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BURNING THE FUTURE: THE DANGERS OF GAS FLARING IN NIGERIA

By

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Abstract

Gas flaring, the continuous burning of natural gas during oil extraction remains a major environmental, health, and economic challenge in Nigeria, particularly within the Niger Delta. Utilizing a qualitative, doctrinal research design alongside systematic legal policy analysis, this study investigates three central research questions: how current regulatory frameworks fail to enforce flare reductions, how flaring impacts local ecosystems and socio-economic structures, and what policy mechanisms can successfully transition flared gas into usable energy. Moving beyond broad literature summaries, this article's specific contribution lies in its multi-tiered evaluation of Nigeria's regulatory gaps alongside a strategic framework for community-centered energy governance. Environmentally, flaring releases significant greenhouse gases, contributing to regional air pollution, acid rain, and soil degradation, which impair biodiversity and agricultural yields. Statistically, populations near flare sites correlate with elevated risks of respiratory conditions and dermatological issues, though establishing direct physiological causation requires more rigorous clinical trials. Economically, the practice wastes valuable energy resources that could bolster national grid stability. Furthermore, flaring exacerbates socio-economic grievances and environmental injustice in host communities. By bridging regulatory gaps with actionable policy and technology strategies, this study outlines a path toward environmental compliance, sustainable energy development, and improved community well-being in Nigeria

Keywords: gas flaring regulation, environmental degradation, health impacts, Nigeria, sustainable practices.

1.0 INTRODUCTION

While early industry literature initially framed Nigeria as a "gas province with some oil," modern energy legal scholarship frequently renders this observation as a "gas province with significant oil accumulations" to reflect the true scale of the nation's hydrocarbon resources.[1] Furthermore, standard energy conversion

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calculations based on official regulatory data confirm that Nigeria's proven natural gas reserves (exceeding 208 trillion cubic feet) yield a total energy content that substantially outweighs its crude oil reserves with total potential gas reserves yielding more than double the energy capacity of its crude oil holdings."[2] In the course of crude-oil exploitation from 1961 to 2004, enormous volumes of associated gas measured in millions of tonnes were flared across the region. This practice has left the landscape scattered with flare sites, producing heat, toxic emissions, and environmental degradation that harm humans, vegetation, and wildlife.[3] Ironically, despite its vast natural-gas endowment, Nigeria ranks among the world's leading gas-flaring nations rather than one of its foremost gas producers.[4]

To properly understand the concept of gas flaring, it is necessary first to clarify what is meant by the term *gas*. According to Section 15 of the Petroleum Act 1969, natural gas refers to "gas obtained from boreholes and wells and consisting primarily of hydrocarbons."[5] The Oxford Advanced Learner's Dictionary defines the verb *flare* as "to burn brightly," which captures the combustion element implied in the term *gas flaring*.

Although Nigerian petroleum legislation does not expressly define gas flaring, several technical and scholarly interpretations exist. James Argo describes gas flaring as a method for the disposal of waste gases, oil residues, and co-produced water by burning the organic materials in an open, elevated system typically between fifteen and seventy-five centimetres above the ground without effective control mechanisms.[6] In a more figurative sense, Darry Graff Vulcan likens gas flaring to "a toilet turned upside down at the end of a

[1] U.J. Orji, 'Moving from Gas Flaring to Gas Conservation and Utilisation in Nigeria: A Review of the Legal and Policy Regime' (2014) 38(2) *OPEC Energy Review* 149, 151; U.S. Energy Information Administration (EIA), *Country Analysis Brief: Nigeria* (EIA 2025) 4–6. U.S. Energy Information Administration (EIA), *Country Analysis Brief: Nigeria* (EIA 2025) 4–6; see also Nigerian Upstream Petroleum Regulatory Commission (NUPRC), *National Petroleum Reserve Estimates Report* (NUPRC 2024) 12 (confirming proven gas reserves of over 208 Tcf, whose energy equivalent substantially exceeds that of crude oil reserves).

[2] Energy and Natural Resources Report: Nigeria – Oil and Gas Overview (Mondaq, 2024) https://www.mondaq.com/nigeria/oil-gas-electricity/1432322/energy-and-natural-resources-report accessed 23 October 2025.

[3] Collins Ugochukwu, Environmental Impact of Gas Flaring in the Niger Delta Region of Nigeria (PhD Dissertation, Brandenburg Technical University, 2014) https://opus4.kobv.de/opus4-btu/files/438/Collins_Ugochukwu_PhD_Dissertation.pdf accessed 23 October 2025.

[4] Sryahwa Publications, 'Environmental and Socio-Economic Consequences of Gas Flaring in Nigeria' (2018) Journal of Geoscience and Environment Protection 45 https://sryahwapublications.com/article/download/2642-8245.0104004 accessed 23 October 2025.

[5] Petroleum Act (Cap P10 Laws of the Federation of Nigeria 2004) s 15.

[6] James Argo, cited in Nairametrics, 'Nigeria's Gas Flaring: Causes, Effects and Possible Solutions' (Nairametrics, 11 April 2018) https://nairametrics.com/2018/04/11/nigeria-gas-flaring/ accessed 23 October 2025.

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pipe thirty feet in the air with a flame to keep the sea warm," emphasising its wasteful and environmentally damaging character.[7]

Within Nigeria's petroleum sector, natural gas occurs as associated gas (AG) produced alongside crude oil or non-associated gas (NAG), extracted independently from dedicated gas fields.[8] Technologically and legally, flaring is not monolithic. Technical literature and statutory frameworks distinguish between routine flaring and non-routine flaring. Routine flaring the continuous burning of associated gas during normal operations due to a lack of processing infrastructure is technically avoidable through reinjection, gas-to-power projects, or Flare Gas Recovery Systems (FGRS).[9] In contrast, non-routine flaring remains necessary for operational safety, emergency depressurization, well testing, and initial plant commissioning.[10] Reflecting this distinction, section 104 of the Petroleum Industry Act 2021 and the *Gas Flaring, Venting and Methane Emissions (Prevention of Waste and Pollution) Regulations 2023* prohibit routine flaring while permitting narrow, safety-based exemptions.[11]

The gas-to-oil ratio in non-associated fields is typically much higher than that of associated gas, making it a key determinant of the economic and technical options for gas utilisation or flaring.

A clear understanding of these definitions is vital because gas flaring represents one of the most persistent environmental and economic challenges in Nigeria's oil industry. The practice, though technologically unnecessary in most cases, continues to occur on a large scale, with grave consequences for the ecosystem, human health, and the sustainability of national energy resources.[12]

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[7] Darry Graff Vulcan, quoted in International Journal of Research Publication and Reviews Vol 2 Issue 8 (2021) https://www.ijrpr.com/uploads/V2ISSUE8/IJRPR1017.pdf accessed 23 October 2025.
[8] U.J. Orji, 'Moving from Gas Flaring to Gas Conservation and Utilisation in Nigeria: A Review of the Legal and Policy Regime' (2014) 38(2) *OPEC Energy Review* 149, 151–152.
[9] World Bank, *Global Gas Flaring Reduction Partnership: Technical and Operational Aspects of Flaring* (World Bank 2023) 8–12.
[10] ibid 14–15.
[11] Petroleum Industry Act 2021, s 104; Gas Flaring, Venting and Methane Emissions (Prevention of Waste and Pollution) Regulations 2023, reg 3–7; Midstream Gas Flare Regulations 2023, reg 3–4
[12] Collins Ugochukwu, Environmental Impact of Gas Flaring in the Niger Delta Region of Nigeria (PhD thesis, Brandenburg Technical University 2014) https://opus4.kobv.de/opus4-btu/files/438/Collins_Ugochukwu_PhD_Dissertation.pdf accessed 23 October 2025

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Gas flaring remains one of the most damaging and controversial practices in Nigeria's oil and gas industry. It involves the burning of excess or unwanted natural gas released during crude oil extraction, usually through elevated stacks that emit intense heat and bright flames. The practice has persisted in Nigeria since the 1950s, particularly in the Niger Delta region, and continues to pose severe environmental, health, and economic challenges.[13] To fully appreciate the magnitude of its impact, it is important to understand the kinds of gases that are flared and the technical justifications often advanced for the practice.

Two broad categories of gases are commonly flared in oil production operations sour gas and sweet gas. *Sour gas* refers to natural gas containing significant levels of hydrogen sulphide (H_2S), a corrosive and poisonous compound that produces a pungent "rotten-egg" odour.[14] This gas is highly flammable and can be lethal to humans and animals when inhaled in high concentrations. When burned, it releases sulphur dioxide (SO_2), which contributes to acid rain, vegetation loss, and soil infertility.[15] By contrast, *sweet gas* contains little or no hydrogen sulphide, making it less toxic but still harmful when flared, as it emits large volumes of carbon dioxide (CO_2) and methane (CH_4) both potent greenhouse gases.[16]

In the Niger Delta, most of the gas flared is *associated gas* that is, gas produced together with crude oil. Because of inadequate infrastructure for capturing and processing this gas, oil companies often find flaring to be a cheaper alternative to reinjection or storage.[17] This persistent practice results in significant energy wastage, air pollution, and environmental degradation, all of which undermine Nigeria's commitments to sustainable development and climate-change mitigation.

Although often criticised, gas flaring is not entirely purposeless. Oil companies typically justify it on safety and operational grounds.[18] During well testing, start-up operations, or equipment maintenance, flaring is used

[13] United Nations Environment Programme (UNEP), Environmental Assessment of Ogoniland (UNEP 2011) https://wedocs.unep.org/handle/20.500.11822/22169 accessed 23 October 2025.
[14] World Bank, Global Gas Flaring Reduction Partnership (GGFR) Report 2021 (World Bank 2021) https://www.worldbank.org/en/programs/gasflaringreduction accessed 23 October 2025.
[15] Enetimi I Seiyaboh and Sylvester C Izah, 'A Review of Impacts of Gas Flaring on Vegetation and Water Resources in the Niger
[16] Delta Region of Nigeria' (2017) International Journal of Environment, Agriculture and Biotechnology 2(4) 1667.
[17] Ibid.
[18] Organisation of the Petroleum Exporting Countries (OPEC), World Oil Outlook 2023 (OPEC 2023) ch 6.

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to safely burn off excess or waste gases that cannot be economically recovered.[19] It also serves to depressurise equipment during emergencies, preventing explosions or damage to facilities.[20] In certain instances, entire well streams are flared when the infrastructure required to separate, process, or transport the gas is unavailable.[21]

Flaring systems are designed to combust volatile hydrocarbons at high temperatures, converting them primarily to carbon dioxide and water vapour. However, incomplete combustion leads to the release of soot, nitrogen oxides, and other harmful pollutants that endanger public health and the surrounding ecosystem.[22]Thus, while flaring serves limited technical and safety functions, its continued prevalence in Nigeria highlights systemic regulatory failures and misplaced economic priorities.

Ultimately, the persistent flaring of both sour and sweet gases reveals a troubling contradiction: a nation endowed with abundant natural gas resources continues to destroy them through wasteful combustion, while its citizens bear the brunt of the resulting environmental and health hazards.[23]

1. Products of Gas Flaring and Their Effects

In the oil-producing Niger Delta region of Nigeria, natural gas flaring releases a complex mixture of airborne pollutants, including greenhouse gases, volatile organic compounds (VOCs) such as benzene and toluene, dioxins, acid-forming sulfur oxides, and fine particulate matter.[24] Epidemiological surveys in host communities consistently observe elevated rates of self-reported respiratory ailments such as asthma,

[19] World Bank (n 10).
[20] OPEC (n 14).
[21] UNEP (n 9).
[22]Seiyaboh and Izah (n 11).
[23] UNEP (n 9).
[24] World Bank, *Global Gas Flaring Reduction Partnership: Emissions and Air Quality Impacts* (World Bank 2022) 18–22; see also CA Osuoha and MA Fakutiju, 'Gas Flaring in Niger Delta Region of Nigeria: Cost, Ecological and Human Health Implications' (2017) 6(2) *Environmental Management and Sustainable Development* 203, 206–208.

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persistent coughing, and chronic bronchitis alongside increased hospital visits attributed to seasonal gas plume dispersion.[25]

While local communities and researchers report statistical associations between proximity to flare stacks and higher risks of severe long-term illnesses including dermatological disorders, haematological abnormalities, and certain cancers like leukaemia establishing a direct, singular causal link remains challenging.[26] Current scientific literature emphasizes that continuous exposure to benzene and VOC emissions represents a significant toxicological health risk; however, confounding environmental factors, multi-pollutant interactions, and a lack of longitudinal clinical trials mean these findings demonstrate strong statistical correlations rather than definitive physiological causation. [27] Nonetheless, empirical cost-ecological evaluations confirm that long-term exposure to flaring emissions inflicts a substantial burden on public health and regional ecology across the Niger Delta.[28]

a) Chronic Chemical Exposure to Health**:** The substances released during flaring carry profound health implications. Raw fuel gases and VOCs like benzene have been documented to cause cancers of the lung, liver, and prostate. [29] Gas flaring emissions fall into two scientifically distinct categories: combustion **products** (byproducts generated when raw gas is burned) and fugitive emissions (uncombusted or raw gas escaping directly into the atmosphere).[30]

Methane ($\text {CH} _4$) forms the primary chemical constituent of raw natural gas rather than a creation of complete combustion. When a flare operates at optimal conditions, complete combustion oxidizes

[25] I Kiani and I Olisa, 'Environmental Impact of Gas Flaring in Parts of Rivers State, Nigeria' (2021) 3(1) *FNAS Journal of Scientific Innovations* 44, 47–49.
[26] NI Obi, PT Bwititi and EU Nwose, 'Gas Flaring in Niger Delta Nigeria and Sustainability Development Goal Framework: Qualitative Survey of the Health Impacts, Mitigation and Adaptation' (2021) 16(3) *Journal of Complementary and Alternative Medical Research* 38, 41–43.
[27] World Health Organization (WHO), *Ambient (Outdoor) Air Pollution and Toxicological Risk Assessment Guidelines* (WHO 2021) 54–58 (distinguishing self-reported epidemiological associations and statistically elevated disease risk from established physiological causation); see also EU Nwose and others, 'Hydrocarbon Pollution and Health Risks in the Niger Delta: A Systematic Review of Causality vs Association' (2020) 12(4) *International Journal of Environmental Studies* 512, 518–521.
[28] Osuoha and Fakutiju (n 1) 211–214.
[29] Journal of Environment and Earth Science, 'Delta Region of Nigeria Using Chevron and Ilaje Crisis as Case-Study' (n.d.) http://www.iiste.org/Journals/index.php/JEES/article/download/29610/30403 accessed 23 October 2025.
[30] World Bank, *Global Gas Flaring Reduction Partnership: Technical Guidance on Flare Efficiency and Methane Emissions* (World Bank 2023) 14–18.

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methane into carbon dioxide ($\text {CO} _2$) and water vapor (H_2O).[31] However, real-world flaring operations particularly crosswind-exposed open stacks across the Niger Delta frequently suffer from incomplete combustion efficiencies below design capacity. Incomplete combustion yields toxic, partially oxidized pollutants including carbon monoxide ($\text {CO}$), black carbon soot, formaldehyde, and volatile organic compounds (VOCs) such as benzene and toluene.[32]

Conversely, direct methane emissions occur as fugitive releases or uncombusted slip. These slip emissions arise when flares experience flame extinction (unlit flares continuously venting raw gas), low flare tip velocities, or severe crosswinds that strip raw fuel gas out of the combustion zone before ignition can occur.[33] Distinguishing these pathways is critical: while combustion product CO_2 drives long-term global warming, uncombusted methane escaping as a fugitive emission exhibits a global warming potential over 80 times greater than CO_2 over a 20-year timescale, making combustion inefficiency a severe short-term climate driver.[34]

b) Cyclical Chemical Exposure (Stress and Chemical Sensitivity): Beyond direct toxicity, chemical exposure from flaring induces stress responses in human systems. Persistent environmental stressors can dysregulate the immune system and increase vulnerability to autoimmune disorders such as multiple sclerosis, rheumatoid arthritis and thyroid disease. Exposure of the nervous system to xenobiotic chemicals can produce symptoms like cacosmia (perception of unpleasant smells), rage followed by headache, sore aching muscles, and bronchial constriction. For example, while workers on-site may be protected by labour codes and safety gear, residents living within 0.2 km to 36 km of a flare stack often lack such protections; wind-borne plumes render their homes vectors of continuous exposure.[35] In one Nigerian flaring region, local

[31] Intergovernmental Panel on Climate Change (IPCC), *2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Volume 2 - Energy* (IPCC 2019) ch 4, 4.35–4.38.
[32] CA Osuoha and MA Fakutiju, 'Gas Flaring in Niger Delta Region of Nigeria: Cost, Ecological and Human Health Implications' (2017) 6(2) *Environmental Management and Sustainable Development* 203, 207–209.
[33] International Energy Agency (IEA), *Global Methane Tracker 2024: Flaring and Venting Emissions in Upstream Oil Operations* (IEA 2024) 22–26.
[34] United Nations Environment Programme (UNEP), *An Eye on Methane: International Methane Emissions Observatory 2023 Report* (UNEP 2023) 31–35.
[35] Ibid.

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physicians report unusually high rates of asthma and bronchitis in oil producing areas a possible marker of the chronic chemical burden borne by host communities.[36]

3. Weather, Climate and Global Warming; Acid Rain, Ecosystem and Light Pollution

a) Weather, Climate & Global Warming: Gas flaring constitutes a significant source of greenhouse gas (GHG) emissions worldwide, and Nigeria's contribution is measurable. Flares emit large quantities of methane (CH_4) and carbon dioxide (CO_2). Methane, in particular, has a global-warming potential many times that of CO_2.[37] Low-efficiency flares in the Niger Delta thus exacerbate global warming and contribute to rising sea levels with deleterious consequences for low-lying coastal zones.[38] The sea-level rise places regions such as Victoria Island, Lagos at high risk of flooding and shoreline erosion as a consequence of anthropogenic emissions.[39]

b) Acid Rain & Acid Deposition: In flaring operations that burn "sour gas" (gas containing hydrogen sulphide, H_2S), sulphur oxides (SO_x) are released. These gases combine with atmospheric moisture and oxygen to form acid rain.[40] Acid deposition has been implicated in higher iron content in water bodies in the Niger Delta and corrosion of building materials such as aluminium and asbestos roofing sheets.[41] For instance, in a coastal community near a low-lying flare pipe, the roofs of homes quickly corroded because of salt-laden steam from sea-water flooding the flare pipe and the resulting acidic vapour being deposited on structures. When nitrogen and sulphur oxides travel hundreds of kilometres before deposition, lakes and streams may become acidic far from the source.[42]

[36] HumAngle, 'Niger Delta Communities Grappling with Health Impacts of Gas Flaring' (HumAngle Media, 2023) https://humanglemedia.com/niger-delta-communities-grappling-with-health-impacts-of-gas-flaring/ accessed 23 October 2025.
[37] Ibid.
[38] Ibid..
[39] Ibid.
[40] Obi Alero Akuirene, Josiah O Adjene & Nkemdilim I Obi, 'Impact of Gas Flaring in Ubeji Metropolis of Delta State Nigeria: A Comparative Survey of Environment Health Effects' (n.d.) https://doi.org/10.18203/issn.2454-2156.intjscr20194249 accessed 23 October 2025.
[41] Ibid.
[42] Ibid.

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c) Ecosystem & Light Pollution: The ecological damage wrought by gas flaring is evident in vegetation loss and alteration of species composition. A study in Ubeji (Warri South Area, Delta State) found that plots near flare sites had significantly lower biodiversity indices compared to control sites, attributed to combustion heat and soot deposition.[43] The intense and continuous heat extending even 50 to 100 m from flare stacks stressed plants, reduced chlorophyll content, and caused changes to flora composition.[44] Light pollution is another often-neglected consequence: night skies above oil producing villages are aglow with flare light. In Eleme-Okrika (Rivers State), residents reported that the flare light enabled night navigation at home (in absence of electricity), yet disturbed nocturnal fauna and disrupted plant photosynthesis by providing constant illumination.[45]

4. Regulatory Framework and Operational Dynamics of Gas Flaring Reduction

Gas flaring, the burning of associated petroleum gas during oil extraction, remains a significant environmental and economic challenge globally. The World Bank estimates that approximately 110 billion cubic meters of gas are flared annually worldwide, resulting in substantial greenhouse gas emissions and waste of valuable resources.[46] Regulations, as vital instruments of governance, have been adopted in various jurisdictions to mitigate this practice. Notably, countries like Norway and Canada have implemented a hybrid model combining strict regulatory frameworks with market-based incentives such as fiscal policies and reforms, achieving notable progress.[47] Such regulatory frameworks typically emanate from foundational resource management and environmental policies that underpin the effective administration of natural resources, including hydrocarbon exploitation.

Legal instruments addressing gas flaring usually exist as primary and secondary legislation. Primary legislation often provides broad mandates empowering regulatory agencies to enforce environmental and

[43] Grace E Obi-Iyeke, 'Effects of Gas Flaring from Warri Refining and Petrochemical Company on Plant Diversity in Ubeji, Warri South Local Government Area, Niger Delta' (n.d.) https://aspjournals.org/Journals/index.php/ijees/article/view/1140 accessed 23 October 2025.
[44] Ibid.
[45] HumAngle (n 28).
[46] World Bank, Global Gas Flaring Reduction Partnership: Annual Report 2023 (World Bank 2023) 7.
[47] ibid 10; see also T Tokheim, 'Gas Flaring and its Reduction in Norway and Canada' (2018) 45 Energy Policy 120.

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resource management policies without necessarily referencing gas flaring explicitly.[48] In contrast, secondary legislation comprising licenses, codes, guidelines, and regulations is more adaptive, providing detailed and flexible operational mandates tailored to technological and economic realities.[49] Nigeria stands out as a jurisdiction with a relatively robust secondary legislative framework addressing gas flaring, reflecting attempts to balance industrial growth with environmental stewardship.[50]

The World Bank's Global Gas Flaring Reduction Partnership (GGFR) underscores several factors for effective regulation, emphasizing the necessity for clear policy objectives and capable regulatory institutions.[51] These factors include explicit flaring policies, accountable regulators, enforceable standards, and operational oversight mechanisms.

Government Policy and Institutional Responsibility in Flaring Regulation: Effective gas flaring reduction begins with clear governmental policy articulating the objectives and scope of flare reduction measures within environmental initiatives. However, many oil-producing nations suffer from a lack of explicit emission standards specifically targeting flare emissions, which complicates enforcement and accountability.[52] For instance, Nigeria has established maximum allowable gas emission levels for upstream oil operations and declared a goal to eliminate non-operational flaring by 2008, a target which remains unmet [53] Institutional responsibilities vary globally; however, the ministry responsible for petroleum resources typically bears the brunt of accountability. [54] Cooperation between petroleum ministries and environmental agencies is critical, with environmental authorities often responsible for assessing the environmental impacts and approving flaring permits prior to issuance.[55]

In countries like Egypt and Canada, independent environmental regulatory bodies such as the Egyptian Environmental Affairs Authority (EEAA) and the Alberta Energy and Utility Board (EUB) play pivotal roles

[48] M Ite and I Ibok, 'Regulatory Framework for Gas Flaring in Nigeria' (2006) 14 Journal of Environmental Law 25.
[49] World Bank (n 38) 15.
[50] Ite and Ibok (n 40) 28.
[51] Nigerian National Petroleum Corporation, 'Gas Flaring Reduction Policy' (NNPC 2020) 11.
[52] World Bank (n 38) 13.
[53] Ibid.
[54] Ibid.
[55] Ibid.

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in setting and enforcing flaring regulations, illustrating alternative governance models where regulatory functions are distinct from oil industry oversight.[56] Moreover, in some cases, state-owned oil companies such as Algeria's SONATRACH maintain significant regulatory responsibilities over flaring activities, reflecting the integrated roles these entities play in national resource management and policy implementation.[57]

Regulatory Approaches: Comparative Lessons and Nigeria's Legal Evolution: The regulation of gas flaring translates policy goals into enforceable operational standards through two primary models: prescriptive and performance-based.[58] Prescriptive models dictate specific engineering and technological criteria, simplifying goal-setting but creating severe enforcement bottlenecks in nations with limited monitoring capacity.[59] Conversely, performance-based models set overarching emission targets and allow operators flexibility in achieving them, fostering industry innovation and continuous improvement.[60] Jurisdictions leading global flare reduction adopt hybrid frameworks that combine prescriptive technical safety thresholds with performance-driven reduction targets.[61]

For Nigeria, comparative legal analysis reveals valuable lessons from Norway and Canada (specifically Alberta). Norway eliminated routine flaring by combining a direct carbon tax on flared gas with strict metering mandates, robust data disclosure, and mandatory reinjection infrastructure prior to field development.[62] Canada's Alberta Energy Regulator (AER) implemented Directive 060, a hybrid model that enforces strict volumetric flare limits while establishing a flexible commercial framework for third-party flare gas capture and midstream monetization.[63] These models are directly adaptable to Nigeria: NUPRC can operationalize Norway's mandatory digital metering and open-access data regimes, while adapting Alberta's

[56] Egyptian Environmental Affairs Authority, Annual Environmental Report 2022 (EEAA 2022) 44; Alberta Energy and Utilities Board, 'Flaring Regulations' (EUB 2021).
[57] H Saidi, 'The Role of SONATRACH in Algeria's Gas Flaring Policy' (2019) 33 Energy Regulation Review 54.
[58] World Bank, *Global Gas Flaring Reduction Partnership: Regulatory Frameworks for Flaring and Venting Management* (World Bank 2023) 18–20.
[59] UE Ite and UI Ibok, 'Gas Flaring and Venting Associated with Petroleum Exploration and Production in the Niger Delta' (2013) 1(2) *American Journal of Environmental Protection* 30, 31–33.
[60] World Bank (n 58) 22.
[61] Ibid, 24
[62] Norwegian Offshore Directorate, *Resource Management and Environmental Regulations on the Norwegian Continental Shelf* (NOD 2022) 12–15; see also Petroleum Activities Act 1996 (Norway) s 4-4.
[63] Alberta Energy Regulator (AER), *Directive 060: Upstream Petroleum Industry Flaring, Venting, and Incineration* (AER 2023) ss 2–4.

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third-party gas cluster collection framework under the Nigerian Gas Flare Commercialization Programme (NGFCP).

Historically, Nigeria relied on prescriptive, under-enforced laws. The Petroleum Act 1969 and the Associated Gas Re-Injection Act 1979 attempted to restrict flaring, but statutory exemptions, low non-compliance penalties, and underdeveloped domestic gas markets severely limited their efficacy.[64]

The institutional landscape has undergone structural reform following the repeal of legacy frameworks including the Federal Environmental Protection Agency (FEPA) Act and the operational dissolution of the Department of Petroleum Resources (DPR). Statutory oversight is now anchored in the Petroleum Industry Act (PIA) 2021, which distributes environmental governance across distinct regulatory bodies:

- Nigerian Upstream Petroleum Regulatory Commission (NUPRC): Oversees upstream operations, enforces section 104 flaring prohibitions, administers flare measurement/metering protocols, and manages environmental compliance (including Environmental and Social Impact Assessments [ESIAs] and Environmental Management Plans) for exploration and production.[65]
- Nigerian Midstream and Downstream Petroleum Regulatory Authority (NMDPRA): Regulates midstream processing, transportation, and gas infrastructure development, facilitating the commercial processing and distribution of recovered associated gas.[66]
- National Environmental Standards and Regulations Enforcement Agency (NESREA): Serves as the general environmental authority under the NESREA Act 2007. While the PIA grants NUPRC and NMDPRA primary jurisdiction within oilfield operational boundaries, NESREA enforces broader cross-sectoral environmental standards, air quality limits, and off-site ecological protection.[67]

[64] Associated Gas Re-Injection Act 1979, ss 3–4; Associated Gas Re-Injection (Amendment) Decree No 7 of 1985
[65] Petroleum Industry Act 2021, ss 4, 10, 104–107.
[66] ibid ss 29, 31, 121–124.
[67] National Environmental Standards and Regulations Enforcement Agency (Establishment) Act 2007, ss 7–8; Petroleum Industry Act 2021, s 102.

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Under this current regime, operators must complete approved ESIAs and establish environmental remediation funds before initiating petroleum operations.[68] Aligning NUPRC's oversight with Norwegian-style digital metering and Alberta's flexible midstream commercialization provides a pragmatic pathway toward eliminating routine flaring in Nigeria.

Complementing sector-specific regulation, environmental governance is further reinforced by the National Environmental Standards and Regulations Enforcement Agency (NESREA) Act 2007, which establishes a comprehensive framework for environmental protection across all industrial sectors, including petroleum.[69] NESREA's role is predominantly supervisory and enforcement-oriented, encompassing the monitoring of effluent discharges, gaseous emissions, waste management practices, and the preservation of sensitive ecosystems. By coordinating its activities with the PIA regulatory authorities, NESREA contributes to a harmonized environmental oversight framework, reducing the jurisdictional conflicts that characterized the prior DPR-FEPA system.[70] The synergy between PIA regulatory bodies and NESREA ensures that petroleum operations adhere to national environmental standards, reinforcing accountability and operational transparency.

Operationally, environmental management under the PIA continues to draw from established sector-specific standards, such as the Environmental Guidelines and Standards for the Petroleum Industry in Nigeria (EGASPIN), which are now enforced through the joint oversight of PIA authorities and NESREA.[71] EGASPIN delineates permissible levels for flaring, hydrocarbon concentrations in effluents, and other emissions, while prescribing procedures for soil and water protection, monitoring, and remediation in the event of contamination. Compliance is mandatory, with reporting obligations and corrective action requirements ensuring continuous oversight of environmental performance.[72] The integration of these standards within the statutory framework reflects a paradigm shift from fragmented regulatory oversight to a unified governance model, wherein environmental sustainability is central to petroleum sector management.

[68] Petroleum Industry Act 2021, ss 102–103, 157–160.
[69] National Environmental Standards and Regulations Enforcement Agency (Establishment) Act 2007.
[70] Petroleum Industry Act 2021, ss 157–160; NESREA Act 2007.
[71] Environmental Guidelines and Standards for the Petroleum Industry in Nigeria (EGASPIN) 2018.
[72] Petroleum Industry Act 2021, ss 161–165.

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Notwithstanding these advancements, enforcement challenges persist, particularly in achieving compliance with flaring reduction targets, effluent limitations, and ecosystem conservation mandates. Nevertheless, the current framework empowers NESREA and PIA regulatory authorities to impose sanctions, suspend operations, and require remediation for violations, thereby reinforcing adherence to environmental norms.[73] By institutionalizing environmental accountability within petroleum regulation, Nigeria's post-DPR and post-FEPA regime demonstrates a commitment to sustainable development, responsible resource utilization, and the mitigation of ecological risks inherent in petroleum operations.

5. National Policy, Economic Incentives, and International Commitments in Gas Flaring Reduction

Nigeria's National Gas Policy and Utilization Framework**:** Recognizing the strategic importance of natural gas, Nigeria instituted the National Gas Policy to diversify its petroleum sector and enhance value addition through gas utilization and development.[74] The policy outlines comprehensive plans and incentives to encourage the capture and productive use of associated gas, with a stated objective to eliminate routine gas flaring by 2003 a goal later revised due to infrastructural and market constraints.[75] The revised timeline set zero flaring targets for 2008 and 2010, reflecting ongoing commitment amidst practical challenges.[76]

Recent production sharing contracts (PSCs) incorporate Associated Gas Utilization Clauses, mandating oil companies to reduce flaring in line with global environmental standards, thus integrating international best practices into contractual obligations.[77] These contractual mechanisms aim to reinforce the regulatory framework by imposing clear utilization requirements on operators.

Economic Incentives and Industry Response to Gas Policy: Despite the legal and policy frameworks, the Nigerian gas industry remains underdeveloped, with no independent natural gas exploration and production by private companies to date.[78] Major international oil companies such as Agip, Shell, Mobil, and Chevron operate mainly in joint ventures with the Nigerian National Petroleum Corporation (NNPC), controlling the

[73] Ibid; NESREA Act 2007.
[74] Ibid.
[75] Ibid.
[76] Ibid.
[77] Ite and Ibok (n 40) 42.
[78] Ibid.

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bulk of gas projects.[79] Noteworthy initiatives include the Liquefied Natural Gas (LNG) project, the World Bank-assisted West African Gas Pipeline, and the Escravos gas-gathering scheme, which seek to improve gas infrastructure and market access.[80]

To stimulate gas utilization, the government introduced the Associated Gas Utilization Fiscal Incentive (AGUFI) Scheme, offering capital allowances, tax holidays, and duty exemptions to offset the additional costs of delivering associated gas to market.[81] However, these incentives have had limited success, primarily due to infrastructural deficits in gas transmission and the continued dominance of the public sector in upstream activities.[82] The absence of a vibrant private sector and a well-structured downstream market impedes the commercial viability of gas projects, contributing to persistent flaring.[83]

A study conducted by Nexant for the Bureau of Public Enterprises estimates Nigeria's annual economic losses due to gas flaring range from US$500 million to US$2.5 billion, underscoring the significant financial opportunity costs linked to inadequate policy implementation and market development.[84]

Natural gas, though underutilized in Nigeria, presents substantial environmental advantages over other fossil fuels, producing lower carbon emissions when combusted, which is critical in global efforts to mitigate climate change.[85] However, the routine flaring of associated gas leads to avoidable greenhouse gas emissions, air pollution, and resource wastage, placing Nigeria under international scrutiny from environmental advocates and global partners.[86] The destruction of vast gas volumes represents a significant economic loss to the nation, undermining energy security and economic diversification efforts.[87]

International Climate Frameworks and Nigeria's Global Commitments: Nigeria's participation in international climate governance began with its signing of the United Nations Framework Convention on

[79] Ibid.
[80] Ibid.
[81] Ibid.
[82] Ibid.
[83] Nexant Report for Bureau of Public Enterprises (Nigeria) 'Economic Impact of Gas Flaring' (2019) 6.
[84] ibid.
[85] World Bank (n 38) 30.
[86] Ite and Ibok (n 40) 45.
[87] ibid.

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Climate Change (UNFCCC) in 1992 (ratified in 1994). As a non-Annex I nation, Nigeria's primary commitments focus on sustainable development while mitigating greenhouse gas emissions. Contrary to legacy assertions, Nigeria ratified the Kyoto Protocol in 2004, which enabled participation in Clean Development Mechanism (CDM) projects designed to attract foreign investment for gas flare reduction.[88]

Nigeria expanded its international commitments by signing the Paris Agreement in 2016 (ratified in 2017). Under its updated Nationally Determined Contribution (NDC), Nigeria pledged an unconditional 20% greenhouse gas reduction below Business-As-Usual (BAU) targets by 2030, and a conditional 47% reduction contingent on international support. Crucially, the updated NDC specifically targets the petroleum sector, committing to end routine gas flaring by 2030 and reduce fugitive methane emissions by 60% by 2031. Furthermore, Nigeria enacted the Climate Change Act 2021 and published its *Long-Term Low-Emission Development Strategy*, binding the nation to achieve net-zero carbon emissions by 2060.[89]

Natural Gas in Nigeria's Energy Strategy: Despite possessing over 200 trillion cubic feet of proven natural gas reserves ranking among the top ten globally Nigeria historically prioritized crude oil extraction, treating associated gas as a disposable byproduct. World Bank tracking indicates that Nigeria consistently ranks among the top nine gas-flaring nations globally, wasting approximately 9 billion cubic meters of gas annually.

To reverse this, the Federal Government launched the "Decade of Gas" initiative alongside the Nigerian Gas Flare Commercialization Programme (NGFCP). This policy framework transitions natural gas from a flared pollutant into a strategic catalyst for domestic gas-to-power generation, industrial feedstocks, and economic diversification. [90]

[88] United Nations Framework Convention on Climate Change (UNFCCC), signed 13 June 1992, ratified 29 August 1994; Kyoto Protocol to the UNFCCC, adopted 11 December 1997, ratified by Nigeria 10 December 2004

[89] Federal Government of Nigeria, *Updated Nationally Determined Contribution* (UNFCCC 2021) 8–12; Climate Change Act 2021, s 1(2); National Council on Climate Change (NCCC), *Long-Term Low-Emission Development Strategy 2060* (NCCC 2023) 14–16.

[90] World Bank, *Global Gas Flaring Tracker Report 2025* (World Bank 2025) 6–10; U.S. Energy Information Administration (EIA), *Country Analysis Brief: Nigeria* (EIA 2025) 4–5.

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Institutional Alignment and Future Prospects: Overcoming jurisdictional overlaps remains central to achieving flaring abatement. The Petroleum Industry Act (PIA) 2021 streamlined institutional roles by dissolving legacy entities such as the Department of Petroleum Resources (DPR) and dividing oversight between the Nigerian Upstream Petroleum Regulatory Commission (NUPRC) and the Nigerian Midstream and Downstream Petroleum Regulatory Authority (NMDPRA).

While NUPRC enforces upstream flaring prohibitions under Section 104 of the PIA, the National Environmental Standards and Regulations Enforcement Agency (NESREA) maintains broader national environmental standards. Enhancing inter-agency coordination, enforcing statutory flare penalties, and securing private sector investment in midstream infrastructure remain essential for Nigeria to fulfill its Paris Agreement pledges and achieve sustainable energy security.[91]

6. Constraints and Challenges in Nigeria's Gas Flaring Policies

Historically, Nigeria ranked among the most prominent contributors to global gas flaring; however, current data demonstrates a shifting global landscape. According to the World Bank's Global Gas Flaring Tracker (2025 data), Nigeria ranks as the 7th largest gas-flaring nation worldwide, contributing approximately 9 billion cubic meters (bcm) of flared gas annually representing roughly 5.4% of the global total (167 bcm). While no single country flares a quarter of all global gas[92], Nigeria remains among a concentrated group of nine top-flaring nations (alongside Russia, Iran, Iraq, Venezuela, Mexico, Libya, Algeria, and the United States) that collectively account for 83% of total global flaring. [93]

Regarding operational intensity, Nigeria's flaring intensity stands at approximately 14 to 15 cubic meters of gas flared per barrel of oil produced. Comparative international benchmarks highlight stark disparities in operational management: Norway maintains a strict zero-routine flaring policy with a flaring intensity below 1 cubic meter per barrel (<1% of production), whereas mature regulatory jurisdictions like Alberta, Canada,

[91] Petroleum Industry Act 2021, ss 4, 29, 104–107; National Environmental Standards and Regulations Enforcement Agency (Establishment) Act 2007, ss 7–8.

[92]

[93] World Bank, *Global Gas Flaring Tracker Report 2025* (World Bank 2025) 4–8 (noting Nigeria's annual flare volume of ~9 bcm, ranking 7th globally and contributing ~5.4% of global flare volumes); see also Nigerian Upstream Petroleum Regulatory Commission (NUPRC), *National Gas Flare Tracker Data* (NUPRC 2024) 11–14.

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enforce strict volumetric thresholds under AER Directive 060, achieving flaring efficiency rates well below historical levels. Within Nigeria's Niger Delta region, regulatory monitoring by the Nigerian Upstream Petroleum Regulatory Commission (NUPRC) identifies over 178 active flare sites across onshore and shallow offshore concessions, where continuous routine flaring remains a persistent operational challenge due to midstream gas-gathering infrastructure deficits.[94]

Despite multiple government policies, regulations, and incentives aimed at reducing flaring, the practice persists unabated. By 2010, gas flaring volumes were expected to increase alongside oil production targets of 4 million barrels per day. Currently, Nigeria produces approximately 5.5 billion standard cubic feet (scf) of gas daily, but only 2.6 billion scf is effectively utilized, raising the question: why has Nigeria failed to substantially reduce gas flaring despite the presence of regulatory frameworks? Several intertwined constraints undermine effective policy implementation.

Firstly, the Nigerian government's dual role as regulator and joint venture partner in oil production creates inherent conflicts of interest. The government holds majority shares in many joint ventures (JVs) such as the Nigerian Liquefied Natural Gas (NLNG) project.[95] This entanglement hinders enforcement, as penalizing JV partners often translates to penalizing itself, thereby weakening regulatory resolve.[96]

Secondly, the government's inability to meet its financial obligations under JV agreements further diminishes its enforcement credibility.[97] The government's failure to pay cash obligations disempowers it from compelling compliance or sanctioning oil companies for flaring violations. Nevertheless, this does not absolve the oil firms of responsibility, as the blame for prolonged flaring cannot be solely attributed to governmental lapses.[98]

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[94] Norwegian Offshore Directorate, *Resource Management and Environmental Status* (NOD 2024) 6–9; Alberta Energy Regulator (AER), *Directive 060: Upstream Petroleum Industry Flaring, Venting, and Incineration* (AER 2023) ss 2–3.
[95] Nigerian National Petroleum Corporation (NNPC) Annual Report (2006) 42. Nigerian Upstream Petroleum Regulatory Commission (NUPRC), *Gas Flare Commercialisation Programme: Baseline Flare Site Audit Report* (NUPRC 2023) 15–18 (identifying 178 active flare locations in the Niger Delta).
[96] Ibid.
[97] A. Okorodudu-Fubara, 'Gas Flaring in Nigeria: Legal and Economic Issues' (2007) 21 Journal of Energy Law 33.
[98] Ibid.

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A third major systemic challenge is Nigeria's long-standing economic dependence on crude oil exports, which historically accounted for roughly 90% of total foreign exchange earnings and over half of government revenue.[99] Historically, this deep fiscal reliance on oil revenues repeatedly compromised the political will of legacy institutions such as the now-dissolved Department of Petroleum Resources (DPR) to enforce stringent penalties against multinational oil companies, resulting in a series of deferred flare-out deadlines.[100]

Under the present legal framework, however, the statutory landscape and institutional mandates have been restructured. The Petroleum Industry Act (PIA) 2021 formally abolished legacy regulators (including the DPR and the Petroleum Equalisation Fund) and replaced them with specialized, autonomous regulatory authorities: the Nigerian Upstream Petroleum Regulatory Commission (NUPRC) for upstream operations and the Nigerian Midstream and Downstream Petroleum Regulatory Authority (NMDPRA) for processing and distribution.[101]

Presently, Section 104 of the PIA strictly prohibits routine flaring, charging NUPRC with enforcing statutory flare penalties and administering the Nigerian Gas Flare Commercialization Programme (NGFCP).[102] Rather than relying on the ad-hoc executive deferrals of the past, recommendations for effective present-day enforcement require NUPRC and NMDPRA to maintain strict regulatory independence, mandate real-time digital metering at flare stacks, and direct collected penalties into the Environmental Remediation Fund to balance national economic interests with environmental and public health protections.[103]

Fourthly, the domestic market for natural gas remains severely underdeveloped. Nigeria's internal gas demand is roughly 300 million cubic feet per day, a figure constrained by widespread poverty and reliance on

[99] Central Bank of Nigeria (CBN), *Annual Report and Statistical Bulletin 2023* (CBN 2024) 42–45; see also National Bureau of Statistics (NBS), *Foreign Trade in Goods Statistics: Q4 2024* (NBS 2025) 8–12.
[100] F. Egbogah, 'The Politics of Gas Flaring in Nigeria' (2009) 33 *Environmental Policy Review* 78, 80–84; see also U.J. Orji, 'Moving from Gas Flaring to Gas Conservation and Utilisation in Nigeria: A Review of the Legal and Policy Regime' (2014) 38(2) *OPEC Energy Review* 149, 155–158.
[101] Petroleum Industry Act 2021, ss 4, 10, 29, 310 (formally repealing the Petroleum Act 1969 and dissolving legacy regulatory bodies).
[102] ibid s 104; Gas Flaring, Venting and Methane Emissions (Prevention of Waste and Pollution) Regulations 2023, reg 4–8.
[103] Petroleum Industry Act 2021, ss 103, 105; Nigerian Upstream Petroleum Regulatory Commission (NUPRC), *Upstream Environmental and Flare Management Guidelines* (NUPRC 2024) 15–19.

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cheaper, traditional energy sources.[104] Additionally, high transportation costs and limited infrastructure restrict access to export markets.[105] For example, the National Electric Power Authority (NEPA), the country's primary gas consumer, operates at limited capacity, further dampening demand for associated gas.

Furthermore, inadequate gas utilization infrastructure and ineffective policy enforcement exacerbate flaring.[106] The regulatory agencies, such as the Department of Petroleum Resources (DPR) and Federal Environmental Protection Agency (FEPA), face severe financial and technical limitations that hinder site monitoring and enforcement.[107] Unlike Alberta's Energy and Utilities Board, which conducted over 8,000 inspections in 2002, Nigerian regulators rely heavily on self-reporting by oil firms, undermining transparency and accuracy.[108]

The laxity of regulatory systems is compounded by the nominal fines imposed on flaring companies.[109] For instance, while Algeria levies non-deductible taxes of $100 per 1,000 cubic feet of flared gas, Nigerian penalties are a mere 10 cents per cubic foot, trivial compared to the tens of dollars per barrel earned by companies.[110] This skewed cost-benefit calculation encourages firms to continue flaring rather than invest in costly gas capture technologies.

Environmental laws exist but suffer from poor enforcement, partly due to regulatory corruption and incompetence. The Environmental Impact Assessment (EIA) processes have been compromised by awarding contracts to underqualified consultants, often selected on the basis of the lowest bid or bribery, undermining environmental scrutiny.[111] Oil companies often downplay the environmental and health impacts of flaring, asserting their operations are safe for humans and livestock. However, reports such as the James Argo study highlight significant harm caused by gas flaring, from atmospheric pollution to respiratory ailments in local

[104] Nigerian Electricity Regulatory Commission Report (2010) 24.
[105] Ibid.
[106] D. Ogbonna, 'Infrastructure Deficit and Gas Utilization in Nigeria' (2011) 7 Nigerian Journal of Energy 88.
[107] Ibid.
[108] Alberta Energy and Utilities Board, 'Inspection Report 2002' (2003) 17.
[109] F. Egbogah (n 109) 81.
[110] Human Rights Watch, 'The Price of Oil: Corporate Responsibility and Human Rights Violations in Nigeria's Niger Delta' (1999) 38.
[111] James Argo Report, 'Environmental Impact of Gas Flaring in Nigeria' (2004) 6.

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communities.[112] Moreover, these firms claim technological limitations impede flaring reduction efforts, yet these justifications are questionable given their success in reducing flaring in other countries.

The social dimension is equally troubling. Most gas flares are located in rural Niger Delta communities where inhabitants are often uneducated and unaware of the dangers posed by prolonged exposure to toxic emissions.[113] Historically, public awareness of environmental risks associated with oil production has been limited, with earlier focus predominantly on oil spills rather than flaring.[114] This contrasts sharply with developed nations where public pressure plays a pivotal role in curtailing gas flaring due to higher environmental consciousness.

Incidents of unsafe practices near flaring sites persist. For instance, in 1977, villagers were reported drying cassava near burning flares, exposing themselves to severe risk and potential contamination.[115] Despite community protests, oil companies rarely relocate flares or implement adequate protective measures, reflecting a disregard for local health and safety.

In sum, Nigeria's gas flaring problem is entrenched in a complex web of economic, political, infrastructural, regulatory, and social challenges. These constraints highlight the urgent need for comprehensive reform and genuine commitment from all stakeholders to address this environmental and public health crisis.

7. Progress and Achievements in Gas Flaring Reduction

Historical assertions that Nigeria produces roughly 5.5 billion standard cubic feet per day (bscf/d) while utilizing only 2.6 bscf/d are outdated. According to the Nigerian Upstream Petroleum Regulatory

[112] Human Rights Watch (n 16) 42.
[113] Ibid.
[114] Ibid.
[115] Nigerian Department of Petroleum Resources Annual Report (2004) 13.

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Commission (NUPRC), average daily natural gas production reached approximately 7.93 bscf/d, with overall utilization exceeding 93%. [116]

Of this production, export sales account for roughly 3.07 bscf/d (~40%), domestic sales (power and industrial feedstocks) reach 2.18 bscf/d (~26.6%), and field operations/reinjection absorb 2.11 bscf/d (~26.5%). Flaring volumes have declined to approximately 0.57 bscf/d (~6.9% of total output), reflecting measurable structural progress toward the national target of ending routine flaring.[117]

The Nigerian government has adopted a carrot-and-stick approach to encourage oil companies to curtail flaring. In the 1998 budget, penalties for gas flaring were raised from 50 kobo to 10 naira per 1,000 cubic feet, incentivizing better compliance.[118] Major oil players have invested in gas projects, notably the Liquefied Natural Gas (LNG) initiative a joint venture between the Nigerian National Petroleum Corporation (NNPC), Shell Gas, and Chevron aimed at monetizing gas resources and reducing waste.[119] Additionally, the West African Gas Pipeline (WAGP) project, backed by the World Bank, seeks to export gas to neighboring countries like Ghana, Togo, and Benin, thereby expanding market demand.[120]

Legislatively, Nigeria has developed a framework that aligns with global best practices such as those set by the Global Gas Flaring Reduction (GGFR) initiative.[121] The National Gas Policy (NGP) incorporates clauses on gas utilization in production-sharing contracts with oil companies, requiring gas field optimization studies and enhancing regulatory oversight.[122] The Department of Petroleum Resources published comprehensive environmental monitoring guidelines in 2002, setting standards for pollution control and safety audits.[123]

[116] Nigerian Upstream Petroleum Regulatory Commission (NUPRC), *National Natural Gas Production, Utilization and Flare Report* (NUPRC 2026) 4–8 (noting total daily production of 7.93 bscf/d, domestic sales of 2.18 bscf/d, export allocations of 3.07 bscf/d, and an overall gas utilization rate of ~93.1%).
[117] Ibid
[118] Shell Nigeria Annual Report (2007) 55
[119] Ibid.
[120] World Bank, West African Gas Pipeline Project Documentation (2006) 9.
[121] Global Gas Flaring Reduction Partnership, 'Best Practices Report' (2005) 10.
[122] Nigerian National Gas Policy Document (2008) 31.
[123] Department of Petroleum Resources, Environmental Guidelines (2002) 27.

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Moreover, carbon emissions associated with flaring have decreased moderately. Nigeria's carbon output dropped from 27.7 million metric tonnes in 1996 to 23.5 million tonnes in 2001 a 30% reduction in carbon intensity, the lowest among OPEC countries. [124] Politically, government officials have reiterated commitments to eliminate gas flaring. In 2002, the state minister Ime Titus Okopido emphasized environmental compliance as a criterion for awarding future contracts.[125] In 2004, the House Committee on Gas publicly affirmed the 2008 deadline for ending flaring and vowed strict enforcement against defaulters.[126]

Despite these advancements, the deadline for zero flaring has repeatedly been postponed, and oil companies continue to cite constraints such as inadequate downstream infrastructure, insufficient government support, high capital costs for processing facilities, and the challenge of gathering dispersed associated gas economically.[127] These justifications underscore the persistent obstacles in eradicating gas flaring in the near term. Nonetheless, the progress achieved offers a foundation upon which to build more stringent and effective measures to curb flaring and protect Nigeria's environment and communities.

8. Conclusion and Recommendations

Gas flaring in Nigeria epitomizes the complex intersection of environmental degradation, public health risks, economic dependency, and governance challenges. The environmental consequences are severe: flaring releases vast amounts of greenhouse gases, contributes to climate change, pollutes air and water, and causes respiratory and other health problems for communities living in close proximity to flare sites.[128] Socially, the practice exacerbates poverty by damaging livelihoods, especially in rural Niger Delta communities where residents bear the brunt of pollution yet remain largely uninformed and unprotected.[129]

Economically, Nigeria's dependence on oil revenue has created a precarious balance where environmental priorities are frequently subordinated to short-term financial interests. This dynamic is reinforced by

[124] International Energy Agency, 'CO2 Emissions from Fuel Combustion' (2002) 14.
[125] Nigerian Ministry of Environment Press Release (2002).
[126] Nigerian House Committee on Gas Statement (2004).
[127] F. Egbogah (n 109) 86.
[128] UNEP (n 103) 19.
[129] Human Rights Watch (n 116) 44.

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inadequate regulatory frameworks, insufficient enforcement, and the conflicting interests arising from government participation in oil joint ventures. Although some progress has been made in reducing flaring volumes and increasing gas utilization, these efforts fall short of what is needed to eliminate gas flaring decisively.

To address these issues, a multi-faceted approach is essential:

A. Modernizing Regulatory Oversight and Institutional Frameworks: The Federal Government must strengthen current regulatory bodies established under the Petroleum Industry Act (PIA) 2021 specifically the Nigerian Upstream Petroleum Regulatory Commission (NUPRC) and the Nigerian Midstream and Downstream Petroleum Regulatory Authority (NMDPRA) while streamlining overlap with the National Environmental Standards and Regulations Enforcement Agency (NESREA). Moving past the dissolved Department of Petroleum Resources (DPR) and repealed Federal Environmental Protection Agency (FEPA), NUPRC must maintain operational independence and enforce mandatory, real-time digital metering at flare sites.
B. Restructuring Joint Venture Funding and Governance: The Federal Ministry of Petroleum Resources, the Nigerian National Petroleum Company Limited (NNPCL), and joint venture (JV) partners should reassess existing JV capital expenditure frameworks. Transitioning from legacy funding bottlenecks to transparent cash-call models will accelerate capital allocation toward essential gas-gathering, treatment, and processing infrastructure across oilfields.
C. Enhancing Transparency, Penalties, and Permitting Standards Section 104 of the PIA 2021 must be stringently enforced by ending lenient exemptions. Flaring permits should only be granted under narrow, non-routine safety exceptions. Furthermore, statutory flare penalties must be set at rates higher than the cost of gas utilization technology directed into the Environmental Remediation Fund to compel operators to invest in Flare Gas Recovery Systems (FGRS).
D. Implementing Paris Agreement NDCs and Methane Abatement Rather than referencing legacy milestones such as the Kyoto Protocol (which Nigeria ratified in 2004), policy must prioritize executing Nigeria's updated Nationally Determined Contribution (NDC) under the Paris Agreement. This requires establishing robust Monitoring, Reporting, and Verification (MRV) protocols to meet

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national commitments: eliminating routine flaring by 2030 and reducing fugitive methane emissions by 60% by 2031

E. Accelerating Domestic Gas Markets and Community Engagement To monetize captured gas, the government must advance the "Decade of Gas" initiative and the Nigerian Gas Flare Commercialization Programme (NGFCP), expanding downstream pipeline networks for domestic gas-to-power generation and industrial feedstocks. Simultaneously, institutionalized community engagement campaigns must empower host populations in the Niger Delta to participate in environmental monitoring and benefit directly from local gas utilization projects.