World Bank, "Nigeria: Ensuring Water, Sanitation and Hygiene for All" (2021), accessed June 12, 2024, https://www.worldbank.org/en/news/feature/2021/05/26/nigeria-ensuring-water-sanitation-and-hygiene-for-all

15 ibid.

Compared to these, in Bangladesh, 98% of people have access to basic water supplies, 58% have safe access to regulated water supplies, and 15% have piped water supplies.[16] Although the total coverage of water is high, the quality of the available water remains poor.[17] Water contamination is especially concerning because 16.7% of the population drinks water contaminated with arsenic and 86% of the poorest families have E. Col. Bacteria exposure.[18] Despite these odds, Bangladesh seems steadfast to 'achieve the SDGs by 2030, attain a developed country status by 2041 and a Prosperous Delta status by 2100.'[19] Towards these goals, Bangladesh's periodic five-year plans emphasize the provision of safe drinking water to rural residents.[20] One of the striking features of the country's pursuit is its "Nature Based Solution" (NBS) Approach which has significantly improved the country's ability to address its water-related problems. The NBS Approach particularly looks into the ease of access for disadvantaged groups, participation and ownership of the communities in the project implementation stage, and also interest in the environmental sustainability for the future generation – all together within one comprehensive development ideology. The NBS is therefore a community-nature collaborative effort.[21]

Bangladesh's NBS approach has earned commendations from international bodies and attracted a significant number of international development partners.[22] Particularly attractive for the international development partners is the country's preference for its projects to be climate change resilient and nature-based. Kristalina Georgieva, the Managing Director of IMF commended Bangladesh for being 'at the forefront…making significant strides to bolster climate resilience, adaptation, preparedness, and conservation.'[23] Though Nigeria has attempted to use the NBS approach to address its water shortages, it has not been as successful as Bangladesh in finding sustainable solutions. This paper aims to examine Bangladeshi laws, regulations, strategies, and government activities and see what lessons Nigeria could learn from there.

The paper begins by examining the concept of Nature-Based Solutions (NBS) as promoted by the UN and its global development partners. It then analyzes the laws and institutional frameworks of Bangladesh and Nigeria to evaluate their alignment with NBS principles. A

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16 WaterAid "Bangladesh" accessed July 3, 2024, https://www.wateraid.org/bd/the-crisis/water.

17 ibid.

18 Ibid.

19 UN, "Bangladesh: SDG 6 Reference-General Debate 75th Session of the United Nations General Assembly" <https://sdgs.un.org/ga75-statement/bangladesh> accessed June 15, 2024.

20 7th FYP of Bangladesh Government, Chapter 5 'Investment Program and its Financing'.

21 UN, "Every Drop Counts: Increasing Water Security in Coastal Areas of Bangladesh" (2022) <https://bangladesh.un.org/en/210179-every-drop-counts-increasing-water-security-coastal-areas-bangladesh> accessed June 4, 2024.

22 International Monetary Fund, "Bangladesh and its Partners are Launching the Bangladesh Climate and Development Platform to Leverage Adaptation and Mitigation Investments" (2023) <https://www.imf.org/en/News/Articles/2023/12/03/bangladesh-launch-climate-development-platform-to-leverage-adaptation-and-mitigation-investments> accessed June 10, 2024.

23 Ibid.

comparative discussion follows, focusing on water resource availability and scarcity in both countries, supported by recent data and statistics. The paper further contrasts their water management strategies, highlighting Bangladesh's climate-resilient and eco-sustainable approaches, such as rainwater harvesting, against Nigeria's inconsistent efforts. Key institutional and cultural challenges in Nigeria—such as transparency, accountability, participation, and fairness—are identified as critical areas needing reform. Finally, the paper concludes by emphasizing that Bangladesh's community-centric water management model offers important lessons for Nigeria. Without adopting a similar NBS approach, Nigeria's government-controlled and privatized water management system risks failing to achieve the SDG6 target by 2030.

Aims, Objectives and Methodology

The aims of this paper are to examine the laws, regulations, and strategies that bring both Bangladesh's people and nature into one collective action and consider whether Nigeria could use it to redress its communities' lack of potable water. To achieve this aim, the study addresses the conceptualization of Nature Based Solutions (NBS) and their significance in providing potable water for consumption. It evaluates the existing water management laws and its institutions in Nigeria and identifies key areas that require improvement on how to be NBS compliant. In order to gain insights into what Nigeria could learn from Bangladesh, an analysis is conducted on the laws, regulations, institutions, policies and practices employed by Bangladesh in implementing nature-based solutions for water management.

This study is desk-based. It uses primary and secondary sources such as laws, regulations, scholarly articles, reports, and case studies related to SDG 6, water management, and NBS in Nigeria and Bangladesh. It applies comparative analysis to identify similarities and differences between Nigeria and Bangladesh in terms of law, regulations, environment, social, and economic contexts. It reviews Bangladesh's NBS strategies, including the use of wetlands, reforestation, and community-based water management, and evaluates the successes and challenges faced by Bangladesh in implementing these solutions and then identifies transferable knowledge and strategies that may be advisable for Nigeria to adopt.

The Nature Based Solution (NBS) Approach

The UN's 2030 Agenda for Sustainable Development, which includes Goal No. 6 on potable water, offers guidelines for guaranteeing that water is available to everyone and is managed sustainably.[24] While the ecosystems provide, filter, and safeguard freshwater supplies, their ineffective management and climate change threaten an adequate and quality supply of water.[25] The UNSDGs provide a broad framework for advancing Nature Based Solutions around climate

[24] Agreed by UN Member States at the 2015 UN Summit.
[25] UN, "Water and Ecosystems" UN Water <https://www.unwater.org/water-facts/water-and-ecosystems> accessed 24 March , 2024.

change and natural resource management.[26] NBS can improve overall water sustainability by increasing water accessibility and quality, lowering water-related risks, and producing extra social, economic, and environmental co-benefits.[27] The UN experts argue that almost 79% of all SDG targets can be achieved by nature-based infrastructure solutions.[28]

The 'Natural Based Solutions' are actions to protect, conserve, restore, sustain and manage natural or modified terrestrial, freshwater…while providing human well-being.'[29] These are actions to protect, maintain, or rebuild natural ecosystems, and improve biodiversity and human well-being while addressing societal challenges such as food and water security, human health, climate change, and disaster risk reduction.[30] The hallmark of the approach is the conservation and harvesting of potable water from obvious natural sources such as rain and storms. A global example of the Nature Based Solution is perhaps the 'Water Sensitive Design' adopted by countries like Australia, Sweden, the UK, and South Africa.[31] South Africa policy tries to incorporate 'Water Sensitive Design' (WSD) in Johannesburg and Cape Town.[32] WSD places a strong emphasis on managing the entire water cycle and using green infrastructure (GI) and Sustainable Drainage Systems (SDS) to transport, store, clean, and filter the rainwater and stormwater.[33]

Secondly, the NBS approach puts the people and the community at the heart of the project. Participation of the community in water supply initiatives is not a novel concept. In the past, a lot of rural communities in underdeveloped countries that could not access government services created indigenous systems for managing and providing water.[34] This changed when governments assumed responsibility for providing water, which was never feasible. However,

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[26] Ibid.

[27] UNESCO World Water Assessment Programme, The United Nations World Water Development Report 2018: Nature Based Solution for Water (UN Education, Scientific and Cultural Organisation, 2018)

[28] UNEP, "Nature Critical to Infrastructure for Sustainable Development-UN" (2023) accessed July 1, 2024, <https://www.unep.org/news-and-stories/press-release/nature-critical-infrastructure-sustainable-developmentun> accessed 9 September 2024.

[29] United Nations Environment Assembly, 2 March 2022, UNEP/EA.5/Res.5

[30] The World Bank, "What You Need to know About Nature based Solutions to Climate Change" (2022) <https://www.worldbank.org/en/news/feature/2022/05/19/what-you-need-to-know-about-Nature Based-solutions-to-climate-change> accessed January 27, 2024.

[31] Farhad Mukhtarov, Carel Dieperink, Peter Driessen and Janet Riley, "Collaborative learning for Policy Innovations: Sustainable Urban Drainage System in Leicester, England," *Journal of Environmental Policy & Planning* 21, no. 2 (2019):288.

[32] Patience Mguni, Amber Abrams, Lisa Byskov Herslund, Kisty Carden, Jessica Fell, Neil Armitage, and Aa'isha Dollie, "Towards Water Resilience Through Nature Based Solutions in the Global South? Scoping the Prevailing Conditions for Water Sensitive Design in Cape Town and Johannesburg," *Environmental Science and Policy* 136, (2022): 147; John C Radcliffe, *History of Water Sensitive Urban design/Low Impact Development Adoption in Australia and Internationally,' Approaches to Water Sensitive Urban Design* (Woodhead Publishing, 2019) 1.

[33] Joshua J Cousins, "Remaking Stormwater as a Resource: Technology, Law, and Citizenship" (2018) 5(5) *Wiley Interdisciplinary Reviews: Water* 5, no. 5 (2018): e1300; Fletcher, Tim D., William Shuster, William F. Hunt, Richard Ashley, David Butler, Scott Arthur, Sam Trowsdale et al. "SUDS, LID, BMPs, WSUD and more–The Evolution and Application of Terminology Surrounding Urban Drainage." Urban water journal 12, no. 7 (2015): 525-542.

[34] Henry Bikwibili Tantoh, and McKay JM Tracey, "Rural Self-empowerment: The Case of Small Water Supply Management in Northwest, Cameroon" *GeoJournal* 85, no.1 (2020): 159.

in the mid-1980s and 1990s, some governments formally recognized community-based solutions.[35] It led to a shift in legal responsibility from state-led and centralized service arrangements to community ownership and management.[36] This strategy is currently employed more frequently worldwide.[37] The community-based approach rests on the idea that communities possess the ability to self-organize to oversee, manage, and maintain water systems once they are constructed by the government.[38] It leaves the management of the source of water and production of potable water in the hands of the residents of rural areas. This can be accomplished by creating water committees or water user groups, and it can be done at the village, group, or community level. The head and principal members of each community should be given a responsibility either to protect the source of water or to be part of the production or distribution of water.

While this sounds a step backward, the communities often lacked the means to maintain water systems.[39] There are a lot of failures recorded, mostly due to the shortage of funds, lack of training and awareness among the rural residents, and corruption on the part of the government officials. According to some studies and reviews conducted in Africa and Asia, the community-based natural resource management strategy has not succeeded in achieving its declared goals of efficiency, equity, and sustainability.[40] Mukherji et al. believe that CBNRM has only made a few achievements.[41] These criticisms show that community engagement will need substantial investment in developing the capacity of the communities to manage the projects. Additionally, some of those community-driven projects simply ignored the importance of nature itself as an equal stakeholder in the problem. Therefore, a more robust approach involving the community and nature is required.

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[35] P Blaikie, "Is small Really Beautiful? Community-Based Natural Resource Management in Malawi and Botswana," *World Development* 34 no. 11 (2006): 1942; G Mansuri, V Rao, *Evaluating Community-based and Community-driven Development: A Critical Review of the Evidence,* (Development Research Group, The World Bank, 2003)

[36] Sarah T Romano, *Transforming Rural Water Governance: The Road from Resource Management to Political Activism in Nicaragua,* (University of Arizona Press, 2019); Ellie Chowns, "Is Community management an Efficient and Effective Model of Public Service Delivery? Lessons from the Rural Water Supply in Malawi," *Public Administration and Development* 35 no. 4 (2015): 263.

[37] ibid.

[38] Peter Harvey, and Bob Reed, *Rural Water Supply in Africa Building Blocks for Handpump Sustainability,* (WEDC Loughborough University, 2004).

[39] Luke Whaley, and Frances Cleaver, "Can 'Functionality' Save the Community Management Model of Rural Water Supply?" *Water Resources and Rural Development* 9 (2017):56.

[40] Bina Agarwal, "Participatory Exclusions, Community Forestry, and Gender: An Analysis for South Asia and a Conceptual Framework," *World Development* 29, no. 10 (2001):1623; Jaap Arntzen et al, *Main Findings of the Review of CBNRM in Botswana* (Occasional Paper 14 Gaborone: IUCN/Netherlands Development Organization (SNV) CBNRM Support Programme, 2003); Sheona Shackleton and Bruce Morgan Campbell, *Devolution in Natural Resources Management: Institutional Arrangements and Power Shifts: A synthesis of Case from Southern Africa,* (Report to USAID SADC NRM Project 690-0251.12.79, Mimeo, 2001); Sheona Shackleton et al, *Devolution and Community Based Management: Creating Space for Local People to Participate and Benefit?* (76 Natural Resources Perspectives (ODI) 1).

[41] Aditi Mukherji et al, *Irrigation Reform in Asia: A Review of 108 Cases of Irrigation Management Transfer* (International Water Management Institute, Colombo 2009)

The United Nations estimates that, if the world is to reach its SDG targets, investments in NBS must increase threefold by 2030 and fourfold by 2050.[42] In recent times, the majority of significant international forums have determined that NBS ought to be implemented more broadly.[43] They have been integrated into political obligations like the United Nations Convention to Combat Desertification (UNCCD) 1994; the Paris Agreement on Climate Change 2015; the Ramsar Convention on Wetlands 1971; the Sendai Framework for Disaster Risk Reduction 2015; the Convention on Biological Diversity 1992; and National Adaptation Plans of Action under the United Nations Framework Convention on Climate Change (UNFCCC) 1993.[44] Major regional development bodies and policy frameworks also encourage the NBS. For instance, the European Union has greatly expanded the prospects for NBS deployment by harmonising its laws and policies on the environment, and water resources.[45] There are instances of national legislation being geared up to help with the local implementation of NBS.[46] Some nations like Bangladesh and Peru have enacted legal framework that supports NBS. Peru established a legal framework that controls and oversees the investments in green infrastructure.[47]

Literature Review

There are a substantial amount of Nigerian literature around "global sustainability", one of the main goals of SDG6.[48] Everyone needs to have access to drinkable water,[49] but scarcity of potable water is a pressing issue in Nigeria.[50] It has caused significant challenges in achieving the targets set by SDG 6.1.[51] Ezra and Fidelis[52] in their paper argued that Nigeria's conventional engineering solutions, such as dams and boreholes, have failed to address the root causes and lead to environmental degradation.[53] Compared to these, the Nature Based Solutions (NBS) leverages natural processes to enhance water availability and quality while providing additional

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42 UN, "State of Finance for Nature 2021" accessed March 24, 2024, https://www.unep.org/resources/state-finance-nature-2021.

43 UN Environment-DHI, *Nature Based Solutions for Water Management: A Primer* (UN, 2018)

44 United Nations World Water Assessment Programme/UN-Water, *The United Nations World Water Development Report 2018: Nature Based Solutions for Water* (Paris UNESCO, 2018)

45 ibid.

46 ibid.

47 OECD, "Multi-level Water Governance in Peru" in *Water Governance in Peru* (OECD Publishing Paris, 2021); Jorge Saldana, "Legal Framework for Investment in Infrastructure Projects in Peru" *Georgetown Law Center on Transnational Business and the Law* <https://www.law.georgetown.edu/ctbl/blog/legal-framework-for-investment-in-infrastructure-projects-in-peru/> 9 September 2024.

48 United Nations, "Transforming our World: 2030 Agenda for Sustainable Development" (2015) < https://sdgs.un.org/2030agenda> accessed 25 August 2024.

49 Maryam Salehi, "Global Water Shortage and Potable Water Safety; Today's Concern and Tomorrow's Crisis" *Environment International* 158 (2022):106936.

50 Amaefule, Excel Obumneme, et al, "Water and Wastewater Treatment in Nigeria: Advancements, Challenges, Climate Change and Socioeconomic Impacts" Path of Science 9, no. 8 (2023): 2010.

51 Oluwagbemi Samuel et al, 'Water Infrastructure Sustainability in Nigeria: A Systematic Review of Challenges and Sustainable Solution' *Water Policy* 25, no. 11 (2023)1094.

52 Ezra Ihezie and Fidelis Obaniyi, "The Importance of Clean Water and Sanitation in Nigeria" (2023) <https://southernvoice.org/the-importance-of-clean-water-and-sanitation-in-nigeria/> accessed 26 August 2024.

53 ibid.

environmental and social benefits.[54] In Nigeria, the potential of NBS to offer resilient, affordable, and sustainable solutions is widely acknowledged.[55] However, the streams of legal research in Nigeria largely lack the pieces of evidence on the connection of NBS with sustainable solutions to the water scarcity.

From the standpoint of Bangladesh, the country Bangladeshis faces a similar scarcity of potable water as Nigeria.[56] Amit Hasan et al has identified the climate change as the main cause of the acute water shortage in Bangladesh.[57] Apart from the effect of climate change on water resources[58] and human health[59], researchers have paid detailed attention to the NBS[60] as a potential solution. As Alison Smith et al argued it, Bangladesh has the chance to set an example for how high-quality NBS can be applied at a large scale to address issues related to sustainable development in low- and middle-income nations, thereby promoting a Green Economic Recovery.[61]

Additionally, comparative studies that analyze Nigeria's water management challenges in relation to other countries, such as Bangladesh, are sparse. The parallels between Nigeria and Bangladesh in terms of climate vulnerability and development challenges suggest that lessons could be drawn from Bangladesh's experience with NBS. For instance, Bangladesh's success in using wetlands and mangroves for flood control and water purification could inform similar strategies in Nigeria. A comparative study by Ahmed and Abubakar highlighted the potential of transferring successful NBS practices from South Asia to Sub-Saharan Africa, including

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[54] Thomas Dunlop et al, "The Evolution and Future of Research on Nature-based Solutions to Address Societal Challenges" (2024) 5 *Communication Earth and Environment* 132; UN, "World Water Development Report 2018" (2018) < https://www.unwater.org/publications/world-water-development-report-2018> accessed 8 September 2024.

[55] Emmanuel Dubois et al, "Nature-based Solution Enhance Resilience to Flooding and Catalyzes Multi-Benefits in Coastal Cities in the Global South" *Science of the Total Environment* 928 (2024): 172282; Stephen Woroniecki et al, "Contributions of Nature-Based Solutions to Reducing People's Vulnerabilities to Climate Change Across the Rural Global South" *Climate and Development,* 15, no. 7 (2023): 590.

[56] Tunvir Ahamed Shohel, 'Safe Water Crisis and Struggle of Climate-Vulnerable Indigenous Communities in Southwestern Coastal Bangladesh' *Water Policy* 26 no. 3 (2024): 273.

[57] Md Jahidul Islam et al, "Flooding Crisis in Bangladesh: Urgent Measures Required" *Biodiversity*, 25, no. 2 (2024): 95; Amit Hasan Anik et al, "The Impact of Climate Change on Water Resources and Associated Health Risks in Bangladesh: A Review" *Water Security* 18, (2023):100133; WaterAid, 'Water' <https://www.wateraid.org/bd/the-crisis/water > accessed 7 September 2024; Euronews, 'Half of Bangladesh Drinking Water is Polluted with Arsenic- and Climate Change is Making It Worse' (2024) <https://www.euronews.com/green/2024/01/18/half-of-bangladeshi-drinking-water-is-polluted-with-arsenic-and-climate-change-is-making-i > accessed 7 September 2024.

[58] Vineis Paolo, Queenie Chan, and Aneire Khan, "Climate change impacts on water salinity and health." *Journal of Epidemiology and Global Health,* 1, no. 1 (2011): 5; Rahman, M Tauhid Ur, et al, "Assessment of Fresh Water Security in Coastal Bangladesh: An Insight from Salinity, Community Perception and Adaptation" *Ocean & Coastal Management,* 137 (2017): 68; Abedin Md Anwarul, et al, "Climate Change, Water Scarcity, and Health Adaptation in Southwestern Coastal Bangladesh" (2019) 10 *International Journal of Disaster Risk Science* 28.

[59] Ashrafuzzaman Md, and Gustavo Luis Furini, 'Climate Change and Human Health Linkages in the Context of Globalization: An Overview from Global to Southwestern Coastal Region of Bangladesh' (2021) 127 *Environment International* 402; Hossain Babul, et al, 'Impact of climate change on human health: evidence from riverine island dwellers of Bangladesh' (2022) 32(11) *International Journal of Environmental Health Research* 2359; Hayward Gemma, and Sonja Ayeb-Karlsson, "Seeing with Empty Eyes': a systems approach to understand climate change and mental health in Bangladesh." *Climatic Change* 165 no. 1(2021): 29.

[60] Bushra Anjum et al, "The Effectiveness of nature-Based Solution to Address Climate Change in Dhaka, Bangladesh" *Social Sciences and Humanitarian Open* 10 (2024): 100985.

[61] Alison C Smith et al, "Nature-Based Solutions in Bangladesh: Evidence of Effectiveness for Addressing Climate Change and Other Sustainable Development Goals" Frontiers in Environmental Science, 9 (2021): 737659.

Nigeria, and called for more localized research to adapt these solutions to the Nigerian context.[62] Ours is an attempt to answer the call.

Water Scarcity: A Comparative Picture of Bangladesh and Nigeria

Bangladesh's potable water resources are scarce despite it being a riverine country full of streams, coastal waters, tanks, lakes, ponds, reservoirs, marshes, watercourses, waterways, wells, springs, and irrigation systems.[63] This is due to water pollution, climate change, and salinity. Also, there are significant seasonal variations in the availability of water due to the recurrent monsoons that bring in copious amounts of water during the rainy season but severe drought during the summer and winter months.[64] Due to infrastructural constraints in withstanding the monsoon season's intense downpours, rainwater cannot be saved for the dry months.[65] In addition, the country's main rivers, the Ganges, Meghna, and Brahmaputra, originate outside of Bangladesh, which limits the amount of water that can finally enter Bangladesh. Merely 7% of the total land area that constitutes the basins of these rivers is occupied by Bangladesh. The Bengalis, being the lower riparian, have very little control over how much water they obtain from these sources. The problem of water salinity caused by climate change and sea-level rise, horizontal expansion of shrimp farms, and the unsustainable Coastal Embankment Projects also contribute to the scarcity.[66] There is a significant rate of arsenic contamination of groundwater, especially in the northern parts of the country which causes one in five contaminated water-related deaths.[67] The World Health Organization believes that inorganic arsenic is very high in the groundwater and it causes diseases like skin lesions, skin cancer, vomiting, abdominal pain, diarrhea, muscle cramping, and death.[68] Bangladesh also faces an alarming challenge of water pollution caused by industry, agricultural runoff, and municipal wastewater. The quantity and quality of surface and groundwater are being threatened by the overuse of water in the industrial sector.

Nigeria faces challenges that make the availability of water as stated in SDG 6 a mirage. In 2018 the Nigerian former President, President Muhammadu Buhari declared a state of emergency and launched 13 years National Action Plan to revitalise Nigeria's water supply.[69] Nigeria is

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62 Ahmed M and Abubakar M, "Comparative Analysis of Nature-Based Solutions in South Asia and Sub-Saharan Africa: Lessons and Opportunities for Nigeria" *Journal of Environmental Management,* (2021): 254

63 Bangladesh Tourism Board, *Bangladesh A Land of Rivers,* (National Tourist Oraganisation)

64 Saima Hedrick, "Water in Crisis-Spotlight on Bangladesh" (The Water Project, 2024).

65 ibid.

66 Participatory Research and Development Initiative, "Increasing Salinity Threatens Productivity of Bangladesh," <https://www.preventionweb.net/files/8199_Salinity.pdf> accessed January 27, 2024.

67 Joseph Graziano, "One in Five Deaths in Bangladesh Linked to Arsenic" (2010) Columbia Mailman School of Public Health, <https://www.publichealth.columbia.edu/news/one-five-deaths-bangladesh-linked-arsenic> accessed 09 September 2024

68 WHO, 'Arsenic' <https://www.who.int/news-room/fact-sheets/detail/arsenic> accessed January 27, 2024.

69 The World Bank, "Nigeria: Ensuring Water, Sanitation and Hygiene for All" (2021) <https://www.worldbank.org/en/news/feature/2021/05/26/nigeria-ensuring-water-sanitation-and-hygiene-forall> accessed 7 September 2024.

particularly vulnerable to water scarcity. 23% of Nigeria's freshwater comes from sources out of the country.[70] However, the withdrawals are significantly more in comparison to supply (9.67 percent) and considerably below the SDG 6.4.2., water stress threshold.[71] Unexpectedly, Nigerian residents lack adequate clean accessible drinking water,[72] even though there are elaborate legal frameworks on the management of water. A very recent report of 2023 shows that only 30 percent of Nigerian have access to water free of contaminants.[73]

An evaluation by Egbueri et al. of Nigerian groundwater revealed the pervasive scale of nitrate pollution in ground water sources.[74] A different study showed that nitrate contamination poses a health concern to Nigerians in 46.67–53.33% of water samples.[75] Ayejoto et al. has identified other potentially hazardous elements (PHEs) posing serious health concerns to the people.[76] In a similar study, Agbasi et al. used health risk assessment and water pollution indexing in Umunya, Nigeria, and found that 66.7% of water resources there are unfit for human consumption because of high lead and nickel levels, which raise the risk of cancer.[77] Collectively, these studies highlight Nigeria's urgent problem of water contamination making the country's already dire water shortage worse.

Nigeria's progress towards the Sustainable Development Goals (SDGs) is a mix.[78] The country has created an Integrated Sustainable Development Goals (ISDG) model, which attempts to align national development plans with the goals.[79] Nevertheless, the rate of advancement towards the goals continues to vary. The UN has emphasized the need for more effective resource allocation and better partnerships.[80]

Comparative Legal Frameworks

To overcome the challenges of water scarcity described above, Bangladesh has ingrained a deeply proactive human rights-based philosophy and nature-based approach (NBS) in its Constitution and laws.

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70 USAID, "Nigeria Water Resources Profile Overview" accessed April 5, 2024 <https://winrock.org/wp-content/uploads/2021/08/Nigeria_Country_Profile_Final.pdf> accessed 09 September 2024.

71 ibid.

72 Efe Jeffery Isukuru et al, 'Nigeria's Water Crisis: Abundant Water, Polluted Reality (2024) 2 Cleaner Water 100026.

73 Ode Uduu, "70% of Nigerians Consume Contaminated Water" Dataphyte (2023) <https://www.dataphyte.com/latest-reports/70-of-nigerians-consume-contaminated-water/> accessed 7 September 2024.

74 Egbueri Johnbosco C et al, "Extent of Anthropogenic Influence on Groundwater Quality and Human Health-related Risks: An Integrated Assessment Based on Selected Physicochemical Characteristics" *Geocarto International* 38, no. 1 (2023): 2210100.

75 Egbueri Johnbosco C et al, "Nitrate Health Risk and Geochemical Characteristics of Water in a Semi-urban: Implications from Graphical Plots and Statistical Computing" *International Journal of Environmental Analytical Chemistry,* (2023): 1.

76 Daniel A Ayejoto et al, "Evaluation of Oral and Dermal Health Risk exposures of Contaminants in Groundwater Resources for Nine Age Groups in Two Densely Populated Districts, Nigeria" *Heliyon,* 9, no. 4 (2023)

77 JC Agbasi et al' "Water Pollution Indexing and Health Risk Assessment due to PTE Ingestion and Dermal Absorption for Nine Human Populations in Southeast Nigeria" *Groundwater for Sustainable Development,* 21 (2023):100921.

78 [i]Gift RA Et al, "Nigerians Crying for Availability of Electricity and Water: A Key Driver to Life Coping Measures for Deepening Stay at Home Inclusion to Slow Covid-19 Spread" Open Access Journal of Science 4, no. 3 (2020): 69; World Bank, "World Bank Open Data: Nigeria" (2020) <https://data.worldbank.org/country/Nigeria> accessed 8 September 2024.

79 Nigerian Government, *Achieving the SDGs in Nigeria: Pathways and Policy Options,* (2019, Office of the Senior Special Assistant to the President on SDGs.)

80 ibid.

Article 18A of the Bangladeshi Constitution provides that "the state shall endeavour to protect and improve the environment and to preserve and safeguard the natural resources, biodiversity, wetlands, forests, and wildlife for the present and future citizens."[81] The Bangladesh Water Act 2013[82] recognizes the rights of the citizens to have access to potable water while its robust policy framework has significantly bolstered NBS. For instance, its National Water Management Plans play a crucial role in integrating NBS into national water management programmes.[83] Recognising the importance of natural ecosystems in the management of water resources, it also prioritises resilient and sustainable water management and incorporates NBS as a key component.[84] NBS is also included in Bangladesh Climate Change Strategies' adaptation and mitigation plans.[85] These policies promote the restoration of wetlands, mangroves, and other ecosystems to lessen the effects of climate change, including storm surges and flooding.[86] Similarly, the Biodiversity and Environmental Policies also adopt a NBS-inspired framework while concentrating on environmental preservation and biodiversity conservation.[87] Natural habitat restoration and preservation are encouraged by these policies, which are essential to the accomplishment of NBS initiatives. Though the 2013 Water Act did not sufficiently address the access to potable water and pollution,[88] the policies accommodate a strong Nature Based Solution Approach to manage the accessibility of potable water.[89]

Compared to Bangladesh, the Nigerian laws do not expressly cover the United Nations Sustainable Development Goal 16 (SDG 16) and Nature Based Solutions (NBS). However, there are inferences that some of the Nigerian laws have implied mandate for the NBS. The Nigerian Constitution states that the "states shall maintain and safeguard the environment, as well as the water".[90] Chapter II provides for environmental protection and sustainable development in guiding legislative and policy actions to ensure justice and equity in resource management. The National Water Resources (Amendment) Act gives the Federal Government the authority to utilise and manage all surface and groundwater, any watercourse that affects multiple states, as well as the banks and beds of such water.[91] It provides a legal framework for

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81 The Constitution (Fifteenth Amendment) Act 2011

82 Act No 14, 2013

83 Bangladesh National Water Management Plan, 2001

84 ibid.

85 Bangladesh Ministry of Environment, Forest and Climate Change, Climate Change Initiatives of Bangladesh: Achieving Climate Resilience

86 ibid.

87 Bangladesh National Environmental Policy 2018; Alexandra Clemett, A Review of Environmental Policy and Legislation in Bangladesh (UK Government).

88 ibid.

89 WWF Report, Water Governance in Bangladesh: Challenges and Opportunities Around Policy, Institutional Function and Implementation for a Sustainable Water Future (Worldwide Fund for Nature, 2015).

90 1999 Constitution, section 20.

91 LFNN. 2016

the management, development, and conservation of Nigeria's water resources. This Promotes integrated water resources management, which includes NBS for sustainable water use. The National Environmental Standards and Regulations Enforcement Agency (NESREA) Act (2007) establishes NESREA to ensure the implementation and enforcement of environmental laws and policies. NESREA supports community and public involvement in environmental preservation, which is consistent with SDG 16's good governance objectives.

A legislative framework for combating climate change through adaptation and mitigation measures is provided by the Climate Change Act of 2021. In addition to establishing institutional frameworks for coordinating climate efforts and guaranteeing accountability, openness, and community involvement, it acknowledges NBS as essential for climate resilience. Environmental Impact Assessment (EIA) Act mandates the assessment of environmental impacts for proposed projects and ensures that NBS projects undergo rigorous environmental scrutiny.[92] Related policies on NBS are the National Policy on Environment (Revised 2016), the National Water Resources Policy, and the National Biodiversity Strategy and Action Plan (NBSAP).

However, to guarantee the fair and efficient use of NBS, these laws need to combine environmental protection, sustainable resource management, and community involvement. Human-caused pollution, such as the release of untreated sewage water from settlements, is the primary driver of the decline in water quality. Nigeria has laws prohibiting the contamination of freshwater, but these regulations are not effectively enforced. The penalties for contaminating water sources, misusing water, and diverting water without authorization are insufficient to discourage such behaviour. Also, the law does not sufficiently shield rural citizens against inequitable actions by water authorities and bad management of their water resources. The current legislative and regulatory framework focuses more on providing water services to urban people than it does on protecting rural dwellers' human rights to drinkable water.

Recently, the Nigerian government sought to address the water crisis by introducing the National Water Resources Bill, of 2016. Its purpose was to establish a regulatory framework for the country's water resources sector, guaranteeing equitable and sustainable development, management, use, and conservation of surface and groundwater water. However, the House rejected the bill because the members of the House were of the opinion that it would give the federal government control over the surface and subsurface water supplies of the states.[93] While the Act might have ensured that the country's water resources are protected, used, enhanced, maintained, managed, and controlled in ways that take into account the right of people to drinkable water,[94] the crude politics of federal-state power balances prevented the law from being passed.

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[92] Cap. E12 LFN 2004.

[93] Anon, *Water resources bill dead in Senate-Anyanwu, Punch Newspaper,* January 21, 2019

[94] Section 1(1) National Water Resources Bill 2016 (Nigeria).

Comparative Institutional Frameworks

So far as the institutional and administrative structures are concerned Bangladesh seems to have established a robust institutional framework through domestic initiatives as well as international support. At the heart of this legal and institutional framework lies a nuanced Nature Based Solution (NBS) approach.

In Bangladesh, some government agencies, such as the Department of Environment and the Ministry of Water Resources, play a prominent role in the NBS's implementation. The Ministry of Water Resources (MoWR)'s mandate includes river management, preserving water, utilising surface and groundwater, and expanding the area under irrigation.[95] The Ministry develops strategies for lowering non-revenue water losses, putting in place policies to minimise waste and promote NBS, developing a public awareness campaign, and promoting the efficient use of water resources.

Water resource planning is carried out by organisations such as the Water Resources Planning Organisation working under the Ministry of Water Resources.[96] The National Water Resources Council (NWRC) is the main body responsible for developing water policy; inter-agency collaboration; and providing advice to the Cabinet on water policy-related issues.[97] The NWRC also promotes collaboration between state and municipal authorities to advance efficient water management. A government organisation that carries out planning, research, and technology transfer concerning water management projects in Bangladesh is the Institute of Water Modelling (IWM).

The management of groundwater and surface water is under the purview of the Bangladesh Water Development Board (BWDB),[98] while the Local Government Engineering Department (LGED) is responsible for organising and overseeing the construction and management of electricity, water supply, sanitation, and health enhancement.[99] A very visible weakness of this complex, sometimes overriding, institutional arrangement is, of course, the confusion and conflict of mandates it brought with it. There are inconsistencies in the scopes of their mandates as it is unclear which agency is in charge of carrying out what specific tasks. Sometimes the policies are vague and ambiguous regarding the responsibilities and authority of specific water institutions.[100] For instance, it does not specify whether the Water Resources Planning

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[95] Animesh K Gain, "From Flood Control to Water Management: A Journey of Bangladesh towards Integrated Water Resources Management" *Water* 9, no. 1 (2017): 55.

[96] Water Resources Planning Organisation (WARPO) <https://warpo.gov.bd/> June 17, 2024.

[97] Das Gupta A and Singh Babel M, Albert X and Mark O, "Water Sector of Bangladesh in the Context of Integrated Water Resources Management: A Review" *International Journal of Water Governance* 1 no.1 (2005): 89.

[98] Molla Rahman Shaibur et al, "Aspects of Bangladesh Water Development Board on the Ecosystems and Water Quality at Nolamara Beel in Narail District of Bangladesh" *Bangladesh Journal of Environmental Science* 32 (2017): 144; Sudip K Pal et al, "Evaluation of the Effectiveness of Water Management Policies in Bangladesh" *International Journal of Water Resources Development* 2 (2011): 401.

[99] Yasuo Fujita, What Makes the Bangladesh Local Government Engineering Department Support (JICA-RI Working Paper, 2011): 27.

[100] ibid.

Organisation (WARPO) or the Department of Environment (DoE) has the responsibility to ensure Environmental Quality Standards (ESQ) for development projects. In terms of project management, WARPO lacks the institutional capacity to bring together a variety of parties and start a collaborative effort.[101] Insufficient funding, unclear mandate, and lack of specialists have prevented the Water Resources Planning Organisation (WARPO), the secretariat of the Northwest Regional Commission (NWRC), and its Executive Committee (ECNWRC), from carrying out its regulatory functions.[102]

Substantial obstacles also surround the plans targeting sufficient awareness among the public about the work of these institutions and the monitoring of on-the-ground activities.[103] There is a perception that the Master Plan for Agricultural Development in the Coastal Region of Bangladesh 2013 is not processed by the Bangladesh Water Development Board (BWDB) within a sustainable institutional framework.[104] Regarding water pollution, sufficient action to minimise it is missing, even though several institutions are dedicated to the protection of water resources.[105]

Compared to Bangladesh, Nigeria's institutional framework provides more promises than capabilities. Governmental organisations, academic institutions, community involvement initiatives, and international organisations have a lot of talking points in tackling Nigeria's water management issues. In advancing sustainable practices in accordance with Nature-Based Solutions (NBS), the Federal Ministry of Water Resources (FMWR) oversees the implementation of water policies and coordinates with other agencies on NBS initiatives. The Nigerian Meteorological Agency (NIMET) provides essential climate and weather data that inform NBS projects while NESREA enforces environmental laws and regulations, ensuring that NBS projects comply with national standards. National Water Resources Institute conducts research, training, and capacity building in water resources, but it faces insufficient funds for research and training. The Integrated Water Resources Management Commission of Nigeria manages and distributes water resources for human use, however, it does not adequately carry out water policy.[106] The River Basin Development Authorities (RBDAs) oversee river basins and support integrated water resources management.[107] Although the Nigeria Hydrological Services Agency oversees hydrological conditions and provides data for managing water resources, its coverage and accessibility of hydrological data are restricted. In addition, the

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[101] ibid.
[102] World Bank Group, *Water Governance and Institutional Reform in Bangladesh* (2016) <https://2030wrg.org/water-governance-and-institutional-reform-in-bangladesh/> accessed June 18, 2024.
[103] ibid.
[104] WWF and H & M, Water Governance in Bangladesh: Challenges and Opportunities around Policy, Institutional Function and Implementation for a Sustainable Water Future (Worldwide Fund for Nature, 2015).
[105] ibid.
[106] Efe Jeffery Isukuru, "Nigeria's Water Crisis: Abundant Water, Polluted Reality" Cleaner Water 2 (2024):100026.
[107] ibid.

World Bank-assisted Nigeria Erosion and Watershed Management Project (NEWMAP) aims to develop sustainable land and water management practices, among other things. It has difficulties raising funds and organizing activities with other partners.[108] It is imperative to state that state governments in Nigeria also have Water Authorities they manage in their states.

Furthermore, some Nigerian universities and research institutions, including the Nigerian Institute for Oceanography and Marine Research (NIOMR) do occasional studies on water management and NBS. Their study offers useful information and insights for developing and implementing policies. The Local Communities put in effort by harvesting rainwater and fetching from the streams according to NBS to stop the infringement on their rights to potable. The international community such as the World Bank,[109] UNDP, and international NGOs provides funding, technical assistance, and capacity-building support for NBS projects in Nigeria.[110] The way Nigerian institutions in charge of water resources operate is impacted by certain problems. These problems include a lack of coordination between departments,[111] a shortage of skilled workers,[112] ineffective monitoring and control,[113] corruption and poor management,[114] the abandonment of water infrastructure projects,[115] unclear policies and guidelines for maintenance and operation,[116] and inadequate planning. [117]

Table 1: Bangladesh and Nigeria's Legal and Institutional Framework in Comparison

	Nigeria	**Bangladesh**
Legal Framework	Water Resources Act, National Water Policy	Water Act 2013, National Water Policy 1999
Institutional Framework	Federal Ministry of Water Resources, NIWRMC, State Water Agencies, RBDA,	Ministry of Water Resources, WARPO, LGED, DPHE
Implementation Strategies	National Action Plan for WASH, PEWASH	Bangladesh Water Development Board, Delta Plan 2100, CLTS
International Collaboration	World Bank, UNICEF, AMCOW	World Bank, ADB, GBM initiatives
Monitoring and Evaluation	The National Bureau of Statistics monitoring progress toward SDG 6 but data collection and reporting are often inconsistent.	Bangladesh Bureau of Statistics regularly tracks and reports on SDG 6 indicators, supported by robust data collection systems.
SDG Overall Score	54.58% (146/166)	64.35% (107/166)

[108] ibid.
[109] World Bank Group, *The World Bank in Nigeria,* July 2, 2024, https://www.worldbank.org/en/country/nigeria.
[110] UN Executive Board of the United Nations Development Programme, the United Nations Population Fund and the United Nations Office for Project Services, Country Programme Document for Nigeria (2023-2027), DP/DCP/NG/4.
[111] Paschaline Nkeiruka Ugwu, et al, "Does Economic Policy in Nigeria Enhance Sustainable Water and Sanitation Facilities?" *Journal of Water, Sanitation and Hygiene for Development* 12, no. 1 (2022) 23.
[112] F Khan et al, "Ensuring Sustainability and Improving Functionality of Water Supply Facilities Through VLOM in Nigeria-From Pilot to National Strategy" Paper presentation at the 41st WEDC International Conference, Egerton University, Nakuru, Kenya, 2018.
[113] Luis Alberto Andres, *An Evaluation of the Contributing Factors of Water Scheme Failures in Nigeria* (2018, World Bank Group).
[114] Ugwu, Paschaline Nkeiruka, et al (Supra).
[115] Popoola Ayobami, et al, "Household Water Stress, Adaptation and Resilience in some Selected Peri-urban and Rural Communities of Oyo State, Nigeria" *IOP Conference Series: Earth and Environmental Science*, 654, no. 1 (2021).
[116] K Khan et al (Supra).
[117] AS Oyekale, and OA Ogunsanya, "Factors Influencing Households' Access to Portable Water in Rural Nigeria" *Life Science Journal*, 9, no. 3 (2012): 2488.

Representative NBS Projects in Bangladesh and Nigeria

Despite its legal loopholes and institutional weaknesses, Bangladesh has emerged as a global champion of the NBS. Bangladesh's particular vulnerability to cyclones, sea-level rise, saline intrusion, floods, and landslides has made the NBS a matter of sustainable solution.[118] Bangladesh has a long engagement with NBS, which involves preserving, responsibly maintaining, and reestablishing both natural and altered ecosystems for the good of society.[119] NBS predominantly emerged in Bangladesh's rural environmental projects.[120] The Five-Year Plans (FYP), National Adaptation Plan to Combat Climate Adaptation (NAP), Bangladesh Delta Plan 2010 (BDP), and the Perspective Plan 2014 feature the NBS most prominently.

One of Bangladesh's flagship 'Climate Proof' rainwater harvest and surface water purification projects has been built around the river Madhumati. Under the project, water from the river Madhumati was taken out and transported to the city via a water supply system.[121] The water is blended with low-salt water that was gathered in a reservoir during the rainy season to reduce its salt concentration before being supplied to the facility during the dry season when the salinity of the Madhumati is high.[122] In the end, the consumers receive water that has been directly handled by the water treatment plant. Though the Madhumati River Project suffers greatly from the water being diverted by the Farakka Dam in India,[123] the NBS proved a successful case study of an eco-friendly water supply system.

Bangladesh's Government adopted the principle of rainwater harvesting in other areas of conservation too.[124] The government has made a rule that every house must have rain harvesting and large buildings, in addition, must have a plant treatment to treat its rainwater.[125] Rainwater harvesting and treatment plants are required for all residential buildings.[126] Every building with a total floor area of at least 4,000 square meters needs to have its rainwater harvesting system.[127] Rainwater harvesting proved to be a potentially very cost-effective supplementary service delivery approach for the government as the people can be self-supplied without much governmental intervention. For example, an NGO called SPS Khulna installed concrete

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[118] Alison Smith et al, "Nature Based Solutions in Bangladesh: Evidence of Effectiveness for Addressing Climate Change and Other Sustainable Development Goals" Frontier in Environmental Science 9 (2021) 1-24.
[119] Tasfia Tasnim and Farah Anzum, Nature Based Solutions (NBS) Workshop Report (International Centre for Climate Change and Development (ICCCAD) and Nature Based Solutions Initiative NBSI) 14-15 October 2019).
[120] Paul J Govind and Shawkat Alam "Nature Based Solutions (NBS) and Climate Change adaptation in Bangladesh: Does Planning Law Facilitate NBS for Climate Change Adaptation in Dhaka?" Climate and Development 15, no.7 (2022): 628-638.
[121] Sonia Ahmad and Neema Kudva, Bangladesh's Water Crisis and the Problem of a 'Green' Solution (Aljazeera, 2023) accessed January 27, 2024, https://www.aljazeera.com/opinions/2023/5/7/bangladeshs-water-crisis-and-the-problem-of-a-green-solution.
[122] ibid.
[123] ibid.
[124] Mashura Shammi et al, "Impact of Salinity Intrusion in Community Health: A Review of Experience on Drinking water Sodium from Coastal Area of Bangladesh" Health Care 7 no. 1 (2019): 50.
[125] Bangladesh National Building Code (BNBC).
[126] ibid.
[127] ibid.

rainwater harvesting tanks that cost 15,000 BDT ($180 US) per home, whereas some large clay containers manufactured locally—called Motka—only cost 1000 BDT ($12 US).[128] Efforts like these paved the way by reducing the number of residents who lack access to potable water. Rainwater harvesting has been experimented at the industrial level too. With the financial and policy support of several development partners and the government, various industrial units have installed rainwater collection systems in their offices and multi-story buildings and minimized the amount of groundwater used.

Another NBS adopted by the Bangladesh Government is called the Managed Aquifer Recharge (MAR). MAR is a tool used to stop and reverse the salinization of coastal aquifers caused by overuse of groundwater and a drop in the water table.[129] It replenishes aquifers with water for later use and environmental advantage. To increase groundwater storage, they use techniques like injection wells, infiltration ponds, stream bed weirs, and riverbank filtration.[130] However, a recent study conducted in the coastal region of the southwest stated that MAR showed a progressive rise in sodium concentration during the dry season.[131] It recommended engaging the community and raising awareness about the need to avoid combining saline water with other types of water in order to extend the usage of MAR throughout the dry season.[132] Understandably this brings the question of community engagement and ownership.

Bangladesh's reformed water policies have resulted in a considerably decentralised water management. Bangladesh's National Water Policy[133] and the Guidelines for Participatory Water Management[134] have transferred water management responsibilities from state-implementing agencies to community-based Water Management Organisations (WMOs) that are societally initiated, with little or no participation from local government institutions. This has impacted rural residents positively,[135] decentralized responsibility to local stakeholders and granted them power to influence water decisions that affect them.[136] All these suggest that despite facing substantial legal, institutional, and environmental challenges, the Government of Bangladesh is putting substantial energy towards eco-friendly, environmentally sustainable, and community-based management of water. Although residents' participation is minimal.

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128 Mashura Shammi et al (n 122)

129 Nerantzis Kazakis, "Delineation of Suitable Zones for the Application of Managed Aquifer Recharge (MAR) in Coastal Aquifers using Quantitative Parameters and the Analytical Hierarchy Process." *Water* 10 no. 6 (2018): 804.

130 ibid.

131 Pauline FD Scheelbeek, et al, "Drinking Water Salinity and raised Blood Pressure: Evidence from a Cohort Study in Coastal Bangladesh," *Environmental Health Perspectives* 125 no. 5 (2017): 057007.

132 ibid.

133 Ministry of Water Resources, *Bangladesh National Water Policy* (Dhaka, Bangladesh: Government of Bangladesh, 1999).

134 Ministry of Water Resources, *Guidelines for Participatory Water Management,* (Dhaka, Bangladesh: Government of Bangladesh, 2001)

135 Camelia Dewan et al, "The Imposition of participation? The Case of Participatory Water Management in Coastal Bangladesh" Water Alternatives 7 no. 2 (2014) : 342.

136 ibid.

Compared to the Bangladeshi projects mentioned above, Nigeria's experiments with the NBS approach in some of its water management projects are marred by half-heartedness, dilemma, and operational loopholes. As mentioned earlier, there is no specific law or institution to ensure NBS solving the scarcity of potable water in Nigeria. However, there are projects put in place that half-heartedly adopt the NBS approach. For instance, the Hadejia-Nguru Wetlands Conservation Project in Jigawa and Yobe States aims to improve water quality through natural filtration and recharge of groundwater.[137] The Erosion and Water Management Projects (NEWMAP) in states like Anambra, Imo, Abia, and Enugu aim to restore natural vegetation and help protect water resources and water quality.[138] The Mangrove Restoration in the Niger Delta contributes to coastal resilience and improves water quality in alignment with SDG 6 target.[139] Others include the Integrated Water Resources Management (IWRM) Project; the Lake Chad Replenishing Project; Forest and Landscape Restoration Initiative.[140] However, these projects are inadequate and scarcely able to ensure potable water due to the country's rapidly urbanising population, environmental stressors, government policies, human-nature relationships, and the difficulties involved in cleaning up and restoring the environment after man-made or natural disturbances.[141]

The scale and nature of community engagement and the traditional top-bottom "development" mindset is another issue. The ignorance of the rural residents contributes to the pollution of the sources of spring and well water which could have been a source of NBS for potable water. Some residents built their toilets close to the well while others emptied the waste in the rivers.[142] The populace often lacked the authority to take the lead, choose which programmes to run, and exercise managerial discretion. Also, there is a high degree of corruption among public servants who serve as intermediaries for residents and international organisations.

Overall, community ownership and participation are almost absent in Nigeria's internal legal and policy processes. There is little effort made by the Government to encourage community participation. The Nigerian National Water Policy[143] lacks community participation in the control and management of water resources.[144] A recent study found at least 265 factors that are responsible for Nigeria's water infrastructure failure and called for heavy reliance on natural

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[137] Isa Olalekan Elegbede, "Wetland Resources of Nigeria: Case Study of the Hadejia-Nguru Wetland" *Poultry Fisheries & Wildlife Sciences* 2 (2014): 2.

[138] World Bank, *Nigeria Erosion and Watershed Management Project (NEWMAP),* <https://documents1.worldbank.org/curated/en/809141468144274655/pdf/685560BR0P12490Official0Use0Only090.pdf> accessed July 2, 2024.

[139] Kabari Sam et al, "Towards a Framework for Mangrove Restoration and Conservation in Nigeria" Regional Studies in Marine Science 66 (2023): 103154.

[140] African Union Development Agency, Nigeria (2023) accessed July 2, 2024, https://afr100.org/country/nigeria.

[141] The Association of Commonwealth Universities, Commonwealth Feature Climate Research Cohort National Based Solutions for Coastal Adaptation: A Comparison between Nigeria and Scotland Final Report, <https://www.acu.ac.uk/media/4193/nbs-project-report.pdf> accessed July 2, 2024.

[142] Ismaila Rimi Abubakar, "Access to Sanitation facilities among Nigerian Households: determinants and Sustainability Implications" Sustainability 9 no. 4 (2017): 547.

[143] National Water Policy 2004

[144] Michael Chukwuma Obeta, "Rural Water Supply in Nigeria: Policy Gaps and Future Directions" Water Policy 20 no. 3 (2018): 597.

solutions.[145] However, for SDG 6 to be achieved, a 'human right to potable water' based approach, and an NBS approach accommodating sustainable development plans, rural community participation, and community-based management must be adopted.

Implementing the Bangladesh Model in Nigeria: Key Areas and Strategies

The comparative overview in Parts 6-8 shows how Nigeria and Bangladesh are addressing SDG 6 within their respective legal and institutional frameworks despite both countries' unique structural and cultural challenges. Still, it appears that adapting the structures of Bangladesh's NBS approach can be highly effective in Nigeria subject to necessary adaptations, of course. In Bangladesh, a variety of NBS is being used, such as conservation agriculture, agro-forestry, participatory forest, fishery, and wetland management, which lessens vulnerability to cyclones, storm surges, floods, landslides, and salinization and aids in helping communities adapt to rising sea levels, water shortages, intense heat, and rainfall.[146] Here's how these structures could be adapted across different levels of government in Nigeria:

National Coordination and Policy Integration

In Bangladesh, the national government integrates NBS into policies related to water management, climate resilience, and ecosystem restoration. For instance, the Bangladesh Delta Plan 2100 highlights NBS as a crucial tactic for managing water resources sustainably and highlights water security and efficiency in water utilization as goal 3.[147]

Nigeria can adapt the National NBS strategy for water resources. It can develop a national strategy that specifically targets NBS for water resource management. This strategy should be integrated into Nigeria's broader National Water Resources Policy and linked with the National Action Plan for Revitalization of Water Supply, Sanitation, and Hygiene (WASH). Also, it can establish an inter-ministerial committee under the Federal Ministry of Water Resources, involving other relevant ministries such as the Ministry of Environment, Ministry of Agriculture, and Ministry of Health. This committee would ensure that NBS is integrated into national policies and that SDG 6 goals are aligned with environmental sustainability efforts.

State-Level Implementation Units

Bangladesh empowers local governments to implement NBS projects tailored to their

[145] Oluwagbemi Samuel Adeoti et al, "Water Infrastructure Sustainability in Nigeria: A Systematic Review of Challenges and sustainable Solutions" Water Policy 25 no. 11(2023): 1094.
[146] Alison Smith et al, "Nature Based Solutions in Bangladesh: Evidence of Effectiveness for Addressing Climate Change and Other Sustainable Development Goals" *Frontier in Environmental Science* 9 (2021): 1-24.
[147] Bangladesh Delta Plan 2100: Bangladesh in the 21st century (Abridged Version) (October 2018, GED, Government of the People's Republic of Bangladesh

specific ecological and socio-economic contexts, with state-level institutions playing a significant role.

Nigeria may do this by strengthening or establishing special state-level agencies responsible for implementing NBS projects related to water management. These agencies would work on projects such as wetland restoration, reforestation, and sustainable agriculture that contribute directly to achieving SDG 6. Each state should develop its own NBS implementation plan that aligns with both the national strategy and local environmental conditions. These plans would focus on using natural processes to improve water quality, manage floods, and ensure sustainable water usage.

Local Government and Community Engagement

In Bangladesh, local governments and communities are actively involved in NBS projects, ensuring that solutions are locally appropriate and community-driven.[148] Nigeria needs to empower local governments to lead NBS initiatives that address specific water-related challenges in their areas. This could involve community-based projects like constructing rainwater harvesting systems, restoring mangroves, and creating green infrastructure to improve water quality and availability. It could also encourage community participation in NBS projects by involving local leaders, civil society organizations, and indigenous knowledge systems. This would ensure that the projects are culturally relevant and have strong local support, leading to better sustainability.

Capacity Building and Technical Support

Bangladesh invests in capacity building for local institutions and communities to effectively implement and manage NBS projects. For instance, the Local Government Initiative on Climate Change (LoGIC) in Bangladesh involves improving communities' capacity to organize and fund locally appropriate adaptation measures that fit their circumstances and needs.[149] Through this project, the Government of Bangladesh's Local Government Division, Ministry of Local Government, Rural Development, and Co-Operatives, offers a platform for exchanging best practices and lessons learned, a system for tracking and evaluating effectiveness and impact, and a mechanism for managing climate finance from various sources.[150] Thus far, about two million individuals have benefited, comprising over 400 thousand households.[151]

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[148] Nafia Saddaf et al, "Vulnerable and Effectiveness of nature-based Solutions (NbS) in Farming Communities of Coastal Bangladesh" Environmental Challenges 14 (2024): 100863.

[149] Global Center on Adaptation, 'Equipping Communities and Local Governments with the Tools to Finance Adaptation Interventions in Bangladesh' (2023) <https://gca.org/equipping-communities-and-local-governments-with-the-tools-to-finance-adaptation-interventions-in-bangladesh/> accessed 27 August 2024.

[150] ibid.

[151] ibid.

The Nigerian Government needs to implement nationwide training programs focused on NBS for water resource management. These programs would target state and local government officials, community leaders, and technical staff to build their capacity in planning, implementing, and monitoring NBS projects. Establishing regional technical support centers that offer knowledge, materials, and direction on NBS is also necessary. These centers might provide services including project design, environmental assessments, and GIS and remote sensing monitoring for NBS projects related to water.

Financial and Resource Mobilization

Bangladesh mobilizes resources from national budgets, international donors, and the private sector to finance NBS projects. The government made large investments in the development of water resource infrastructure, including dredging, embankments, polders, dykes, and surface water development for irrigation and drainage.[152]

The Nigerian government may establish a special fund for NBS initiatives aimed toward SDG 6 in the national and state budgets. This fund might encourage investments in environmentally friendly water management techniques by receiving funding from the private sector, international grants, and climate money. Furthermore, it can encourage public-private partnerships for the financing and execution of large-scale NBS projects that support SDG 6—like floodplain control or wetland restoration. These collaborations could guarantee public benefits while using resources and innovation from the private sector.

Monitoring, Evaluation, and Reporting

Bangladesh uses comprehensive monitoring and evaluation (M&E) frameworks to track the progress of NBS projects and their impact on SDG achievement.[153] The Nigerian government ought to create a strong M&E structure specifically for NBS initiatives that support SDG 6. To ensure that progress is quantifiable and visible, this framework should include precise metrics for improving water quality, ecosystem health, and community resilience. To enable state and local governments to report on the results of NBS projects, the government should also set up frequent reporting channels. Feedback systems must be in place so that initiatives can be modified and enhanced in response to results monitoring, guaranteeing ongoing advancement toward SDG 6.

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[152] *Bangladesh National Conservation Strategy 2021-2036* (2021, Ministry of Environment, Forest and Climate Change Bangladesh Government) 35

[153] Revised Monitoring and Evaluation Framework of the Sustainable Development Goals (SDGs): Bangladesh Perspective (GED, Government of the People's of Bangladesh, April 2020)

Integration with Existing Water Management Programmes

Bangladesh ensures that NBS is integrated with existing water management and disaster risk reduction programs, creating synergies and maximizing impact.[154] There should be a rule and regulation to Integrate NBS into existing Nigerian water management initiatives, such as the Nigeria Erosion and Watershed Management Project (NEWMAP) and the Water, Sanitation, and Hygiene (WASH) programs. This integration would ensure that NBS complements and enhances ongoing efforts to improve water security and sanitation. Also, there should be a holistic approach to water management that combines NBS with traditional infrastructure solutions. For instance, combining engineered flood defenses with restored wetlands can offer greater resilience and sustainability.

Overcoming the Challenge of Transparency and Accountability

SDG 6 guarantees that everyone has access to and can sustainably manage water and sanitation. A strong foundation of accountability and openness in governance, policy execution, and resource management is necessary to achieve this goal. Although Bangladesh and Nigeria both have formidable obstacles in this area, their approaches to accountability and transparency in the water and sanitation sector differ because of the disparities in their institutional, cultural, and sociopolitical backgrounds.

While both Nigeria and Bangladesh face challenges in achieving SDG 6, Bangladesh has developed more effective structures for transparency and accountability, particularly in terms of data management, civil society involvement, and institutional coordination.[155] The government's approach to integrating SDG 6 into national policies has been more systematic, with clearer mandates for different agencies involved in water and sanitation. Nigeria, on the other hand, struggles with corruption and institutional weaknesses that hinder its progress.[156] Corruption Perceptions Index has consistently ranked Nigeria poorly, highlighting the challenges of ensuring accountability in public service delivery, including in the water and sanitation sectors.[157] Strengthening transparency and accountability mechanisms, particularly through enhanced public participation and more robust monitoring system is crucial for Nigeria in achieving SDG

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[154] *National Adaptation Plan of Bangladesh* (2023 – 2025), (2022, Ministry of Environment, Forest and Climate Change Bangladesh Government).

[155] Naimur Rahman, *Journey for Advancement For Transparency Representation and Accountability: Final Evaluation,* (World Bank Document)

[156] United Nations Office on Drugs and Crime, Corruption in Nigeria: Patterns and Trends (2019) <https://www.unodc.org/conig/uploads/documents/Corruption_Survey_2019.pdf> accessed 27 August 2024.

[157] Transparency International, "Our Work in Nigeria" (2024) <https://www.transparency.org/en/countries/nigeria> accessed 27 August 2024.

6. A particularly useful strategy for Nigeria in this regard could be to develop a comprehensive, decentralized, and community-driven approach to water resource management. This would enhance water quality, improve sanitation, and increase resilience to water-related challenges, ensuring sustainable progress toward achieving SDG 6 across Nigeria.

Conclusion

The UN Sustainable Development Goal 6 is straightforward. It calls for ensuring safe drinking water for all by the year 2030. However, in countries like Nigeria, people are forced to drink contaminated water due to depletion of safe water sources and other human-caused causes. Lack of potable water has created a greater public health crisis causing an increase in various diseases like diarrhea, cholera, dysentery, jaundice, and skin diseases. Nigeria and other African nations are struggling to contain the problem. In this paper, we have argued that the challenges are multiplied by the government and policymakers' failure to adopt sustainable development plans and exclusionary attitudes towards the main stakeholders of their plans – the people and communities. In this regard, Bangladesh, one of the notable Global champions of UNSDG, presents a very encouraging case study of the successes of eco-friendly and nature-based solutions. There is no denying that Bangladesh continues to face problems like those in Nigeria, but its efforts are commendable compared to the others. The country has recognised the need for NBS more boldly than Nigeria. NBS-inspired strategies such as rainwater harvesting have reduced the pressure on underground and surface water and have proved beneficial to future generations. Solar-based irrigation systems have been used to support the rural off-grid areas.[158] Socially adaptable and environmentally sustainable techniques have been applied to gather clean drinking water. Bangladesh's Government is also making a visible attempt to involve the people in the production of potable water. Unfortunately, the Nigerian government is doing little or nothing in this direction. Nigeria's archaic and mechanical intervention-based development projects have caused more harm to the environment than their benefits. It appears surprising that Nigerian policymakers ignore a very cheap and simple NBS-inspired conservation technique called rainwater harvesting. Also, the Nigerian government and policymakers habitually perceive the people as mere consumers or beneficiaries of their developmental initiatives. Lacking community ownership and participation in the project implementation processes, most of Nigeria's water development projects have proved abortive. Against these realities, this paper argues that if Nigeria is willing to achieve the UN Sustainable Development Goals (SDGs) by 2023, it should look towards Bangladesh's inspiring story of success. Nigeria must adopt legislation that upholds the citizens' right to drinkable water. It is also imperative that the country internalizes the NBS in its development philosophy. An NBS-inspired right to potable water regime means developments are eco-friendly, environmentally sustainable, and community-owned.

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[158] Bangladesh: *A Green Deal,* (Centre for Research and Information, 2021).