



Regulating carbon emissions technologies in Nigeria: A critical examination of intellectual property rights and access to clean energy

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Abstract

This paper critically examines the relationship between intellectual property rights (IPRs) and access to carbon emission technologies in Nigeria, focusing on how legal and institutional frameworks influence the nation's transition to clean energy. It explores the challenges posed by the exclusive nature of IPRs in facilitating technology transfer and innovation within Nigeria's climate policy context. The paper highlights key policy instruments such as the Nationally Determined Contributions (NDCs) and the Energy Transition Plan (ETP) and evaluates their effectiveness in promoting renewable energy adoption. Findings reveal that weak enforcement mechanisms, inadequate institutional coordination, and limited access to patented clean technologies hinder progress. The study recommends stronger policy integration, use of TRIPS flexibilities, and enhanced public-private partnerships to ensure equitable access to green innovations and accelerate Nigeria's sustainable energy transformation.

Keywords: Carbon Emission Technologies, intellectual property rights (ipr), climate change, Environmental Regulation

Introduction

Climate change remains one of the most pressing global challenges, driven largely by rising carbon emissions from industrial and energy sectors. The transition to clean and sustainable energy sources has become a global imperative, particularly for developing country like Nigeria, which depend heavily on fossil fuels for economic growth. Nigeria ranks among Africa's top emitters of greenhouse gases, primarily due to oil exploration, gas flaring, and inefficient energy production. To address these challenges, Nigeria has committed to international environmental frameworks such as the Paris Agreement and has articulated its Nationally Determined Contribution (NDC), pledging to reduce carbon emissions by 47% by 2030 through investments in renewable energy technologies.

The Nigerian government has made great strides in putting measures in place to lessen the effects of and prepare for climate change. The National Climate Change Policy and Response Strategy (NCCPRS), which describes methods for cutting emissions, advancing renewable energy, improving climate resilience, and incorporating climate change into development planning, is one of these initiatives. In order to coordinate efforts related to climate change, the government formed the Federal Ministry of Environment. It also established specialized organizations like the Nigerian Climate Change Commission and the National Environmental Standards and Regulations Enforcement Agency.

The National Climate Change Policy and Response Strategy (NCCPRS), which offers a thorough framework for climate change action, is one of the most important policy tools. The NCCPRS describes methods for mainstreaming climate change into development planning, boosting renewable energy, cutting greenhouse gas emissions, and improving climate resilience. The government has appointed the Federal Ministry of Environment as the primary organization in responsibility of coordinating climate change-related initiatives to ensure the effective

implementation of policy. In addition, a number of specialized departments and agencies have been established to supervise particular facets of climate change, including the National Environmental Standards and Regulations Enforcement Agency and the Nigerian Climate Change Commission.

This paper is divided into six parts. The first part is the introduction. The second part discusses the concept of carbon emission technologies and their role in mitigating climate change. The third part examines environmental and climate change regulation in Nigeria. The fourth part explores the intellectual property rights framework and its impact on access to clean energy technologies. The fifth part analyzes the tensions between private rights and public environmental goals. The seventh and final part presents the conclusion and recommendations.

Carbon Emission Technologies

Carbon emission technologies is a range of scientific innovations, systems, and processes designed to either reduce, capture, or eliminate the release of carbon dioxide (CO₂) and other greenhouse gases (GHGs) into the atmosphere. According to IEA technologies are central to global efforts aimed at mitigating climate change and achieving net-zero emissions targets. Furthermore, carbon emission technologies encompass carbon capture, utilization and storage (CCUS), renewable energy systems such as solar, wind, hydro, and bioenergy, as well as energy efficiency innovations that minimize carbon intensity in production and consumption (Intergovernmental Panel on Climate Change).

Carbon capture and storage (CCS) technologies involve capturing CO₂ emissions from industrial processes and power generation before they are released into the atmosphere and storing them underground in geological formations. Zhang et al review that renewable energy technologies reduce dependence on fossil fuels by generating energy from natural and replenishable sources. In

addition, low-carbon technologies such as electric vehicles, hydrogen fuel systems, and smart grids play a vital role in decarbonizing transport and industrial sectors.

Climate Change and Carbon Emission Reduction

The urgency of addressing climate change cannot be overstated. The Intergovernmental Panel on Climate Change (IPCC) has highlighted the need to limit global warming to 1.5°C above pre-industrial levels to avoid catastrophic consequences. Reducing carbon emission is integral to achieving this goal. Nigeria, as a major emitter of greenhouse gases in Africa, significantly reduces its carbon emission. A substantial portion of its emissions comes from burning fossil fuels for electricity generation, transportation, and industrial processes.

According to Awodumi and Adewuyi solar energy adoption has the potential to play a pivotal role in reducing Nigeria's carbon footprint. The country can make significant progress in decarbonizing its energy sector by substituting fossil fuel-based power generation with solar energy. Solar power is a clean and renewable energy source that produces zero direct emissions during electricity generation.

Intellectual Property Rights (Ipr)

Intellectual Property Rights (IPR) is the legal protections granted to creators, inventors, and innovators over their intellectual creations, enabling them to control and benefit from the use of their inventions, literary and artistic works, designs, symbols, names, and images. The primary rationale for IPR is to encourage innovation and creativity by granting exclusive rights for a limited period, thereby providing incentives for investment in research and development.

This concept cover several categories, including patents, which protect inventions and technological processes; trademarks, which safeguard distinctive signs identifying goods or services; copyrights, which protect literary, musical, and artistic works; and industrial designs, which protect the aesthetic aspects of products. In the context of environmental sustainability, intellectual property plays a critical role in facilitating or restricting access to carbon emission reduction and clean energy technologies.

Environmental and Climate Change Regulation in Nigeria

Environmental and climate change regulation in Nigeria is governed by a combination of constitutional provisions, statutory enactments, and policy instruments aimed at protecting the environment and promoting sustainable development. Section 20 of the 1999 Constitution of the Federal Republic of Nigeria (as amended) mandates the state to “*protect and improve the environment and safeguard the water, air, land, forest and wildlife of Nigeria.*” This constitutional provision forms the legal foundation for Nigeria’s environmental governance framework. The primary statutory body responsible for environmental regulation is the National Environmental Standards and Regulations Enforcement Agency (NESREA), established under the NESREA Act of 2007. NESREA enforces environmental laws, sets emission standards, and ensures compliance with international environmental agreements. Other key institutions include the Federal Ministry of Environment, which coordinates climate policy, and the Energy Commission of Nigeria

(ECN), which oversees energy planning and renewable energy promotion.

Nigeria has also developed several policies addressing climate change, such as the National Climate Change Policy (2021–2030), the Nigeria Climate Change Act 2021, and its Nationally Determined Contribution (NDC) under the Paris Agreement. The Climate Change Act provides a legal framework for carbon budgeting, greenhouse gas monitoring, and the establishment of the National Council on Climate Change (NCCC) to oversee implementation. Despite these initiatives, enforcement challenges persist due to weak institutional capacity, inadequate funding, and poor inter-agency coordination. Strengthening regulatory institutions and aligning environmental laws with sustainable energy goals remain essential for Nigeria’s effective transition toward a low-carbon economy.

1. The Role of Nationally Determined Contributions (NDCs) and the Energy Transition Plan (ETP)

Nigeria’s Nationally Determined Contributions (NDCs) and Energy Transition Plan (ETP) represent the country’s central policy instruments for addressing climate change and achieving a low-carbon, sustainable energy future. The NDCs, developed in alignment with the Paris Agreement (2015), outline Nigeria’s commitment to reduce greenhouse gas (GHG) emissions by 20% unconditionally and up to 47% conditionally by 2030, depending on international support in the form of finance, technology, and capacity building. The NDCs focus on key sectors such as energy, oil and gas, agriculture, industry, and transportation, with particular emphasis on promoting renewable energy technologies, improving energy efficiency, and phasing down gas flaring.

Complementing this, the Energy Transition Plan (ETP) launched in 2022 provides a comprehensive roadmap for achieving net-zero emissions by 2060 while ensuring universal access to modern energy services. The ETP seeks to diversify Nigeria’s energy mix by significantly expanding solar and other renewable capacities, electrifying transportation, and reforming industrial processes. It estimates that over \$1.9 trillion will be required to implement the transition, underscoring the need for international partnerships, private investment, and technology transfer.

Both the NDCs and ETP underscore the critical role of clean technologies and intellectual property frameworks in accelerating Nigeria’s decarbonization agenda. However, limited access to affordable technology and weak institutional coordination threaten their effective implementation. Strengthening domestic capacity, leveraging TRIPS flexibilities, and encouraging local innovation in renewable technologies are therefore essential to realizing Nigeria’s NDC and ETP goals.

2. Challenges in Enforcement and Regulatory Coordination

Despite Nigeria’s extensive environmental and climate change regulatory framework, enforcement remains a persistent challenge due to weak institutional capacity, fragmented mandates, and poor inter-agency coordination. The multiplicity of regulatory bodies including the Federal Ministry of Environment, the National Environmental Standards and Regulations Enforcement Agency (NESREA), the Energy Commission of Nigeria (ECN), and

state-level environmental agencies often results in overlapping functions and jurisdictional conflicts. This fragmentation undermines policy coherence and complicates the implementation of national climate initiatives such as the Climate Change Act 2021 and the Energy Transition Plan (ETP).

One major obstacle is the lack of adequate technical capacity and financial resources to monitor and enforce compliance with environmental standards. NESREA, for instance, faces constraints in manpower, laboratory infrastructure, and funding, limiting its ability to conduct regular inspections and impose sanctions effectively. Furthermore, political interference and corruption in regulatory institutions weaken enforcement mechanisms, as violators of environmental laws often escape penalties through bureaucratic loopholes.

The need to keep up with technological advancements, handle cross-border complexities, improve access to justice, align with changing societal values, improve enforcement mechanisms and expedite legislative. Even with well-established laws, there may be challenges in their effective enforcement and implementation. Inadequate resources, ignorance, and corruption can all undermine the effectiveness of the legal system. To encourage enforcement and implementation, law enforcement organisations must be strengthened, transparency must be promoted, and public awareness of legal rights and obligations must rise the backlog of bills and laws that are pending approval or change is known as the legislative backlog. This backlog may make it more difficult for the legal system to adapt to new concerns and postpone the adoption of critical reforms. It will need a streamlined legislative procedure, adequate funding, and prioritisation of important legislative measures to close this gap.

Intellectual Property Rights Regime in Green Technology

Green technology means a technology that is environmentally friendly and sustainable. It is also sometimes referred to as clean technology. It means creating ecologically friendly, sustainable products. It aims to promote a sound and healthy environment. Therefore, green technologies are more appropriately called clean, environmental, or eco-friendly technologies. The adoption of green technologies is simply due to the community's global challenges against ecological crises. The harsh greenhouse gas emissions, unjustified use of fossil fuels, and carbon emissions lead to creating an imbalance in the environment, threatening the ecosystem as a whole, wherein there are repercussions such as depletion of the ozone layer, heat waves, forest fires, extinction of certain life forms of birds and animals they are the result of the extreme loss caused to our environment. Green technology is one such step taken to combat climate change. Rapid climate deterioration is one of the driving forces for the launch of green technology, so going green is the need of the hour to address the global climate crisis. Green technology includes production and consumption technologies that would function to preserve the environment. Green technology uses the three R's, i.e., reuse, recycle, and reduce.

Climate change crises and environmental imbalances have been a significant concern globally in recent times. The climatic changes give rise to various issues such as global warming, depletion of the ozone layer, deterioration of

natural resources, soil erosion, deforestation, and more. Many international and national agreements and policies have been created to protect the environment, from the UNFCCC to the recent Paris Agreement, aiming to control rising environmental issues. However, developed and developing countries must achieve desirable results in combating climate change. Industrial and technological developments are critical reasons for environmental pollution and degradation. Progress is necessary for planned developing countries, but growth and expansions shall also consider ecological sustainability.

Tensions Between Private Rights and Public Environmental Goals

One of the major challenges in regulating carbon emission technologies lies in reconciling private intellectual property rights (IPRs) with the broader public goal of environmental sustainability. Intellectual property rights, particularly patents, are designed to incentivize innovation by granting inventors exclusive rights to exploit their inventions for a certain period. However, when these rights pertain to clean energy technologies, they may inadvertently create barriers to access, especially in developing countries like Nigeria where technological transfer and local innovation capacity remain limited.

The exclusive nature of IPRs can restrict the diffusion of critical technologies needed for carbon reduction and renewable energy development. For instance, multinational corporations that own patents for advanced carbon capture or renewable energy systems may impose high licensing fees or restrictive conditions, thereby limiting the ability of developing nations to adopt such technologies. This situation creates a tension between protecting innovators' commercial interests and achieving global climate goals that require widespread access to clean technologies.

Nigeria's situation highlights this conflict. While the country seeks to reduce emissions under its Nationally Determined Contributions (NDCs) and implement its Energy Transition Plan (ETP), it often faces difficulties in obtaining affordable access to patented technologies. The current global intellectual property system anchored in agreements such as the WTO's TRIPS Agreement tends to prioritize proprietary rights over equitable access. Therefore, balancing IPR protection with environmental justice requires innovative approaches such as patent pools, compulsory licensing, and open-source technology collaborations that can ensure both innovation incentives and public benefit.

Conclusion and Recommendation

This study has shown that Nigeria has made considerable policy and legislative efforts toward addressing climate change and promoting clean energy, the full realization of these goals remains hindered by weak institutional frameworks, limited access to patented technologies, and inadequate enforcement of environmental laws. The intersection between intellectual property rights and access to carbon-emission technologies reveals a fundamental tension between private innovation incentives and public environmental needs. Without mechanisms to facilitate affordable technology transfer, Nigeria's ambition to meet its Nationally Determined Contributions (NDCs) and Energy Transition Plan (ETP) targets will remain constrained.

To address these challenges, the government should strengthen the enforcement capacity of institutions such as NESREA and the National Council on Climate Change, promote policy coherence, and improve inter-agency collaboration. Furthermore, Nigeria should explore TRIPS-compliant flexibilities, including compulsory licensing and patent pooling, to improve access to clean technologies. Encouraging local research and development, investing in renewable-energy infrastructure, and fostering public-private partnerships will also be essential. By aligning intellectual property regulation with sustainable-development objectives, Nigeria can effectively balance innovation protection with equitable access to clean technologies, thereby accelerating its transition toward a low-carbon and climate-resilient economy.

Reference

1. Abubakar I. The Impact of Climate Change Legislation on Nigeria's Energy Sector. *Journal of Environmental Law and Policy*,2023:12(1):44–63.
2. Adebayo K, Akintola T. Environmental Law and Climate Change Governance in Nigeria. *Nigerian Journal of Environmental Policy and Law*,2021:5(1):33–48.
3. Adegbite F T. The Climate Change Act 2021 and Nigeria's Transition to a Low-Carbon Economy. *Nigerian Journal of Environmental Law*,2022:10(2):33–50.
4. Aderoju O M, Dias G A, Echakraoui Z. Assessment of renewable energy sources and municipal solid waste for sustainable power generation in Nigeria. *IOP Conference Series: Earth and Environmental Science*, 2017.
5. Adetunji O, Bello S. Renewable Energy Development and Policy Challenges in Nigeria. *Energy Policy Review*,2021:8(3):21–37.
6. Afinotan U. How serious is Nigeria about climate change mitigation through gas flaring regulation in the Niger Delta? <https://journals.sagepub.com/> accessed, 2023.
7. Aina O. Intellectual Property Rights and Access to Green Technologies in Developing Countries. *African Journal of Law, Innovation and Development*,2022:6(2):70–85.
8. Aluko A. Technology Transfer and Intellectual Property Protection in Nigeria's Clean Energy Sector. *Journal of African Legal Studies*,2023:15(1):55–72.
9. Awodumi O B, Adewuyi A O. The role of non-renewable energy consumption in economic growth and carbon emission: Evidence from oil producing economies in Africa. *Energy Strategy Reviews*,2020:27:100434.
10. Ayodele O. Climate Change Governance and Legal Enforcement in Nigeria. *International Journal of Environmental Governance*,2021:9(2):48–61.
11. Bekhechi M A. The Legal and Regulatory Framework for Environmental Impact Assessments. *World Bank Publishers*, 2002, 143.
12. Bello H, Okon A. Access to Clean Energy Technologies and the Role of Intellectual Property in Nigeria's Development. *Energy and Environmental Law Journal*,2022:7(4):96–112.
13. Cohen L, Gurun U, Nguyen Q. The ESG - Innovation Disconnect: Evidence from Green Patenting. *European Corporate Governance Institute – Finance Working*, 2021, 1–61. <https://ssrn.com/abstract=3718682> or <http://dx.doi.org/10.2139/ssrn.3718682>.
14. Correa C. Intellectual Property and the Transfer of Environmentally Sound Technologies. *Journal of World Intellectual Property*,2019:22(5–6):195–210.
15. Dada K. Patent Protection and Green Technology Innovation in Africa. *African Journal of Intellectual Property*,2020:3(1):14–31.
16. Ebeku K S A. The Right to a Healthy Environment and Climate Change Law in Nigeria. *Environmental Law Review*,2020:22(3):189–205.
17. Eboh M. Carbon Emissions Regulation and the Petroleum Industry in Nigeria. *Nigerian Energy Law Review*,2023:11(3):58–77.
18. Echefu N, Akpofure E. Environmental impact assessment in Nigeria: regulatory background and procedural framework. UNEP EIA Press, 2011.
19. Eduweb. Nigeria Ministry of Environment Agencies. <https://www.eduweb.com.ng/nigeria-ministry-of-environment-agencies/> accessed December, 2023.
20. Ekpo E. Enforcing Nigeria's Nationally Determined Contributions: Institutional Challenges and Opportunities. *Journal of Environmental Management and Policy*,2022:13(2):102–120.
21. Federal Ministry of Environment. Nigeria's Climate Change Policy and Response Strategy (2021–2030). Government of Nigeria, 2021.
22. Ibekwe E, Hassan S. Balancing Intellectual Property Rights and Access to Sustainable Energy in Nigeria. *Nigerian Journal of Intellectual Property and Innovation*,2023:5(1):23–40.
23. International Energy Agency (IEA). Net Zero by 2050: A Roadmap for the Global Energy Sector. IEA Publications, 2021.
24. International Energy Agency. Tracking Clean Energy Progress: Nigeria Country Report. OECD/IEA, 2023.
25. International Renewable Energy Agency. Renewable Energy Innovation in Africa: Technology Transfer and Local Manufacturing. IRENA Publications, 2022.
26. Khor M. Intellectual Property, Climate Change and Technology Transfer: Issues for Developing Countries. South Centre Research, 2019, 98.
27. Littleton M. The TRIPS Agreement and Transfer of Climate-Change-Related Technologies to Developing Countries. *Journal of World Trade*,2020:54(3):423–444.
28. Ndukwe P. Nigeria's Energy Transition Plan and Its Legal Implications. *African Energy Policy Journal*,2023:8(1):66–82.
29. Nigerian Upstream Petroleum Regulatory Commission. Upstream Petroleum Decarbonisation Template (UPDT). NUPRC, 2024.
30. Nwokedi L. Legal Barriers to Clean Energy Technology Adoption in Nigeria. *Journal of Environmental Law and Development Studies*,2021:9(2):75–91.
31. Obaje J. Technology Transfer Mechanisms for Green Energy in Sub-Saharan Africa. *Energy Law Journal of Africa*,2020:7(1):51–66.
32. Ogbu F. The Role of Intellectual Property in Nigeria's Energy Transition Policy. *Journal of African Legal Research*,2023:11(4):91–109.

33. Okafor C, Ojo B. The Nigerian Copyright Act 2022 and Its Impact on Technology and Innovation. *Nigerian Law and Technology Review*,2021:4(3):38–56.
34. Okonkwo C. Clean Energy Transition and Sustainable Development in Nigeria. *Journal of Energy Policy Studies*,2021:12(3):45–59.
35. Okorie F. Intellectual Property Rights and Climate Technology Transfer: Balancing Innovation and Environmental Sustainability in Africa. *Journal of Environmental Law and Policy*,2022:15(2):112–130.
36. Olawale T. Institutional Challenges in Implementing Climate Change Legislation in Nigeria. *African Journal of Environmental Studies*,2022:9(2):61–74.
37. Organisation for Economic Cooperation and Development (OECD). *Climate Change Mitigation through Technology and Innovation Policies*. OECD, 2020.
38. Oyedele D. Climate Governance and Institutional Enforcement in Nigeria: An Appraisal of the Climate Change Act 2021. *Environmental Law Review of Africa*,2022:10(1):13–29.
39. Sharma L (ed.). *Green Intellectual Property and Climate Change Mitigation Technologies: Road Ahead*. Bharti Publications, 2021.
40. South Centre. *Promoting Access to Climate Technologies: Policy Brief*. South Centre,2021.
41. Su H.N. Does innovation respond to climate change? Empirical evidence from patents and greenhouse gas emissions. *Technological Forecasting and Social Change*,2017:122:49–62.
42. Templars Law Firm. *Nigeria’s Energy Transition Plan: Legal and Policy Overview*. Templars Insights Series, 2023.
43. United Nations Development Programme (UNDP). *Nigeria’s NDC Implementation Strategy*. UNDP, 2022.
44. United Nations Framework Convention on Climate Change (UNFCCC). *Technology Mechanism Annual Report*. UNFCCC Secretariat, 2021.
45. United Nations Industrial Development Organization (UNIDO). *Facilitating Technology Transfer for Green Industrialisation in Africa*. UNIDO, 2020.
46. Wira S, Abadi H. The importance of green technologies and energy efficiency for environmental protection. *International Journal of Applied Environmental Science*,2017:12(5):76.
47. World Bank. *Nigeria Energy Sector Review: Access, Emissions, and Efficiency*. World Bank Group,2022.
48. World Bank. *Financing Nigeria’s Energy Transition: Policy Note*. World Bank Group.
49. World Bank. *Nigeria Climate and Development Report*. World Bank Group, 2022.
50. World Intellectual Property Organization (WIPO). *What is Intellectual Property?* WIPO, 2022. Retrieved from <https://www.wipo.int/about-ip/en/>
51. World Trade Organization (WTO). *TRIPS Agreement and Climate Change: Technology Transfer and IP Policy Options*. WTO Secretariat, 2021.
52. Zhang L, Chen X, Zhao Y. Carbon Capture and Renewable Energy: Pathways for Emission Reduction. *Energy Policy Journal*,2020:147:111–125.