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ARTIFICIAL INTELLIGENCE, ENVIRONMENTAL RESPONSIBILITY AND SUSTAINABLE DEVELOPMENT IN NIGERIA: REIMAGINING HUMAN STEWARDSHIP

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Abstract

Artificial intelligence has considerable potential to support environmental monitoring, climate modelling, agricultural planning, disaster prediction and natural resource management. However, the increasing deployment of AI also generates environmental concerns through energy consumption, electronic waste, resource extraction and the expansion of digital infrastructure. This paper examines the relationship between artificial intelligence, environmental responsibility and sustainable development in Nigeria. Using qualitative documentary and conceptual analysis, the study evaluates recent literature on AI, environmental sustainability and climate resilience alongside Islamic and Christian perspectives on human responsibility toward creation. The Quranic concept of human trusteeship is examined through Quran 2:30 and 6:141, while Quran 30:41 is considered in relation to human actions and environmental degradation. Biblical perspectives draw on Genesis 2:15, which associates human vocation with cultivating and keeping the earth, and Leviticus 25:1 to 7, which provides a conceptual basis for responsible use and periodic rest of land. The paper argues that AI should not be considered environmentally sustainable merely because it provides technological solutions to environmental problems, and that its sustainability must also be assessed in terms of energy use, resource consumption, infrastructure and long-term ecological consequences. It proposes an integrated framework of technological efficiency, ecological responsibility, intergenerational justice and ethical stewardship, and argues that Nigeria can benefit from AI-enabled environmental innovation while establishing stronger environmental standards for digital infrastructure and technology deployment.

Keywords: Artificial intelligence; environmental sustainability; climate resilience; environmental ethics; stewardship; Nigeria

1. Introduction

Nigeria faces mounting environmental pressures that intersect directly with its development prospects, including recurrent flooding, desertification in the north, coastal erosion, and increasingly unpredictable rainfall patterns affecting a population that remains heavily dependent on rain-fed agriculture. During the 2024 flood season, more than 320 people were reported dead, and approximately 1.3 million people were affected across 34 states, highlighting the scale of the country's vulnerability to flood-related disasters (United Nations Office for the Coordination of Humanitarian Affairs [OCHA], 2024). The severity of these recurring events has strengthened calls

for a more proactive approach to flood risk management, including the development of a National Flood Insurance Programme designed to provide financial protection and strengthen resilience among vulnerable households, communities, and businesses (Federal Republic of Nigeria, 2024). Against this backdrop, artificial intelligence has emerged as a technology of considerable interest to environmental policymakers and researchers, promising improved flood prediction, more precise agricultural planning, and more effective natural resource management.

Nigerian research has already begun to demonstrate this potential. A study applying explainable AI techniques, including Random Forest, XGBoost and Support Vector Machine models, to flood risk prediction in Bauchi found that these methods could accurately identify high-risk areas based on historical flooding patterns, offering a tool for more targeted urban planning and disaster preparedness. Complementary research using machine learning and geospatial analysis of flood patterns in downstream Nigeria between 2018 and 2024 similarly demonstrated the capacity of AI methods to identify environmental drivers of flood risk with greater precision than conventional approaches. In agriculture, research on the use of AI, including drone and sensor-based monitoring, to address the effects of climate change on smallholder farmer revenue in Delta State found that AI could provide meaningful adaptive support, while cautioning that broader structural measures, including flood control infrastructure and climate-smart agricultural practice, remain essential complements to any technological intervention (Kanu et al. 2025a; Anthony & Michael, 2026).

Yet this same technology carries a high and frequently underappreciated environmental cost of its own. Research on the environmental footprint of AI infrastructure has documented that training large AI models can generate substantial carbon emissions, with early estimates demonstrating significant energy use and associated carbon costs in the development of modern deep-learning systems (Strubell et al., 2019). More recent analysis in *Nature Sustainability* projects that AI server deployment in the United States could generate between 24 and 44 million tonnes of additional annual carbon dioxide-equivalent emissions and between 731 and 1,125 million cubic metres of annual water footprint by 2030, depending on the scale of expansion, server efficiency, grid decarbonisation, and the geographical distribution of AI infrastructure (Xiao et al., 2025). These findings demonstrate that the environmental sustainability of AI cannot be assessed solely according to the benefits generated by its applications. It must also account for the energy, water, and carbon costs associated with the infrastructure required to operate increasingly computationally intensive AI systems.

This paper argues that a responsible approach to AI and environmental sustainability in Nigeria must hold both sides of this picture together, recognising the genuine potential of AI to support climate resilience and environmental management while refusing to treat AI as environmentally sustainable simply because it addresses environmental problems, given that its own infrastructure carries substantial and growing ecological costs. To develop this integrated view, the paper draws on Islamic and Christian environmental ethics, both of which articulate longstanding theological accounts of human responsibility toward creation that predate and can inform contemporary environmental policy debates.

The specific objectives of this paper are to review recent literature on AI applications in environmental management and on the environmental costs of AI infrastructure, to examine Islamic and Christian perspectives on human responsibility toward creation, to synthesise these materials into an integrated framework for environmentally responsible AI, and to draw out policy implications for Nigeria. The paper is guided by the following questions. What does recent scholarship reveal about the environmental benefits and costs of AI. What resources do Islamic and Christian environmental ethics offer for evaluating the sustainability of AI infrastructure and applications? How can these resources be combined into a framework applicable to Nigerian environmental and technology policy?

The paper proceeds as follows. Section two reviews the literature on AI applications in environmental management, the environmental costs of AI infrastructure, and Islamic and Christian environmental ethics. Section three describes the qualitative documentary methodology. Section four presents the results, analysing each theme in turn before synthesising an integrated framework. Section five discusses policy implications for Nigeria. Section six concludes with recommendations.

2. Conceptual and Literature Framework

2.1 AI applications in environmental monitoring and climate resilience

AI methods, particularly machine learning models capable of identifying patterns in large geospatial and meteorological datasets, have demonstrated significant value for environmental monitoring and climate resilience applications relevant to Nigeria. Beyond the flood prediction studies discussed above, broader research on AI and sustainable development in Africa documents applications spanning climate modelling, agricultural planning, disaster prediction and natural resource management, while also noting persistent challenges including poor infrastructure, data scarcity and gaps in relevant skills that limit the realisation of this potential across the continent (Mienye et al., 2024; Pilani et al., 2026; A comprehensive review of AI and sustainable development in Africa similarly identifies infrastructural and data-access constraints that could hinder the effective and equitable deployment of AI technologies, alongside the need for context-sensitive strategies and stronger governance to ensure that AI contributes meaningfully to sustainable development (Mienye et al., 2024).

2.2 The environmental costs of AI infrastructure

A growing body of research documents the environmental footprint of the computing infrastructure that underlies contemporary AI. Foundational work by Strubell and colleagues showed that training large neural network models can require substantial computational resources, electricity, and associated carbon emissions, helping to establish the environmental costs of modern AI as an important research concern (Strubell et al., 2019). More recent facility-level analysis of United States hyperscale data centres, many of which are being expanded in response to AI workloads, estimated that these facilities consumed between 68 and 99 terawatt-hours of electricity and were associated with between 37 and 54 million metric tonnes of carbon dioxide emissions, with approximately 54% of attributed electricity generation supplied by fossil fuels (Guidi et al., 2026). Beyond carbon emissions, research has also identified significant water requirements associated with AI computing and data-centre cooling, while recent analysis of generative AI has highlighted the growing electronic-waste burden associated with the rapid expansion and replacement of AI hardware (Li et al., 2025; Wang et al., 2024). These findings indicate that the environmental cost of AI extends beyond electricity consumption to include water use and the material lifecycle of the hardware on which AI systems depend.

2.3 Islamic perspectives on environmental responsibility

Quran 2:30, already discussed in relation to human trusteeship in the companion paper on AI and human dignity, establishes the foundational concept of *khalifah*, human trusteeship over the earth, a concept extensively developed in Islamic environmental ethics scholarship as the theological basis for human responsibility toward the natural world (Kanu et al., 2026a). A growing body of research documents the environmental implications of Islamic principles of stewardship and responsible resource use. Recent scholarship on Islamic environmental ethics identifies *khilafah* as a foundational concept of human stewardship, linking it to the responsibility to preserve ecological balance and protect natural resources (Bakar et al., 2025). A recent contribution on green accounting and university social responsibility similarly connects the *khilafah* concept to contemporary sustainability practice, arguing that aligning technological advancement with faith-based responsibilities promotes a value-driven approach to sustainability in institutional contexts, including universities (Ismail et al., 2025). Qur'an 6:141 instructs believers to eat of the produce of cultivated land but not to waste, explicitly linking economic and agricultural activity to a principle of moderation and prohibition of

wastefulness, described in Islamic ethical vocabulary as *israf*. Qur'an 30:41 states that corruption has appeared on land and sea because of what human hands have earned. This provides an important theological basis for understanding environmental degradation as connected to human actions and responsibilities.

2.4 Christian perspectives on environmental responsibility

Genesis 2:15 states that the first human was placed in the garden to work it and to keep it, using the Hebrew verbs *'ābad* and *šāmar*, with the latter carrying the sense of guarding, keeping, or preserving. Contemporary ecological readings therefore understand the verse as expressing a responsibility of care rather than unrestricted occupation or use (Waas, 2026). This interpretation supports the view that ecological guardianship is integral to human vocation rather than a secondary ethical concern. Leviticus 25:1–7 introduces the sabbatical year, requiring agricultural land to rest every seventh year. Contemporary biblical ecological scholarship interprets this provision as placing limits on human exploitation of land and establishing a rhythm of restraint, renewal, and responsible resource use (Dike, 2026). The sabbatical principle therefore offers a conceptual basis for relating biblical land ethics to contemporary concerns about sustainable resource management, ecological regeneration, and respect for environmental limits.

2.5 Complementarity between Islamic and Christian environmental ethics

The Islamic and Christian material reviewed above, though rooted in distinct theological traditions, converges on several points relevant to AI and environmental policy. Both traditions understand human authority over the natural world as delegated and accountable rather than absolute, both explicitly link human action to environmental outcomes rather than treating ecological change as a purely natural or amoral process, and both articulate limits on resource use, whether expressed through the prohibition of waste in Quran 6:141 or the sabbatical rest of land in Leviticus 25:1 to 7. This convergence is significant for a Nigerian audience because it suggests that an environmental ethic for AI grounded in these two traditions is not a sectarian imposition but a shared moral inheritance capable of informing environmental policy across Nigeria's religiously diverse population, complementing rather than replacing the technical sustainability standards already emerging in international AI governance discourse.

3. Methodology

This study adopts a qualitative conceptual research design based on documentary analysis, combining review of technical and policy literature on AI and environmental sustainability with close reading of the selected Quranic and biblical texts. The methodology proceeds in three stages. The first stage involved review of recent scholarship, largely published between 2023 and 2026, on AI applications in environmental management, the environmental and infrastructural costs of AI, and climate resilience research specific to Nigeria, drawing on sources including Nature Sustainability, Frontiers in Sustainability, and Nigerian focused studies on flood prediction and climate adaptation. The second stage involved close reading of Quran 2:30, 6:141 and 30:41 and Genesis 2:15 and Leviticus 25:1 to 7, informed by established Islamic and Christian environmental ethics scholarship, in order to situate these texts within their interpretive traditions rather than reading them as isolated proof texts. The third stage involved thematic synthesis of recurring concepts, namely technological efficiency, ecological responsibility, intergenerational justice and ethical stewardship, drawn from both the technical literature and the religious material, into an integrated framework. The principal limitation of this approach is its reliance on interpretive judgement in selecting and connecting sources, mitigated by drawing on multiple independent and recent sources for each major claim.

4. Results and Discussion

4.1 The environmental paradox of AI

The literature reviewed above establishes what this paper terms the environmental paradox of AI, namely that the same technology increasingly relied upon to model, predict and mitigate

environmental problems is itself a significant and growing contributor to energy consumption, water use, carbon emissions and electronic waste. This paradox is not adequately addressed by treating AI's environmental applications and its environmental costs as separate domains to be assessed independently (Pilani, 2025). A genuinely sustainable evaluation of AI requires a net accounting that weighs the environmental benefits of a given AI application, such as improved flood prediction or more precise agricultural input use, against the environmental costs of the computing infrastructure required to develop and run that application, including costs incurred far from the site of deployment where the underlying models were originally trained.

4.2 Moderation and the prohibition of waste in Quran 6:141

Quran 6:141's prohibition of waste, understood in Islamic ethics as the principle of *israf*, offers a directly relevant standard for evaluating AI infrastructure decisions. Applied to AI development, this principle would caution against the pursuit of ever larger AI models without regard to the proportional environmental cost of the additional computing resources required, particularly where more modest, efficient models could deliver comparable practical benefit for applications such as flood prediction or agricultural planning in the Nigerian context. This is consistent with a growing strand of technical AI research, evident in recent work on hype, sustainability and the price of the bigger is better paradigm in AI, which argues that the pursuit of ever larger models is not always justified by proportional gains in practical performance, particularly for applied tasks rather than general purpose language generation.

4.3 Human responsibility for environmental degradation in Quran 30:41

Quran 30:41's attribution of environmental corruption to human action carries a specific implication for AI governance, namely that the environmental consequences of AI infrastructure, including emissions from data centres and electronic waste from hardware disposal, cannot be treated as an unavoidable side effect of technological progress but must be understood as a consequence of human choices for which accountability can and should be assigned. This reframes questions about the environmental footprint of AI, including questions about where AI data centres are located, what energy sources power them, and how AI hardware is disposed of at end of life, as matters of direct moral and religious significance rather than as externalities properly left to market forces alone.

4.4 Guardianship and Genesis 2:15

Genesis 2:15's vocation of working and keeping the earth translates directly into a standard for evaluating AI infrastructure decisions from a Christian ethical perspective, requiring that those who develop and deploy AI systems, including technology firms and government agencies in Nigeria considering AI enabled environmental monitoring systems, actively guard against environmental harm rather than passively accepting environmental cost as the unavoidable price of technological benefit (Kanu & Pilani, 2024). This guardianship standard supports calls in the technical literature, discussed above, for AI developers to adopt carbon aware data centre design, renewable energy sourcing, and water efficient cooling technologies as standard rather than optional practice.

4.5 Sustainable limits and Leviticus 25:1 to 7

The sabbatical year principle in Leviticus 25:1 to 7, requiring periodic rest for cultivated land, offers a conceptual analogy relevant to AI infrastructure planning, namely that continuous, unrestrained expansion of computing capacity without corresponding limits or restoration periods for the natural systems that support it, including water sources used for data centre cooling and energy grids supplying data centre electricity, is inconsistent with a sustainable relationship between technological activity and its ecological foundation. While a literal sabbatical year is not directly applicable to digital infrastructure, the underlying principle that resource use must be bounded and periodically restrained rather than treated as limitless supports policy measures such as capacity planning that accounts for regional water and energy constraints before approving new data centre development.

4.6 Towards an integrated framework

Synthesising these results, the paper proposes a framework for environmentally responsible AI built on four elements, namely technological efficiency, ecological responsibility, intergenerational justice and ethical stewardship. Technological efficiency, informed by Quran 6:141's prohibition of waste and by recent technical scholarship questioning the bigger-is-better paradigm in AI, requires that AI systems be designed and selected for proportional environmental cost relative to practical benefit, rather than pursuing maximal scale for its own sake. Ecological responsibility, informed by Quran 30:41's attribution of environmental harm to human action and by Genesis 2:15's guardianship vocation, requires that AI developers and deploying institutions take direct responsibility for the environmental footprint of their systems rather than treating it as an unavoidable externality. Intergenerational justice, informed by the sabbatical year principle in Leviticus 25:1 to 7, requires that current AI infrastructure decisions account for the interests of future generations who will inherit both the environmental consequences and the technological benefits of today's choices. Ethical stewardship, informed by the khilafah concept in Quran 2:30, requires an overarching orientation of accountable care for the environment as a trust rather than a resource to be exploited without limit, applicable to all of the more specific commitments above.

4.7 Comparing the framework with technical sustainability metrics

It is useful to compare this framework directly with the technical sustainability metrics already emerging in the AI research community, such as carbon intensity per model training run and water usage effectiveness for data centres, since Nigerian policymakers will need to work with both ethical and technical vocabularies together. The efficiency and responsibility elements of the proposed framework correspond closely to these technical metrics, providing a normative rationale for adopting them as mandatory rather than voluntary reporting requirements for AI infrastructure operating in Nigeria. The intergenerational justice and stewardship elements extend beyond what current technical metrics typically capture, since metrics focused on a single facility's current emissions do not by themselves address longer-term or cumulative environmental effects, nor do they address the equity question of which populations bear the environmental costs of AI infrastructure located in or near their communities.

4.8 Human Biological Implications of AI-Related Environmental Stress

The environmental consequences of AI infrastructure also have implications for human biological well-being, providing an additional reason for treating environmental responsibility as a human-centred concern. Data centres and other computing facilities generate substantial heat and require continuous cooling, while the electricity demands associated with AI can contribute indirectly to air pollution and other environmental pressures where electricity generation remains dependent on fossil fuels. These environmental changes can affect human physiological systems through pathways involving thermal stress, air quality, water availability, and exposure to environmental pollutants. From an anatomical and physiological perspective, prolonged exposure to excessive heat can place additional demands on the cardiovascular and thermoregulatory systems, while deteriorating air quality can adversely affect the respiratory system. The environmental burden of AI should therefore be assessed not only in terms of carbon emissions and resource consumption but also in relation to the conditions necessary for maintaining human health and functional well-being (Watts et al., 2021; Romanello et al., 2023).

This perspective strengthens the human-centred dimension of the proposed framework. Environmental sustainability is ultimately connected to the preservation of the biological conditions that allow individuals and communities to live healthy and productive lives. Water consumption by data centres is particularly relevant in regions where communities already experience water insecurity, while heat generation and energy-related pollution may compound existing environmental health vulnerabilities. AI infrastructure should consequently be evaluated through a broader principle of ecological responsibility that recognises the interdependence of technological systems, ecosystems

and the human body. Such an approach does not reduce environmental ethics to human utility, but it demonstrates that environmental degradation can eventually become embodied as physiological stress and disease risk. The anatomical perspective therefore complements the ethical and technical dimensions of the framework by making explicit the biological consequences that may arise when environmental costs are transferred from technological systems to human communities (IPCC, 2022; WHO, 2023).

4.9 Practical indicators for implementation

Translating the four framework elements into practice requires indicators capable of guiding regulatory and institutional review. For technological efficiency, a practical indicator is whether an AI system deployed for a given environmental or agricultural task has been benchmarked against smaller or less computationally intensive alternatives to confirm that its additional environmental cost is justified by a proportional gain in practical benefit. Such benchmarking is consistent with emerging approaches to measuring the environmental footprint of AI, which emphasise computational efficiency, resource consumption, and the need to assess both direct and indirect environmental impacts (OECD, 2022). For ecological responsibility, a practical indicator is whether any data centre or significant computing facility supporting Nigerian AI development discloses its energy source mix and water consumption, and whether it has a documented plan to increase its share of renewable energy over time. This is increasingly important as data centres become significant consumers of electricity and, depending on their design and location, can also place pressure on water resources (International Energy Agency [IEA], 2025). For intergenerational justice, a practical indicator is whether infrastructure planning processes for AI facilities include an assessment of cumulative, long-term environmental effects on the surrounding region, rather than only immediate, facility-level impacts. For ethical stewardship, a practical indicator is whether an identifiable institutional body, whether a government agency, university research ethics committee, or industry association, has been assigned explicit responsibility for monitoring the environmental conduct of AI infrastructure operators in Nigeria. Such institutional responsibility is consistent with broader calls for governments and other stakeholders to develop transparent methods for assessing the environmental effects of AI throughout its life cycle (United Nations Environment Programme [UNEP], 2024). These indicators are intended as a starting point for future regulatory and research development rather than as a finished audit instrument.

5. Policy Implications for Nigeria

Nigeria's engagement with AI-enabled environmental applications, including the flood prediction and climate-adaptive agriculture research discussed above, should proceed alongside, rather than instead of, environmental standards governing domestic AI infrastructure development. This includes data centres and other computing facilities that may be established to support Nigeria's growing AI research and commercial ecosystem. This approach is consistent with Nigeria's National AI Strategy, which recognises both the potential of AI to contribute to sustainable development and the need to address the energy and resource demands associated with AI systems (National Information Technology Development Agency [NITDA], 2024). It also reflects the broader recognition that AI development is increasingly connected to substantial electricity demand, particularly through data centres (International Energy Agency [IEA], 2025).

Given Nigeria's continuing electricity supply challenges, any large-scale data centre development should therefore be assessed for its implications for national grid capacity, local energy availability, and the country's renewable energy transition. This assessment is particularly important because data centres can create concentrated electricity demand and may place additional pressure on already constrained power systems. The IEA projects substantial growth in global data-centre electricity consumption and notes the increasing importance of renewable energy in meeting this demand (IEA, 2025). In the Nigerian context, such considerations are consistent with the National Energy Compact, which includes increased renewable energy deployment, improved energy efficiency, and sustainable

power-sector development among its objectives (IEA, 2025a). They also support the ecological responsibility element of the proposed framework by requiring AI infrastructure investment to be considered within the wider environmental and energy system rather than as an isolated technological project.

In agriculture, the framework supports continued investment in AI-enabled climate adaptation tools of the kind demonstrated in the Delta State smallholder farmer research discussed above. Such investment is justified where AI can improve farmers' capacity to respond to changing rainfall patterns, temperature variability, crop stress, and other climate-related risks. However, these tools should be evaluated for genuine net environmental and social benefit rather than adopted merely because they are technologically novel. This principle is consistent with Nigeria's National AI Strategy, which explicitly identifies sustainable development and environmental well-being as areas in which AI should generate practical value (NITDA, 2024). It also accords with the wider policy recognition that AI can support climate adaptation, agricultural productivity, and more efficient management of environmental resources when its deployment is appropriately governed (United Nations Environment Programme [UNEP], 2024).

In flood management, the framework supports continued development of AI-based flood prediction systems, such as those demonstrated in Bauchi, integrated into Nigeria's existing community-based flood forecasting and early-warning initiatives. Such integration is important because the value of AI-based prediction depends not only on the accuracy of the underlying model but also on whether warnings reach vulnerable communities in a timely and usable form. Nigeria's climate-related policy needs already identify floods and the strengthening of early-warning and preparedness systems as significant areas requiring attention (United Nations Framework Convention on Climate Change [UNFCCC], 2024). AI systems should therefore complement existing community and institutional mechanisms rather than operate as technologically isolated interventions. At the same time, the computing infrastructure supporting these systems should itself be developed according to the efficiency and responsibility standards proposed here (Kanu et al., 2025b).

In energy policy, the framework suggests that Nigeria's approach to attracting AI-related investment, including data-centre development, should include environmental conditions consistent with the country's own climate commitments. Nigeria's long-term low-emission development strategy and its updated climate commitments establish a broader policy direction towards emissions reduction and eventual net-zero development (Federal Republic of Nigeria, 2024; IEA, 2025b). Environmental standards should therefore not be treated as an obstacle to be minimised to attract investment. Rather, they can form part of the conditions for responsible investment by requiring appropriate energy sourcing, efficiency measures, environmental assessment, and transparent reporting. This approach would allow Nigeria to pursue the economic and technological benefits of AI while ensuring that the infrastructure required for its expansion does not undermine the country's longer-term environmental and energy objectives.

5.1 Renewable energy synergies

Nigeria's ongoing efforts to expand renewable energy access, including the deployment of solar mini-grids in underserved and off-grid regions, present a potential synergy with the ecological responsibility element of the proposed framework. Recent programmes have significantly expanded Nigeria's distributed renewable-energy infrastructure, while the Distributed Access through Renewable Energy Scale-up (DARES) programme is designed to extend clean electricity access to more than 17.5 million Nigerians through solar mini-grids and standalone solar systems (World Bank, 2023). Nigeria's Energy Transition Plan likewise envisages a substantial expansion of renewable generation and decentralised energy systems as part of the country's longer-term transition towards a lower-emission electricity system (Federal Republic of Nigeria, 2022). These developments create an

opportunity to consider AI infrastructure not simply as an additional consumer of electricity but as part of a broader strategy for developing new renewable-energy capacity.

Accordingly, AI computing facilities located in Nigeria could, where technically and economically feasible, be developed in association with dedicated renewable-generation capacity rather than relying exclusively on an already constrained national grid. Such arrangements could include solar generation, battery storage, and other distributed energy resources capable of providing a more predictable and cleaner electricity supply for computing operations. This approach would be particularly relevant for data centres located outside major urban centres, where co-location with renewable generation could potentially reduce pressure on existing grid infrastructure while supporting investment in underserved regions. Nigeria's experience with solar hybrid mini-grids demonstrates that decentralised renewable systems can already be deployed to provide electricity to communities and productive users that are inadequately served by conventional grid infrastructure (World Bank, 2025).

Such co-location could also reinforce the technological efficiency principle by creating a clearer incentive for data-centre operators to manage computing demand, storage capacity, cooling systems, and other energy-intensive operations efficiently. However, renewable-energy availability should not be treated as a justification for unlimited computing growth. The ecological responsibility principle requires operators to demonstrate that the energy consumed by AI systems is proportionate to the social, economic, or environmental benefits generated. Renewable-powered AI infrastructure should therefore be accompanied by measurable standards for energy efficiency, resource consumption, and environmental performance. In this sense, the proposed framework would encourage Nigeria to move beyond simply asking whether AI infrastructure has access to electricity and instead ask whether the infrastructure is being developed in a manner consistent with the country's wider renewable-energy transition and long-term environmental responsibilities.

5.2 Regional equity in infrastructure siting

Decisions about where AI computing infrastructure is sited within Nigeria carry equity implications relevant to the intergenerational justice element of the proposed framework, since communities hosting data centres may bear disproportionate local environmental costs, including water use and land use change, while the economic and informational benefits of the resulting AI systems may accrue primarily to distant urban or international users. Environmental impact assessment processes for AI infrastructure should therefore explicitly evaluate the distribution of costs and benefits between hosting communities and broader beneficiary populations, consistent with the stewardship principle that treats environmental resources as a trust held on behalf of a wider community rather than a resource available for exploitation by whichever party proposes a development project (Pilani, 2024).

6. Conclusion and Recommendations

This paper has argued that a responsible approach to AI and environmental sustainability in Nigeria must recognise both the genuine potential of AI to support climate resilience and environmental management and the substantial environmental costs associated with AI infrastructure itself. Drawing on Quran 2:30, 6:141 and 30:41 and on Genesis 2:15 and Leviticus 25:1 to 7, the paper proposed an integrated framework built on technological efficiency, ecological responsibility, intergenerational justice and ethical stewardship, and traced its policy implications for Nigeria across data infrastructure, agriculture, flood management and energy policy.

The paper recommends that Nigerian regulators developing data centre and digital infrastructure policy require environmental impact assessment, including energy and water use projections, as a condition of approval for large-scale AI computing facilities. It recommends that AI applications developed for Nigerian environmental management, including flood prediction and climate-adaptive agriculture tools, be evaluated using a net environmental benefit standard that accounts for the

computing infrastructure required to develop and operate them, not solely their intended environmental function. It recommends that Nigerian universities incorporate environmental ethics, including relevant Islamic and Christian material, into AI and computer science curricula to ensure that the next generation of Nigerian AI developers approach infrastructure decisions with explicit ecological accountability. Finally, it recommends further empirical research to quantify the environmental footprint of AI infrastructure specific to the Nigerian and West African context, given that most existing quantitative research on AI's environmental costs has focused on data centres in the United States and other high-income economies.

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