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LEGAL AND ENVIRONMENTAL PERSPECTIVES ON CLIMATE CHANGE AND OCEAN ACIDIFICATION IN NIGERIA AND UNDERDEVELOPED COUNTRIES

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Abstract

The issues relating to Climate Change and Ocean acidification pose urgent environmental threat and interlocking crises for underdeveloped coastal states over the years. Notwithstanding, the well documented ecological and economic consequences as well as legal and policy frameworks, it has been observed that in countries such as Nigeria the menace remain, strikingly silent on Ocean Acidification-specific mitigation, adaptation and regulatory oversight. Against this backdrop, the paper critically evaluated the intersection of environmental vulnerability and legal inadequacy, using Nigeria as a case study to highlight the broader crisis facing underdeveloped nations. Drawing on international instruments such as the United Nations Convention on the Law of the Sea (UNCLOS) as well as the Paris Agreement and Sustainable Development Goal 14.3, identified gaps in global-to-local legal translation and the systemic weaknesses in Nigeria's national legislation; including the NESREA Act, NOSDRA Act and Environmental Impact Assessment Act. Consequent on the above, the author argued that there is a significant disconnect between international environmental obligations and domestic implementation, compounded by limited institutional capacity, fragmented legal mandates and minimal integration of ocean acidification into national climate policies. The paper therefore maintained the need for a pathway for reform; emphasizing the relevance for context-specific legal instruments, sub-regional cooperation within West Africa and a justice-oriented approach to environmental governance. The author concluded by calling for urgent recognition of ocean acidification as both a legal and policy priority in Nigeria as well as other underdeveloped coastal states.

Keywords: Climate Change, Ocean Acidification, Ocean governance, Environmental governance, Coastal vulnerability

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1. Introduction

Ocean acidification is a rapidly advancing consequence of anthropogenic climate change, yet it remains one of the least understood and least regulated marine environmental threats, particularly in under-developed countries. Unlike more politically visible climate phenomena such as sea level rise and extreme weather events, ocean acidification progresses quietly, but catastrophically through increased oceanic absorption of atmospheric carbon dioxide, leading to a measurable decline in seawater pH and alterations in marine carbonate chemistry. These changes, no doubt, threaten the structural integrity of coral reefs, the survival of calcifying organisms, and the livelihoods of

millions dependent on coastal and marine resources.¹ The consequences are especially more serious in countries like Nigeria, where communities' livelihood depend extensively on artisanal fishing and mangrove ecosystems for economic sustenance and food security.

Notwithstanding, its trans-boundary nature and long-term ecological devastating consequences on the environment, ocean acidification is not adequately captured in the legal frameworks of most developing nations. In Nigeria, environmental legislation such as the National Environmental Standards and Regulations Enforcement Agency (NESREA) Act², the Environmental Impact Assessment (EIA) Act³ and the National Oil Spill Detection and Response Agency (NOSDRA) Act⁴ provides general mandate for environmental protection, but are silent on the scientific and regulatory uniqueness of ocean acidification. This gap is worsened by fragmented governance structures, weak institutional capacities, and a limited tradition of marine-specific environmental legislation. Moreover, Nigeria's compliance with international environmental instruments; such as the United Nations Convention on the Law of the Sea (UNCLOS),⁵ the Paris Agreement, and the Sustainable Development Goals (SDGs); has been characterized more by rhetorical commitment than substantive implementation.⁶

The paper aims to bridge the gap in the legal-environmental scholarship by interrogating the extent to which developing countries like Nigeria are equipped legally and institutionally to respond to ocean acidification. It situates ocean acidification within the broader climate justice discourse, arguing that the disproportionate exposure of the Global South to marine degradation, despite minimal historical carbon emissions, constitutes an evolving form of environmental inequity. The paper critically assesses both international and domestic legal instruments and exposes their shortcomings in addressing ocean acidification. It further proposes actionable reforms to align Nigeria's environmental legal regime with emerging global standards, including the need for Ocean Acidification-specific legal mandates, integration of marine acidification into national climate policy, enhancing regional cooperation within West Africa. In achieving the above, the paper makes

¹ J. P. Gattuso and ors., (2015) 'Contrasting futures for ocean and society from different anthropogenic CO₂ emissions scenarios,' *Science*, 349(6243), aac4722 <<https://doi.org/10.1126/science.aac4722>>

² United Nations (1982), *United Nations Convention on the Law of the Sea (UNCLOS)*. available at: <https://www.un.org/depts/los/convention_agreements/texts/unclos/unclos_e.pdf> (Accessed: 20 June 2025)

³ United Nations (2015) *Paris Agreement*. United Nations Framework Convention on Climate Change. available at: <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement> (Accessed: 20 June 2025)

⁴ National Environmental Standards and Regulations Enforcement Agency (Establishment) Act, 2007, Laws of the Federation of Nigeria

⁵ Environmental Impact Assessment Act, 1992, Cap E12, Laws of the Federation of Nigeria.

⁶ See especially, the SDG 14.3, which explicitly targets Ocean Acidification monitoring and mitigation.

a novel contribution to the legal literature on ocean governance in the context of climate change. It offers a focused analysis of ocean acidification through the dual lenses of environmental vulnerability and legal insufficiency, challenging policymakers, scholars and development institutions to rethink the structural and normative deficits in current ocean governance regimes, especially in underdeveloped and resource-constrained areas.

2. Nature and scope of ocean acidification

Ocean acidification refers to the routine decrease in ocean pH caused by the absorption of excess atmospheric carbon dioxide (CO₂)⁷. Significantly, from the time of Industrial Revolution, the world's oceans have absorbed roughly 30 per cent of anthropogenic CO₂ emissions⁸, resulting in a 0.1 unit decline in pH; a shift representing a 26 percentage increase in ocean acidity.⁹ Projections indicate that without significant emission reductions, average surface ocean pH could decrease by up to 0.4 units by 2100, a level not seen for millions of years¹⁰. This chemical shift disrupts the ability of marine organisms; particularly calcifying species such as corals, oysters, and plankton, to form shells and skeletons, ultimately undermining entire marine food webs and coastal economies¹¹.

While OA is a global phenomenon, its impacts are unevenly distributed, with developing nations disproportionately affected due to their reliance on marine-based livelihoods and limited institutional capacity for environmental monitoring and response. In Nigeria, for instance, over 20 million people live in coastal communities, depending on fisheries and mangrove ecosystems that are sensitive to ocean chemistry.¹² The Niger Delta, in particular, combines extreme ecological vulnerability with institutional neglect, creating a high-risk zone for OA-related impacts such as biodiversity loss, fishery collapse, and shoreline destabilization¹³.

Yet, Nigeria's environmental legal architecture remains silent on ocean acidification. The NESREA Act 2007, which empowers the National Environmental Standards and Regulations Enforcement

⁷ National Oil Spill Detection and Response Agency (Establishment) Act, 2006, Laws of the Federation of Nigeria

⁸ United Nations (2015) *Transforming Our World: The 2030 Agenda for Sustainable Development*, A/RES/70/1. Available at: <<https://sdgs.un.org/2030agenda>> (Accessed: 20 June 2025)

⁹ J. P. Gattuso and others, 'Contrasting futures for ocean and society from different anthropogenic CO₂ emissions scenarios,' (2015) 349 *Science* 6243, aac4722

¹⁰ Intergovernmental Panel on Climate Change (IPCC), *Climate Change 2021: The Physical Science Basis* (Cambridge University Press 2021)

¹¹ P. Williamson and others, 'Impacts of Ocean Acidification' (UK Ocean Acidification Research Programme, 2017) <https://www.ukoa.ac.uk> accessed 20 June 2025.

¹² Federal Ministry of Environment, *National Biodiversity Strategy and Action Plan 2 (NBSAP II)* (Abuja, 2016).

¹³ UNEP, *Environmental Assessment of Ogoniland* (United Nations Environment Programme 2011).

Agency to enforce environmental laws and standards, does not contain any provision specifically addressing Ocean Acidification or marine carbonate chemistry¹³¹⁴. Similarly, the Environmental Impact Assessment Act 1992, though obligatory for coastal and offshore development projects, lacks criteria for assessing OA-specific risks in cumulative or long-term impact assessments.¹⁵ This regulatory gap extends to Nigeria's climate change policy framework, which has largely focused on terrestrial emissions and land degradation, rather than integrated ocean-climate interactions.¹⁶

At the international level, the United Nations Convention on the Law of the Sea (UNCLOS) recognises the general obligation of states to prevent marine pollution (Article 194) and to protect the marine environment from anthropogenic interference.¹⁷ Likewise, the Paris Agreement (Article 7) obliges parties to enhance adaptive capacity and climate resilience; an obligation that, in principle, should extend to OA mitigation and monitoring.¹⁸ However, these frameworks rely heavily on domestic implementation, which remains weak in Nigeria and most underdeveloped countries.

Moreover, Sustainable Development Goal (SDG) 14.3 explicitly calls for the "minimisation and addressing" of ocean acidification, including through scientific cooperation. Nigeria's Voluntary National Reviews of the SDGs, however, contain no mention of OA, reflecting a deeper epistemic and policy gap within the country's marine governance system.¹⁹

In this context, the absence of Ocean Acidification-specific legislation and institutional mechanisms for marine pH monitoring constitutes both a regulatory oversight and a justice failure. It neglects the socioeconomic rights of vulnerable coastal populations and contravenes Nigeria's commitment to intergenerational environmental protection under Section 20 of the 1999 Constitution of the Federal Republic of Nigeria, which mandates the state to 'protect and improve the environment and safeguard the water, air and land.'²⁰

¹⁴ National Environmental Standards and Regulations Enforcement Agency (Establishment) Act 2007, LFN

¹⁵ Environmental Impact Assessment Act 1992, Cap E12 LFN

¹⁶ Federal Ministry of Environment, *National Policy on Climate Change 2021–2030* (Abuja, 2021)

¹⁷ United Nations Convention on the Law of the Sea (UNCLOS), 1982, art 194.

¹⁸ Paris Agreement, 2015, art 7.

¹⁹ Government of Nigeria, *Voluntary National Review on the Implementation of the 2030 Agenda and the SDGs* (2020) <<https://sdgs.un.org/documents/nigeria-vnr-2020>> accessed 20 June 2025

²⁰ Constitution of the Federal Republic of Nigeria 1999 (as amended), s 20

This review therefore argues that the failure to legally recognise and respond to ocean acidification in Nigeria represents a novel environmental governance blind spot; one that undermines climate resilience, marine biodiversity conservation and compliance with evolving global norms.

3. Framework on existing gaps in Ocean Acidification

Despite the growing body of climate change literature, ocean acidification remains largely peripheral in environmental legal scholarship, particularly within underdeveloped countries. Existing studies primarily focus on carbon emissions, mitigation and adaptation frameworks under the UNFCCC and the Paris Agreement, with minimal attention to Ocean Acidification under marine biodiversity or fisheries regulation. Scholarly emphasis has traditionally been on the ecological and scientific dimensions of OA, leaving a significant normative vacuum in legal and institutional analyses.²¹

In African contexts, research has largely overlooked the interplay between marine environmental harm and national legal systems. For instance, Nigeria's environmental law literature heavily concentrates on oil pollution, deforestation, and climate-induced flooding, with scant attention to chemical stressors in marine systems such as acidification.² While the Abidjan Convention provides a framework for regional marine cooperation, its implementation and updating have not kept pace with climate-induced ocean changes.

International legal instruments such as UNCLOS, SDG 14.3, and the Paris Agreement (Article 7) recognise the need for adaptive measures to ocean stressors, yet these do not impose binding obligations for OA-specific interventions. Consequently, underdeveloped countries, already limited by institutional and technological capacity, operate in a legal context where soft law dominates, and domestic codification lags behind. The review addressed the lacuna by offering a focused analysis on how Nigeria; and by extension, similar states can integrate OA into national legal responses to climate change.

4. Rethinking Legal and Policy Frameworks for Ocean Acidification Governance in Nigeria

The absence of any ocean acidification-specific legislative or regulatory provision in Nigeria reveals a deeper normative and structural failure: environmental law in many underdeveloped countries has

²¹ National Environmental Standards and Regulations Enforcement Agency (Establishment) Act 2007, LFN, S. 7

not evolved to accommodate emerging, complex, and cumulative climate-ocean risks. While environmental statutes in Nigeria focus on classical pollution, land degradation, and resource exploitation, they remain largely silent on biogeochemical climate impacts, such as OA, which do not fall neatly within conventional categories of pollution or visible degradation.

A major novelty deficit in Nigerian marine environmental governance lies in the failure to conceptualize ocean acidification as both a climate and human rights issue. OA directly threatens the right to life and livelihood, especially for artisanal fishers, women in coastal economies, and future generations. Yet, the NESREA Act 2007, despite its general mandate under section 7 to enforce compliance with environmental standards, does not list carbon dioxide as a pollutant in marine contexts, nor does it establish any standard for seawater pH or carbonate saturation²⁰. Similarly, no enabling law or regulation mandates periodic pH monitoring in Nigeria's exclusive economic zone (EEZ) or coastal waters. This legislative void leaves a vast jurisdictional space unregulated, despite growing scientific evidence of acidification's impacts on ecosystem integrity and food security.²²

The novelty in legal reform should begin with amending core environmental statutes to reflect ocean acidification as a distinct category of marine threat. For example, the Environmental Impact Assessment (EIA) Act 1992 should be revised to include mandatory OA risk assessments for all coastal infrastructure projects-particularly those that involve fossil fuel combustion, shipping, or dredging, which increase localised CO₂ concentrations in marine environments.²³ In parallel, the Climate Change Act 2021, which created the National Council on Climate Change (NCCC), should include OA within its climate adaptation and vulnerability planning mandates.²⁴

There is also a pressing need to codify national water quality standards that include baseline pH levels, carbonate system thresholds, and acidification mitigation indicators, with enforcement tied to the NESREA regulatory framework. Such reform would be consistent with Nigeria's obligations under Article 207 of UNCLOS, which obligates states to enact laws and regulations to prevent, reduce, and control pollution of the marine environment from land-based sources.²⁵

²² J-P Gattuso and others, 'Ocean acidification and its impacts: an expert survey' (2021) 128 *ICES Journal of Marine Science* 1, 13–21.

²³ Environmental Impact Assessment Act 1992, Cap E12 LFN

²⁴ Climate Change Act 2021, Federal Republic of Nigeria Official Gazette, No. 176 Vol. 108

²⁵ United Nations Convention on the Law of the Sea (UNCLOS), 1982, art 207

Moreover, institutional innovation is necessary. Nigeria should establish a Marine Acidification Observatory Unit (MAOU) under the Federal Ministry of Environment or Nigerian Institute for Oceanography and Marine Research. This unit could serve as the focal point for long-term pH monitoring, community education, and international reporting obligations, especially under SDG 14.3 and the Paris Agreement. Importantly, this body should be equipped with legally enforceable mandates; not merely advisory roles to influence sectoral policies, such as fisheries, oil and gas, and coastal infrastructure.

On the regional level, Nigeria could pioneer a West African Ocean Acidification Compact, modelled after transboundary environmental regimes like the Abidjan Convention, which promotes regional cooperation for marine environmental protection in the African Atlantic coast ²⁶. A legally binding protocol on OA under the Abidjan Convention could harmonise pH standards, support shared scientific data, and create regional liability mechanisms for cross-border marine damage arising from unregulated CO₂ discharges.

Ultimately, a novel legal response to OA in Nigeria and other underdeveloped countries must recognise that marine climate impacts require cross-cutting, anticipatory, and rights-based regulation. Traditional pollution control laws are inadequate for an evolving planetary condition like ocean acidification. Legal reforms must incorporate scientific metrics, participatory governance, and forward-looking enforcement frameworks to ensure that OA does not remain an invisible crisis with irreversible consequences.

5. Conclusion and Policy Implications

Ocean acidification presents a profound and underappreciated environmental threat; one that straddles the boundaries of climate science, marine ecology, and international human rights. For underdeveloped nations such as Nigeria, the consequences are disproportionately severe due to socio-economic vulnerability, environmental degradation, and a fragmented legal landscape. Despite the mounting evidence of OA's ecological and economic consequences, legal systems in many low-income countries have remained silent, failing to respond to what is arguably the next frontier of climate-induced marine disruption.

²⁶Abidjan Convention (1981) for Cooperation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region

This review has argued that Nigeria's current environmental legal architecture; comprising the NESREA Act 2007, EIA Act 1992, and even the more recent Climate Change Act 2021, is structurally outdated in addressing the unique challenges posed by OA. The absence of explicit reference to ocean chemistry, seawater pH standards, or mitigation obligations reflects a deep normative gap in marine governance. Additionally, international frameworks such as UNCLOS and the Paris Agreement provide only generalised obligations, leaving national legislatures with considerable discretion that, in practice, translates into inertia.

Addressing ocean acidification in Nigeria requires more than piecemeal legal amendments. It demands a re-conceptualisation of environmental law to recognise OA as a systemic threat linked to constitutional environmental duties, climate justice, and intergenerational equity. Legal innovation should be driven by the following policy imperatives:

- i. **Legislative Codification:** Enactment or amendment of statutes to explicitly address OA through monitoring mandates, emission control, and water quality standards.
- ii. **Institutional Strengthening:** Creation of a dedicated marine acidification unit for interagency coordination, public engagement, and regional cooperation.
- iii. **Integrated Climate Governance:** Align national climate change adaptation plans with OA vulnerability assessments and incorporate pH monitoring in coastal environmental impact assessments.
- iv. **Transnational Cooperation:** Pursue a regional legal instrument on OA under the framework of the Abidjan Convention to promote harmonised norms and shared accountability.
- v. **Constitutional Enforcement:** Operationalise Section 20 of Nigeria's 1999 Constitution to hold the state accountable for its obligation to "protect and improve the environment," extending this duty to ocean systems and carbon-based marine harm.²²

Ultimately, the novelty of this review lies in bringing ocean acidification to the legal forefront of climate discourse in underdeveloped settings. Until OA is understood not just as a scientific or environmental issue—but as a legal and governance failure; it will continue to evolve in silence, undermining food security, marine health, and climate resilience for millions across the Global South.

Policy Reform Summary Table

Identified Gap	Proposed Legal/Policy Reform	Mechanism or Legal Instrument
OA not explicitly mentioned in Nigerian laws	Amend NESREA Act to include OA-specific mandates	Parliamentary amendment + new environmental regulation
Absence of coastal pH monitoring	Mandate OA monitoring in Environmental Impact Assessment (EIA) processes	Revise EIA Act 1992 with marine chemistry protocols
Weak regional marine legal collaboration	Develop regional OA protocol under Abidjan Convention	Through ECOWAS or African Union legal mechanism
Lack of legal linkage between OA and human rights	Recognise OA's threat to right to food, health, and life	Apply African Charter, Articles 16 & 24 in judicial interpretation
Poor institutional coordination	Establish national Ocean Acidification Task Force	Via Federal Executive Order or cross-agency MoU