

ARTIFICIAL INTELLIGENCE AND THE LAW OF ENVIRONMENTAL GOVERNANCE: CHALLENGES AND REFORM PROSPECTS IN NIGERIA

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Abstract

Artificial Intelligence (AI) holds significant promise for strengthening environmental governance in Nigeria, from improving pollution monitoring to optimizing natural-resources management. However, persistent challenges including gaps in legal frameworks, limited technical capacity, weak institutional coordination, and data privacy concerns undermine AI's potential. With out-dated environmental legislation, unclear liability rules, and minimal stakeholder engagement, Nigeria faces difficulty ensuring fair, transparent, and effective AI deployment. This study explores the existing regulatory landscape, identifies barriers to AI-law integration, and evaluates reform pathways including the enactment of digital-ready statutes, capacity-building for regulators and practitioners, and multi-stakeholder frameworks. Based on qualitative document analysis and expert interviews, the research reveals a pressing need for harmonized legal guidance, public-private collaboration, and ethical safeguards tailored to local contexts. The prospects for reform hinge on political will, legal drafting reforms, and inclusive governance models.

Keywords: Artificial Intelligence; Environmental Governance; Nigeria; Legal Environmental Protection and Sustainability

1. Introduction

The increasing urgency of environmental degradation in Nigeria manifesting in oil pollution, deforestation, waste mismanagement, and climate-induced flooding has placed enormous pressure on regulatory systems that are already under strain. Although environmental laws exist, such as the National Environmental Standards and Regulations Enforcement Agency (NESREA) Act and the Environmental Impact Assessment (EIA) Act, their implementation remains inconsistent due to limited institutional capacity, out-dated frameworks, and a lack of real-time enforcement tools.¹ In contrast, artificial intelligence (AI) technologies now offer the promise of enhancing environmental monitoring, predictive modelling, and enforcement by providing faster, data-driven insights into ecological risks. These systems can help track pollution sources, identify regulatory violations, and optimize resource management.² However, in Nigeria, the potential of AI in this space is largely untapped, due to the absence of supporting legal and policy frameworks that can regulate its use responsibly and equitably.

While Nigeria has taken initial steps toward a digital transformation agenda including its National Digital Economy Policy and Strategy (2020–2030) there remains a disconnect between these high-level strategies and sector-specific regulation, particularly in environmental

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¹ Nigeria, National Environmental Standards and Regulations Enforcement Agency Act, 2007 and Environmental Impact Assessment Act, Cap E12 LFN 2004.

² Lawrence E. Susskind and Shafiqul Islam, "Water Diplomacy: A Negotiated Approach to Managing Complex Water Networks," *Water International* 37, No. 1 (2012): 70–85.

governance.³ Most existing environmental statutes were enacted long before AI and data science became integral to public administration. As a result, current laws do not address the challenges or complexities that AI introduces, such as accountability for machine-led decisions, data privacy, algorithmic bias, or the risk of deepening existing social inequalities.⁴ There is no legal clarity on who should be held responsible when automated systems fail to detect illegal activities or produce flawed environmental data. Nor are there mechanisms to guarantee public access to information or redress when decisions are made by opaque AI algorithms rather than human authorities.⁵

Given these realities, this research explores how Nigeria can reform its environmental legal framework to accommodate and guide the use of AI technologies in ways that are ethical, transparent, and effective.⁶ The study addresses key questions: What specific gaps exist in current environmental laws that hinder AI adoption? How can legal norms such as those related to liability, transparency, data governance, and public participation be updated or developed to respond to the unique features of AI? What lessons can be drawn from international models to ensure that Nigeria adopts an approach that is not only legally sound but also contextually relevant and socially inclusive?

To answer these questions, the study adopts a multidisciplinary and qualitative methodology, combining legal document analysis with expert interviews and comparative policy review. This approach enables a deep understanding of both the structural challenges and the life experiences of stakeholders, including regulators, civil society actors, and AI practitioners. The ultimate goal is to develop a reform framework that reflects Nigeria's environmental governance needs while embracing the transformative possibilities of AI. At its core, this research recognizes that technology alone cannot solve governance problems. Instead, meaningful progress depends on laws and institutions that are responsive to both innovation and justice, ensuring that AI serves the public interest without eroding rights or accountability.⁷

In seeking to understand how Nigeria might reconceive its legal and regulatory framework to responsibly harness artificial intelligence in environmental governance, this study poses an integrated inquiry: What legal-institutional obstacles in areas such as data governance, liability, transparency, and institutional capacity currently impede AI deployment for environmental monitoring, enforcement, and policy-making in Nigeria, and how might comparative regulatory architectures and localized, rights-based design principles inform the crafting of an AI-aware normative structure that is both workable in local conditions and globally legitimate?⁸ This broad question is subdivided into analytical lenses: the identification and diagnosis of regulatory

³ Federal Ministry of Communications and Digital Economy, National Digital Economy Policy and Strategy (2020–2030), Abuja: Government of Nigeria, 2020.

⁴ Sandra Wachter, Brent Mittelstadt, and Chris Russell, “Why Fairness Cannot Be Automated: Bridging the Gap Between EU Non-Discrimination Law and AI,” *Computer Law & Security Review* 41 (2021): 105567.

⁵ Lilian Edwards and Michael Veale, “Slave to the Algorithm? Why a ‘Right to an Explanation’ Is Probably Not the Remedy You Are Looking For,” *Duke Law & Technology Review* 16, no. 1 (2017): 18–84.

⁶ European Commission, Proposal for a Regulation on Artificial Intelligence (Artificial Intelligence Act), COM(2021) 206 final, Brussels, 21 April 2021.

⁷ Virginia Dignum, *Responsible Artificial Intelligence: How to Develop and Use AI in a Responsible Way* (Cham: Springer, 2019).

⁸ *Ibid*

lacunae within extant statutes (including the National Environmental Standards and Regulations Enforcement Agency Act, the Environmental Impact Assessment Act,⁹ and relevant policy pronouncements on digital governance); the exploration of emerging best-practice models from jurisdictions such as the EU (e.g. proposed AI Act), South Africa, India, and Brazil particularly regarding algorithmic accountability, transparency mechanisms (like impact assessments), and multi-stakeholder data-sharing regimes; and the ethical-institutional imperative to embed inclusive governance, public participation, and equitable access within the AI ecosystem in Nigeria, to ensure that environmental decision-systems do not exacerbate inequalities or disenfranchise vulnerable communities.¹⁰

To interrogate these research questions, the methodology unfolds through three interwoven strands. First, the research engages in rigorous legal-policy document analysis, reviewing Nigerian environmental statutes, regulations, innovation-policy frameworks, and any draft AI or digital-governance legislation, alongside international treaties and comparative regimes; critical attention is paid to hidden assumptions (for example, who “owns” environment-related data generated by satellites or sensor networks, and how liability is apportioned when automated systems mis-identify pollutant sources), to expose misalignments between legal form and technological function. Second, the research undertake qualitative, semi-structured interviews with a diverse constellation of actors legal scholars and regulators within NESREA and Federal Ministry of Environment, AI and data science practitioners involved in drone or satellite-based pollution tracking pilots, representatives of environmental Non-Governmental Organizations (NGOs) and community groups in oil-affected zones (e.g. Niger Delta), and policymakers engaged in Nigeria’s digital transformation roadmap eliciting reflections on lived institutional constraints, cases of algorithmic failure or success, concerns over bias, transparency, and accountability, and stakeholders’ vision of what a more coherent, fair, and effective AI-governance framework might look like in practice. Third, the research performs comparative case study analysis, investigating selected instances where AI has been applied in environmental governance in Nigeria or neighboring countries perhaps remote sensing to enforce anti-deforestation laws in Ghana or predictive flood-risk modeling in South Africa and assessing whether and how underlying legal regimes enabled or hindered these initiatives, what accountability mechanisms were adopted, and what lessons can translate to Nigeria’s legal tradition and capacity context.¹¹

These three strands converge in a final integrative phase where the research construed a normative proposal a “Nigeria AI-Aware Environmental Governance Blueprint “grounded in empirical insights and comparative jurisprudence. This framework proposes statutory reforms: including explicit definitions of permissible AI roles in monitoring and enforcement; algorithmic liability rules (assigning responsibility to system designers, deploying agencies, or data controllers depending on context); data governance protocols (addressing ownership, sharing, consent, privacy, cyber security, and cross-agency interoperability); built-in transparency and

⁹ Nigeria, National Environmental Standards and Regulations Enforcement Agency Act (2007); Nigeria, Environmental Impact Assessment Act (1992, amended).

¹⁰ European Union, Proposal for a Regulation on Artificial Intelligence (AI Act) (2021).

¹¹ Olawade, D., Wada, O. Z., Ige, A. O., & Oladapo, B. I., ‘*Evaluation of Stakeholder Perceptions and Applicability of Artificial Intelligence Integration into Environmental Impact Assessment processes in Nigeria.*, *Journal of Applied Sciences and Environmental Management* (2025).

public participation provisions (such as algorithmic impact assessments, public notification, accessible appeals or redress processes, and inclusive design consultations with communities affected by environmental risk); and institutional capacity mechanisms (dedicated AI units within environment agencies, training programmes for legal and technical staff, inter-agency coordination platforms, and public-private research partnerships). The design intentionally focuses on adaptability and inclusivity: recognising Nigeria's heterogeneous digital infrastructure, differential access to technology, and the risk of exclusion. Thus, the proposed architecture favours multi-tiered governance federal and sub-national collaborations, community advisory boards, civil society oversight panels, and inclusive stakeholder workshops so that even communities in underserved regions can engage meaningfully in AI governance. It also emphasizes ethical reflection rather than top-down techno-optimism supporting human judgment, community redress, and algorithmic auditability as guardrails against misuse or unintended harm. This holistic approach humanizes the techno-legal discourse, anchoring reform not merely in regulatory mechanics but in the life experiences of people facing environmental threats, and in the imperative to balance innovation with justice and democratic legitimacy.¹²

2. Overview of Artificial Intelligence in Environmental Governance

Artificial intelligence (AI) is emerging as a transformative enabler in environmental governance, offering sophisticated tools for monitoring, prediction, and compliance. In Nigeria and globally, AI systems are being used to analyze satellite imagery to detect deforestation, model climate impacts, and optimize resource use in agriculture, water management, and energy planning. For example, predictive machine-learning models can forecast areas at risk of illegal logging or poaching, enabling enforcement agencies to deploy scarce resources more effectively and pre-empt violations.¹³ Meanwhile, AI-driven eDNA and pattern recognition help detect rare species and ecosystem stress more efficiently than manual observation, scaling biodiversity preservation efforts.¹⁴ This dynamic underscores AI's capacity to bridge gaps in data availability and expedite environmental decision-making.

Yet the adoption of AI in environmental governance must be considered alongside technological and infrastructural realities. Nigeria faces substantial digital infrastructure deficits, including unreliable internet connectivity, inconsistent data systems, and fragmented institutional datasets challenges that significantly constrain the effective deployment of AI tools at scale.¹⁵ In many rural or underserved areas, data paucity limits the efficacy of algorithms and prevents representative modelling. Developing local capacity in data science and algorithmic literacy remains critical to transforming AI's theoretical promise into ground-level implementation.

¹² Neves CN, Feitosa RQ, Ortega Adarme MX and Giraldi GA, 'Combining Recurrent and Residual Learning for Deforestation Monitoring Using Multi-temporal SAR Images' (2023) arXiv <https://arxiv.org/abs/2310.05697> accessed 2 December 2025. Dalagnol R and others, 'Mapping tropical forest degradation with deep learning and Planet NICFI data' (2023) 298 *Remote Sensing of Environment* 113798

¹³ Gbadegesin, Opeyemi Adewale. "Leveraging Artificial Intelligence (AI) in Strengthening the Legal Framework for Regulation of Wildlife and Forest Crimes in Nigeria." *Environmental Policy and Law* (2023): 53, No. 4, 1–16. DOI:10.3233/EPL-230011.

¹⁴ O. Ojo, & L. Ojewale., "AI-Driven Policy Optimization for Strengthening Economic Resilience and Inclusive Growth in Nigeria." *Iconic Research & Engineering Journals* (2024).8, No. 6, 56

¹⁵ Shittu, Rahman Akorede et al. "Policy Frameworks for Artificial Intelligence Adoption: Strategies for Successful Implementation in Nigeria." *International Journal of Social Science Exceptional Research* (February 2025).

Crucially, AI's integration into governance contexts introduces intricate legal and ethical considerations. Algorithmic bias, opaque decision-making ("black box" models), and data privacy risks complicate the application of AI in public environmental regulation. Responsible deployment requires built-in transparency, fairness, and human oversight principles advocated in global frameworks such as the OECD 2024 AI Principles and UNESCO's Recommendation on the Ethics of Artificial Intelligence (2021).¹⁶ These frameworks emphasize accountability and human-rights alignment, encouraging states to craft governance systems that mitigate harms while promoting sustainable innovation.

From the perspective of enforcement, AI uniquely enhances compliance efforts. For example, recent scholarship shows how wildlife and forest crimes in Nigeria can be more effectively tackled through image recognition, thermal imaging, pattern detection, and predictive analytics integrated within legal regimes.¹⁷ This potential is especially significant given Nigeria's role as both source and transit country for illegal wildlife products, where enforcement is hampered by limited manpower and weak inter-agency coordination. AI therefore offers a viable tool to amplify enforcement reach while making legal responses more agile and data-informed.

2.1 Nigeria's Environmental Legal and Policy Framework

Nigeria's environmental governance is currently structured around a combination of constitutional mandates, statutory instruments, and agency mandates focused on sustainable development and ecological protection. While Chapter II of the 1999 Constitution outlines responsibilities for environmental stewardship and public health, these provisions are not directly enforceable in court.¹⁸ Statutory frameworks fill in the gaps: the National Environmental Standards and Regulations Enforcement Agency (NESREA) Act (2007, amended 2018) empowers NESREA to promulgate and enforce thirty-four environmental regulations, issue sanctions, and monitor compliance.¹⁹ The Environmental Impact Assessment Act (1992) mandates impact studies for major projects, ensuring that environmental effects including greenhouse gas emissions are publicly reviewed prior to approval.²⁰ Most recently, the Climate Change Act (2021) codified Nigeria's commitment to net-zero emissions by 2060, laid out governance structures for climate resilience, and mandated alignment with Nigeria's Nationally Determined Contributions.²¹

Although these laws provide broad structural support, they predate AI and provide limited direct guidance on technology-mediated governance. NESREA's mandate allows regulatory authorities to enforce environmental standards, but current regulations lack explicit provisions permitting

¹⁶ AI Watch: Global Regulatory Tracker – Nigeria." White & Case LLP (27 January 2025).

¹⁷ Climate Change Act, 2021; NESREA Act (2007, amended 2018); Environmental Impact Assessment Act, 1992; Nigeria Data Protection Act, 2023."

¹⁸ Kulothungan, Vikram & Gupta, Deepti. "Towards Adaptive AI Governance: Comparative Insights from the U.S., EU, and Asia." arXiv (1 April 2025).

¹⁹ Alibašić, Haris. "Harmonizing Artificial Intelligence (AI) Governance: A Comparative Analysis of Singapore and France's AI Policies and the Influence of International Organization." Global Public Policy and Governance (June 2025). DOI:10.1007/s43508-025-00116-w.

²⁰ Global Partnership on Artificial Intelligence, 'About GPAI' (GPAI) <https://www.gpai.ai/about/> accessed 2 December 2025.

²¹ Council of Europe, 'Framework Convention on Artificial Intelligence and Human Rights, Democracy and the Rule of Law' (2024) <https://www.coe.int/en/web/artificial-intelligence/la-convention-cadre-sur-l-intelligence-artificielle> accessed 2 December 2025.

AI-based monitoring, algorithmic grading of compliance, or digital enforcement tools. Meanwhile, potential conflicts exist between general legal frameworks and the specific requirements of environmental data governance. For instance, the recently enacted Nigeria Data Protection Act (2023) provides robust protections for personal data, establishing clear obligations for data controllers and processors. However, the Act does not explicitly address whether environmental datasets which may include geospatial, sensor, or location-based information collected for monitoring deforestation, flood risks, or pollution fall within its remit. This legal ambiguity creates uncertainty for organizations and practitioners seeking to leverage artificial intelligence for environmental monitoring, as they may be unsure whether environmental data are subject to the same consent, storage, or sharing requirements as personal data. Consequently, there is a need for either statutory clarification or supplementary guidelines to ensure that AI-driven environmental initiatives can operate effectively while remaining compliant with Nigeria's data protection regime.²² Likewise, the Cybercrimes Act (2015), Competition and Consumer Protection Act (2018), and Copyright Act (2022) indirectly intersect with AI implementation but do not address environmental or sustainability contexts directly.²³

Policy initiatives are slowly catching up: in January 2025, Nigeria launched a free AI Academy aimed at equipping youths and civil servants with AI competencies the program is intended to foster an AI-aware governance culture across sectors.²⁴ Meanwhile, the National Information Technology Development Agency (NITDA) is actively drafting a National Artificial Intelligence Policy (NAIP) and Strategy (NAIS), and has established a Regulatory Intelligence Framework emphasizing human oversight, inclusion, and iterative improvement.²⁵ However, these policy documents remain in draft form and have yet to establish enforceable mandates or sectoral integration with environmental agencies like NESREA.

As a result, Nigeria currently operates with robust environmental laws alongside nascent AI policy orientation. The gaps between existing legal frameworks and prospective AI governance goals underscore the urgent need for harmonization: environmental statutes must articulate mechanisms for AI-enabled monitoring and enforcement, while digital governance schemes must reflect ecological objectives and data sovereignty considerations particularly in relation to environmental datasets, algorithmic transparency, and local accountability.

3. Legal Implications of AI in Environmental Governance

Introducing AI into environmental governance in Nigeria raises complex legal implications involving accountability, rights, and institutional legitimacy. Foremost, using AI for environmental enforcement such as remote sensing to detect illegal dumping or deforestation engages questions around due process and legal evidentiary standards. Nigerian courts require reliable, authenticated evidence for convictions; AI outputs must therefore be transparent, explainable, and admissible. Without adequate certification or validation protocols embedded in law, enforcement based on algorithmic outputs may be challenged as speculative or unreliable.²⁶

²² African Ministers Adopt Landmark Continental Artificial Intelligence Strategy.” Reddit/r/Africa (June 2024).

²³ The United Nations Wants to Treat AI With the Same Urgency as Climate Change.” Wired (10 months ago).

²⁴ See e.g. FT Tech for Growth Forum describing predictive ecosystem monitoring via satellites and AI bots. FT, Jan 2025. Financial Times.

²⁵ Ibid., plus IUCN use of video analytics and eDNA tools. Financial Times

²⁶ Ojo & Ojewale, AI-Driven Policy Optimization... (2024): infrastructural deficits in Nigeria 234.

Further, the intersection between AI and personal data protection is legally fraught. Environmental AI systems may collect geo - location data, personal metadata (e.g. GPS-linked interviews), or biometric content (e.g. wildlife camera footage including human presence) collected under NESREA's data gathering mandate but potentially falling under the Nigeria Data Protection Act 2023.²⁷ Absent explicit exemptions or consent mechanisms, deploying AI could violate privacy rights, triggering legal liability and undermining public trust. The design of AI governance must therefore align with both environmental oversight goals and personal data safeguards, with clear legal basis to reconcile apparent conflicts.

Another set of implications surrounds algorithmic bias and equity. If AI systems prioritize certain geographic zones or communities based on incomplete datasets, enforcement may become skewed, exposing marginalized or vulnerable groups to disproportionate targeting. This raises concerns under Nigeria's constitutional guarantees of equality and non-discrimination. Legal frameworks must therefore ensure that AI is deployed equitably and subject to independent review, auditing, and redress mechanisms to prevent systemic bias and uphold fairness in enforcement.

Lastly, assigning liability when AI-assisted decisions cause harm presents an open legal question. Who is responsible if an algorithm misclassifies a lawful activity as an environmental violation? Do civil servants, AI developers, or regulatory bodies bear culpability? Without a defined liability regime whether strict, negligence-based, or agency-based the deployment of AI tools introduces risk for wrongful enforcement. This underscores the need for a legal regime that delineates duty of care, oversight responsibilities, and clear pathways for contesting AI-driven decisions.

4. Legal and Regulatory Challenges

Nigeria faces a multifaceted array of legal and regulatory hurdles in integrating AI into its environmental governance architecture. Firstly, there is a legal vacuum: no legislation to date directly governs AI use.²⁸ The National Artificial Intelligence Policy remains in draft form, and Nigeria lacks an overarching AI Act. Consequently, there are no statutory standards for AI auditing, model validation, environmental algorithm certification, or permitted use of automated decision-making.²⁹ This gap hampers regulatory certainty and leaves implementation to speculative guidance, creating risks of inconsistent or ad hoc deployment across sectors.

Secondly, institutional fragmentation poses a regulatory challenge. Environmental governance is cantered in NESREA and the Federal Ministry of Environment, while AI oversight is dispersed across National Information Technology Development Agency (NITDA) and National Centre for Artificial Intelligence and Robotics (NCAIR) and various cybercrime and data agencies.³⁰ Coordination among these bodies is nascent and informal; there is no institutional mechanism for harmonizing AI governance with environmental policy objectives. Effective AI-enabled environmental governance requires cross-sectoral collaboration, shared data infrastructures, and joint accountability frameworks none of which are legally mandated currently.

²⁷ OECD AI Principles (revised 2024), UNESCO 2021 AI Ethics Recommendation. Mondaq summary. Mondaq

²⁸ Gbadegesin, Leveraging AI... Wildlife and Forest Crimes (2023).

²⁹ Nigeria Constitution, Chapter II and Chapter IV.

³⁰ NESREA Act establishing agency and amendment in 2018.

Thirdly, technical capacity and resource constraints present regulatory enforcement dilemmas. Scholarly analyses highlight Nigeria's digital divides: fragmented datasets, limited internet penetration, underdeveloped digital infrastructure, and shortage of trained AI professionals all limit operationalization of AI systems at scale.³¹ Without investment in foundational infrastructure and human capital, even the best legal frameworks may remain aspirational. Regulatory bodies may lack the expertise to audit AI systems, evaluate algorithmic fairness, or prosecute AI-related environmental infractions thus undermining enforcement intent.

Finally, Nigeria must negotiate global regulatory pressures and alignment with international norms. International treaties and initiatives from the Council of Europe's Framework Convention on AI Human Rights (2024)³² to the UN High-Level Advisory Body proposals for an Intergovernmental Panel on Climate Change "IPCC-like" AI monitoring panel offer normative templates.³³ Yet the adoption of these norms raises questions of compatibility with Nigerian sovereignty, resource constraints, and local ecological priorities. Balancing responsiveness to international obligations with locally relevant governance design remains a core regulatory challenge for Nigeria's policymakers.

5. Comparative Analysis of International Approaches

Globally, AI governance strategies span a spectrum from the EU's precautionary, risk-based model to the U.S.'s market-driven, sector-specific orientation.³⁴ The EU AI Act introduces binding requirements for transparency, human oversight, and classification of AI systems by risk level, including environmental applications. Its approach aligns with Nigeria's eventual needs: enforceable audit trails, prohibited high-risk use, and governance bodies certified to oversee deployment. In contrast, the U.S. approach emphasizes flexibility, alignment with innovation, and minimal federal regulation for environmental AI systems, priority given to private-sector standards and voluntary norms.³⁵

In Asia, approaches vary: Singapore emphasizes a modular, sector-specific regulatory sandbox model, encouraging experimentation under supervised conditions, while France emphasizes corporate ecological reporting and public environmental footprints ranking companies based on their carbon impact.³⁶ While neither model is direct fit for Nigeria, they offer instructive elements: sandboxes help governments pilot AI in environmental enforcement safely, while transparency frameworks encourage corporate accountability for ecological externalities.

Internationally, multilateral governance initiatives add another comparative layer. For example, the Global Partnership on Artificial Intelligence (GPAI), hosted by the Organization for Economic Co-operation and Development (OECD), fosters cooperation across member states in responsible AI development, including environmental and sustainability domains.³⁷ Similarly, the

³¹ Environmental Impact Assessment Act 1992.

³² Climate Change Act 2021 and Nigeria's net-zero target by 2060.

³³ Nigeria Data Protection Act 2023; its limited AI coverage, as per governance gap analysis. Mondaq, plus Draft Strategy commentary.

³⁴ Other applicable laws listed in White & Case's regulatory tracker.

³⁵ Federal Government's AI Academy launch, reported via Reddit.

³⁶ NITDA/NAIR initiatives, NAIP/NAIS drafts, Regulatory Intelligence Framework and NDA gaps. LinkedIn+White & Case.

³⁷ Alibašić comparative analysis, plus Council of Europe Framework Convention.

Council of Europe's Framework Convention on AI (2024) establishes binding rights-based AI governance obligations, emphasizing democracy, human rights, and oversight mechanisms.³⁸ Participation in these platforms could offer Nigeria access to normative standards and peer-learning opportunities, provided it is willing to engage and adapt principles to local context.

African regional coordination is exemplified by the 2024 African Continental AI Strategy and Digital Compact endorsed by ECOWAS and African Ministers, which expressly calls for AI development aligned with peace, education, agriculture, health, and governance goals.³⁹ This continental framework emphasizes capacity building, research ecosystems, inclusive governance, and harmonized regulation an approach that resonates strongly with Nigeria's needs as a leading West African nation.⁴⁰ In synthesizing these models, Nigeria could adopt a hybrid AI governance framework that draws from global best practices while aligning with domestic priorities and institutional realities. This hybrid approach would combine risk-tiered, enforceable regulation, inclusive multi-stakeholder participation, and regional cooperation to ensure both innovation and responsible use of AI.⁴¹

5.1 Challenges to AI Integration in Environmental Governance

Nigeria's efforts to integrate Artificial Intelligence (AI) into environmental governance face significant challenges, chief among them being legal and regulatory gaps. Currently, Nigeria lacks comprehensive legislation that explicitly addresses AI's application within environmental contexts. Existing environmental laws do not contemplate AI-driven processes such as automated data collection or algorithm-based decision-making, creating ambiguity around enforcement mechanisms and accountability.⁴² This regulatory vacuum is compounded by limited availability and quality of environmental data, as AI technologies heavily depend on vast, accurate datasets.⁴³ Weak monitoring infrastructure and fragmented data management across different governmental agencies result in unreliable or incomplete information, undermining the effectiveness of AI application.⁴⁴ Furthermore, the country's technical infrastructure is inadequate unreliable internet connectivity, limited access to advanced computing resources, and insufficient digital tools particularly in rural and underserved areas further impede AI deployment.⁴⁵ These infrastructural deficits constrain the ability to fully harness AI for real-time environmental monitoring, predictive analytics, and responsive governance.

³⁸ Kulothungan & Gupta on U.S. minimal regulation vs EU precautions.

³⁹ French summit and Singapore attentions. FT article on ranking AI firms' environmental footprint and Summit coverage.

⁴⁰ Global Partnership on Artificial Intelligence overview.

⁴¹ African Continental Strategy and ECOWAS endorsement. Reddit/Africa summary

⁴² L, Okoye, & E, Ezeani., 'Environmental Law and Policy in Nigeria: The Need for Reform in the Digital Age. Nigerian Journal of Environmental Law, (2020). 5(2), 45–67.

⁴³ United Nations Environment Programme. (2019). AI and environmental governance: A global review of laws and regulations. UNEP. Nigerian Environmental Protection Act. (1999).

⁴⁴ T. Oluseyi., & A, Abimbola. Data challenges in environmental monitoring in Nigeria: A critical analysis. Journal of Environmental Monitoring, (2021). 13(4), 215–234. World Bank. (2022). Nigeria digital economy diagnostic: Data infrastructure and governance. World Bank Publications.https://wedocs.unep.org/bitstream/handle/20.500.11822/28757/AI_env_governance.pdf?sequence=1&isAllowed=y

⁴⁵ Oluseyi & Abimbola World Bank (2022) Nigeria Digital Economy Diagnostic: <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099855108192333609/Nigeria-Digital-Economy-Diagnostic>

Beyond infrastructural and regulatory constraints, Nigeria faces critical capacity deficits that hinder AI integration into environmental governance frameworks. There is a pronounced shortage of professionals skilled in the intersecting fields of AI technology, environmental science, and legal regulation, which limits the country's ability to design, implement, and oversee AI-driven solutions effectively.⁴⁶ This gap threatens the sustainability and scalability of AI initiatives without adequate human capital to manage them. In addition, ethical and social concerns pose significant hurdles to AI acceptance among the public and stakeholders. Issues such as data privacy breaches, risks of surveillance, algorithmic bias, and the digital divide exacerbate mistrust and resistance to AI-based interventions, especially in communities that are already marginalized or digitally excluded.⁴⁷ Financial constraints further complicate the landscape, as Nigeria's limited budget allocations and competing developmental priorities restrict investments in AI research, infrastructure, and comprehensive regulatory reforms necessary to advance AI-powered environmental governance.⁴⁸

To address these challenges, Nigeria must embark on comprehensive reforms that establish a robust legal and institutional framework for AI in environmental governance. This includes the enactment of dedicated legislation that clearly delineates the roles and responsibilities of AI developers, government regulators, and private sector actors, while integrating international best practices related to AI ethics, data privacy, transparency, and environmental protection.⁴⁹ Central to these reforms is the development of a centralized, interoperable environmental data governance system that facilitates seamless data sharing among government agencies, researchers, and civil society organizations, ensuring standardized quality, security, and accessibility.⁵⁰ In parallel, substantial investments are needed to upgrade digital infrastructure nationwide expanding broadband access, enhancing cloud computing capabilities, and ensuring reliable internet connectivity, especially in remote ecological zones.⁵¹ Building local expertise through targeted education and training programs that blend environmental sciences, AI technology, and legal studies is equally critical. Such multidisciplinary capacity building will empower professionals to navigate the complexities of AI regulation and deployment, fostering sustainable and adaptive governance systems.⁵²

Concrete policy recommendations to realize this vision include establishing a National AI-Environment Governance Taskforce to coordinate strategy, harmonize policies, and oversee pilot

⁴⁶ Nigerian Communications Commission Annual Report: No DOI; official site: <https://www.ncc.gov.ng/documents/1062-2022-annual-report/file> ITU (2022) Measuring Digital Development: <https://www.itu.int/en/ITU-D/Statistics/Pages/facts/default.aspx>.

⁴⁷ Adeoye UNESCO (2021) AI Skills Development in Africa: (2022): <https://unesdoc.unesco.org/ark:/48223/pf0000376565.locale=en>.

⁴⁸ Eze & Onwuegbuzie Mittelstadt (2019): <https://doi.org/10.1007/s00146-017-0737-x>

⁴⁹ IMF Nigeria Fiscal Policy (2022): No DOI; IMF Nigeria page: <https://www.imf.org/en/Countries/NGA> AfDB report (2023): No DOI; African Development Bank site: <https://www.afdb.org/en/countries/west-africa/nigeria>

⁵⁰ OECD AI Recommendation (2021): <https://doi.org/10.1787/6908f1f9-en> EU AI Act Proposal: <https://digital-strategy.ec.europa.eu/en/library/proposal-regulation-artificial-intelligence>.

⁵¹ WEF Data Governance (2021): <https://www.weforum.org/reports/data-governance-principles-for-ai/> ODI Environmental Data Platforms: <https://theodi.org/article/creating-interoperable-data-platforms/>.

⁵² World Bank Digital Infrastructure (2021): <https://openknowledge.worldbank.org/handle/10986/35703>

Nigerian Ministry of Communications National Broadband Plan: <https://www.commtech.gov.ng/national-broadband-plan/>.

AI projects demonstrating tangible benefits for environmental management.⁵³ Legislative action should focus on drafting and enacting a Nigerian Artificial Intelligence and Environmental Protection Act to regulate AI's application, ensure data privacy, impose ethical standards, and specify penalties for misuse.⁵⁴ Additionally, creating a National Environmental Data Repository will centralize and democratize access to environmental information collected via satellites, sensors, and field reports.⁵⁵ Strategic investment in rural digital infrastructure will enable AI-enabled monitoring tools to empower local communities and enhance environmental oversight in vulnerable areas.⁵⁶ Integrating AI literacy into educational curricula at all levels will prepare future generations for technology-driven governance challenges.⁵⁷ Encouraging public-private partnerships can stimulate innovation tailored to Nigeria's unique environmental contexts.⁵⁸ Periodic audits assessing AI's environmental and social impacts will ensure compliance with legal and ethical standards.⁵⁹ Moreover, developing clear ethical guidelines emphasizing transparency, fairness, and inclusivity will build public trust.⁶⁰ To sustain these initiatives, Nigeria should actively seek funding from international climate and technology funds such as the Green Climate Fund.⁶¹ Finally, fostering meaningful engagement with civil society and local communities will ensure AI governance systems are responsive, equitable, and grounded in the lived realities of Nigeria's diverse population.⁶²

Artificial Intelligence stands at the forefront of transformative technologies capable of addressing some of Nigeria's most urgent environmental governance challenges. However, the successful integration of AI requires more than technological innovation; it demands a holistic

⁵³ AU AI Skills Initiative (2020): <https://au.int/en/documents/20201019/african-digital-transformation-strategy-2020-2030>. Nigerian Universities Commission (2022): No direct DOI; check official site: <https://www.nuc.edu.ng/>.

⁵⁴ South Africa AI Governance Taskforce (2021): No DOI; government publication site: <https://www.environment.gov.za/> Nigerian Federal Ministry of Environment: <https://environment.gov.ng/>

⁵⁵ Singapore Model AI Governance Framework: https://www.pdpc.gov.sg/-/media/Files/PDPC/PDF-Files/Resource-for-Organisation/AI/SG_Model_AI_Gov_Framework_2.pdf.

⁵⁶ Canada AI Policy Guidelines: <https://www.canada.ca/en/government/system/digital-government/digital-government-innovations/artificial-intelligence.html> GEF Environmental Data Management (2022): <https://www.thegef.org/publications/best-practices-environmental-data-management> NASRDA Reports: <https://nasrda.gov.ng/>.

⁵⁷ ITU Closing Rural Digital Divide (2021): https://www.itu.int/en/ITU-D/Conferences/GSR/Documents/GSR2018/GSR18_Workshop_Report_Rural.pdf

Nigerian Rural Electrification Agency: <https://rea.gov.ng/>.

⁵⁸ UNESCO Integrating AI into Education (2023): <https://unesdoc.unesco.org/ark:/48223/pf0000380712.locale=en>

Nigerian Ministry of Education: No DOI; official website: <https://education.gov.ng/>

World Bank PPP Models for Technology (2022): <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/427961650996466987/innovative-public-private-partnership-models-for-technology-in-africa> Nigerian Tech Hubs Association: <https://techhubs.ng/>

⁵⁹ Global Reporting Initiative (2020): <https://www.globalreporting.org/how-to-use-the-gri-standards/gri-standards-english-language/> Nigerian Environmental Impact Assessment Guidelines: <https://environment.gov.ng/wp-content/uploads/2020/01/Environmental-Impact-Assessment-EIA-Guidelines.pdf>

⁶⁰ IEEE Ethically Aligned Design: <https://ethicsinaction.ieee.org/> Nigerian Data Protection Regulation (2019): <https://nitda.gov.ng/nigeria-data-protection-regulation/>.

⁶¹ Green Climate Fund: <https://www.greenclimate.fund/projects> Climate Investment Funds: <https://www.climateinvestmentfunds.org/>

⁶² Nigerian Civil Society Situation Room <https://situationroomng.org/> UNDP Participatory Governance: https://www.ng.undp.org/content/nigeria/en/home/operations/projects/democratic_governance.html.

approach that reforms legal frameworks, strengthens institutional capacities, and fosters ethical, inclusive governance. By proactively addressing the challenges and implementing forward-looking reforms, Nigeria can position itself as a regional leader in harnessing AI for sustainable environmental management.

The path forward is not without risks or complexities, but the benefits of enhanced environmental protection, better compliance with international environmental commitments, and improved livelihoods for Nigerian communities make the pursuit of AI-driven environmental governance an imperative. Thoughtful policies, robust regulations, and sustained stakeholder engagement will be crucial to ensuring that AI's promise translates into tangible, equitable environmental outcomes for Nigeria today and future generations.

6. Observations

A comparison of international approaches shows that Nigeria sits within a global field where states experiment with markedly different models of AI governance. The European Union's framework anchored in a mandatory, risk-classification system illustrates how environmental applications of AI can be regulated through compulsory safeguards such as transparency rules, traceability obligations, and independent oversight, all of which highlight the kind of structured accountability that Nigeria currently lacks but may ultimately require.⁶³ By contrast, the United States relies predominantly on sector-based norms and voluntary standards, a model that prioritizes innovation incentives but provides considerably weaker regulatory certainty. Asian practices diversify the landscape further: Singapore's supervised sandboxing offers a method for testing environmental AI tools within controlled boundaries, whereas France's emphasis on ecological disclosure shows how public reporting duties can pressure private actors to confront their environmental impacts.⁶⁴ Multilateral initiatives introduce yet another governance layer. The Global Partnership on Artificial Intelligence supported by the Organization for Economic Co-operation and Development facilitates coordinated learning among states on responsible, sustainability-oriented AI use,⁶⁵ while the Council of Europe's 2024 Framework Convention on AI sets down binding commitments rooted in human rights and democratic oversight that could serve as normative anchors for Nigeria.⁶⁶ At the regional level, the African Continental AI Strategy and related ECOWAS declarations lay out a continent-wide plan centered on capacity building, harmonized regulation, and AI deployment consistent with development and environmental priorities, offering a framework that aligns closely with Nigeria's strategic needs.⁶⁷ Nevertheless, Nigeria's domestic context is burdened by fragmented legislation, unreliable environmental datasets, infrastructural weaknesses, and limited technical and regulatory capacity. Ethical anxieties regarding surveillance, digital exclusion, and data misuse further complicate implementation. These overlapping constraints reveal a governance

⁶³ Regulation (EU) 2024/... Artificial Intelligence Act.

⁶⁴ Infocomm Media Development Authority (Singapore), *Model AI Governance Framework* (3rd edn 2024); Loi no 2021-1104 du 22 août 2021 (France).

⁶⁵ Global Partnership on Artificial Intelligence (GPAI), hosted by the Organisation for Economic Co-operation and Development.

⁶⁶ Council of Europe, *Framework Convention on Artificial Intelligence, Human Rights, Democracy and the Rule of Law* (2024).

⁶⁷ African Union, *African Continental Strategy for Artificial Intelligence* (2024).

environment in which the potential of AI for environmental protection is substantial, yet unrealized, due to persistent structural and institutional deficiencies.

7. Recommendations

Nigeria should take forward a blended governance model that draws upon foreign experience but is firmly anchored in its own developmental and environmental priorities. This requires, first, a legislative overhaul through a dedicated AI and Environmental Regulation Act that establishes binding obligations on AI system developers and users, mandates algorithmic and environmental impact assessments, and clarifies liability, transparency, and data-protection duties tailored to ecological contexts. A National Taskforce on AI for Environmental Governance should be constituted to coordinate regulatory design, supervise inter-agency collaboration, and engage with regional and international bodies whose technical expertise Nigeria can leverage. Parallel to these reforms, national environmental governance would benefit significantly from a centralized, interoperable data architecture that standardizes collection, quality control, and access across government institutions and research entities. Investments in digital infrastructure including broadband expansion, cloud-computing support for public institutions, and sensor technologies in ecologically fragile areas are equally essential for functioning AI systems. Human-capital development should be prioritized through multidisciplinary training that integrates environmental science, machine learning, data governance, and legal skills. Ethical guidance must be codified to ensure transparency, fairness, inclusivity, and community-centered decision-making, thereby mitigating public mistrust and safeguarding vulnerable populations. Public-private partnerships can spur innovation tailored to Nigeria's environmental demands, while external financing particularly from climate and technology funds can sustain long-term reforms. Through this multi-layered approach, Nigeria can construct a governance ecosystem capable of deploying AI responsibly and effectively in service of environmental sustainability.

8. Conclusion

The integration of Artificial Intelligence (AI) into environmental governance in Nigeria presents both unprecedented opportunities and significant challenges. As Nigeria grapples with pressing environmental issues ranging from deforestation and pollution to climate change and biodiversity loss the adoption of AI technologies offers a promising avenue to enhance regulatory frameworks, enforcement mechanisms, and sustainable development objectives. However, realizing the full potential of AI in environmental governance requires a deliberate and multifaceted approach that addresses legal, institutional, technological, and socio-economic dimensions.

Environmental governance in Nigeria has historically been impeded by regulatory fragmentation, weak enforcement, corruption, and inadequate data management. AI, with its capabilities in data analytics, real-time monitoring, predictive modelling, and decision support, can revolutionize how environmental laws are implemented and enforced. For example, AI-powered remote sensing can track illegal logging or pollution spills, while machine learning algorithms can predict environmental hazards and inform proactive policies. These technologies can improve transparency, accountability, and efficiency in managing natural resources.

Nonetheless, the deployment of AI in Nigeria's environmental governance is constrained by several challenges. Nigeria currently faces infrastructural deficits, limited digital literacy, and a

lack of robust data ecosystems, which undermine AI applications. Moreover, existing legal frameworks are out-dated or insufficient to regulate AI technologies, raising concerns about privacy, data protection, ethical use, and liability. Without a clear regulatory foundation, AI tools may be misused, leading to unintended environmental harm or social injustices. Furthermore, socio-political factors such as public mistrust, resistance to technological change, and potential job displacements due to automation add layers of complexity.

The interplay between AI and environmental governance also raises profound questions about equity and inclusivity. Nigeria's diverse population, including vulnerable rural communities heavily dependent on natural resources, must be integrated into AI-driven governance models. Failure to do so risks exacerbating existing inequalities and undermining community participation in environmental decision-making.