CLEAN AIR TASK FORCE CARBON LIMITS

Methane Abatement in Nigeria's Oil and Gas Sector

This fact sheet presents findings for Nigeria from a broader study assessing the costs and financial implications of methane abatement measures across nine countries in Africa and Latin America. The study aims to support regulators in designing appropriate incentives and policies to guide and prioritize the deployment of abatement technologies.

Estimates of abatement potential and mitigation costs are developed at the country level, accounting for real-world constraints including existing policy frameworks, ease of deployment, and prevailing industry practices. Four key abatement measures were analyzed: leak detection and repair (LDAR) programs, installation of vapor recovery units (VRU) for storage tanks, replacement of natural gas-driven pneumatic equipment with electric or air-driven alternatives, and improved flaring practices. Additional technologies, operational practices, and regulatory approaches can further drive methane reductions but are beyond the scope of this study. The full report, published in June 2026, is available via the QR code.

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Key figures

Estimated annual emissions[1]

1,794 kt methane

(53.5 Mt CO_2e)

Emissions analyzed[2]

865 kt methane

(48% of estimated emissions)

Technical abatement possible from analyzed technologies

30%

of estimated emissions

Low-cost abatement potential from analyzed technologies[3]

28%

of estimated emissions

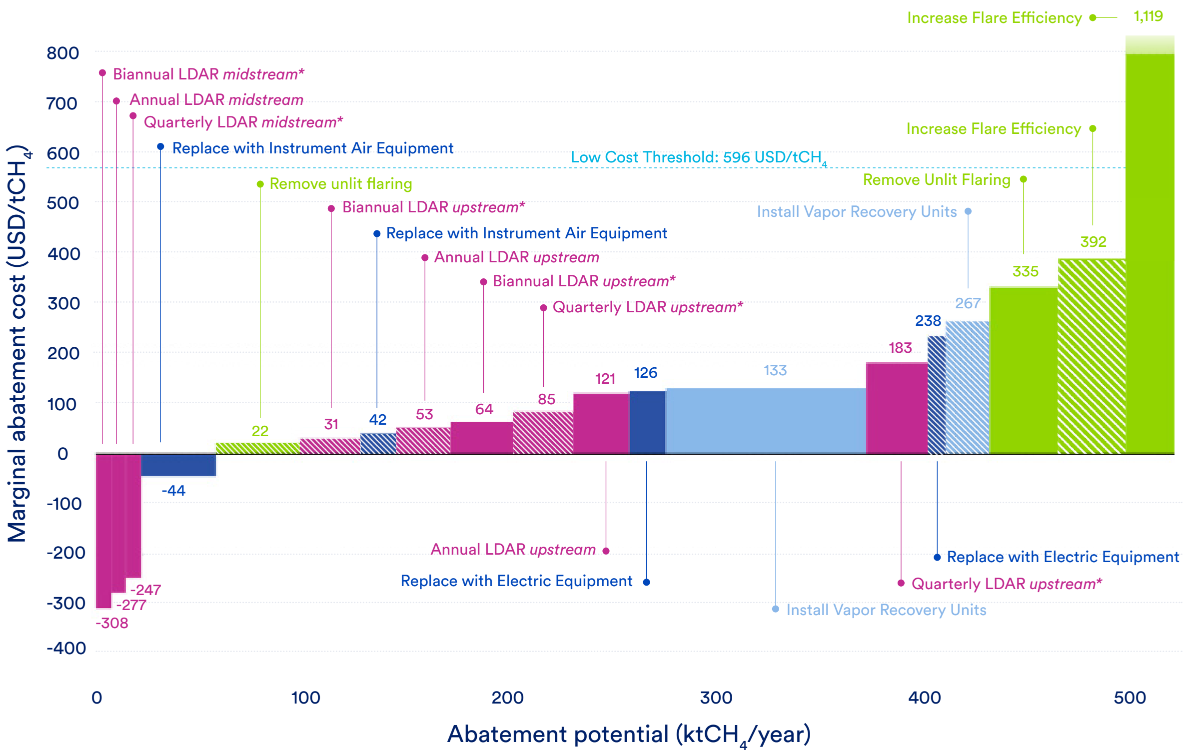
Current policies and practices

Nigeria has established a **regulatory framework[4,5] to reduce methane emissions and routine flaring** through penalties, equipment prescriptions and practice bans, and strengthened monitoring requirements. The upstream petroleum regulator (NUPRC) enforces a dynamic flare regulation system with progressively stricter thresholds targeting zero routine flaring by 2030, with penalties set to match or exceed market gas prices. While this framework provides a clear policy signal and is **increasingly reflected in operators' methane management strategies**, opportunities exist to strengthen and optimize its implementation.

In practice, progress remains uneven. While most onshore assets connect to the domestic pipeline network, many offshore facilities remain disconnected due to high infrastructure costs and regulated prices, resulting in continued flaring or reinjection. To address this, Nigeria is **expanding gas market opportunities through infrastructure development and investment-oriented government programs**, which are gradually improving conditions for gas capture, transport, and commercialization.[6] This policy direction is supporting the integration of methane abatement projects.

Deployment technologies remains constrained by high equipment costs (mainly due to dependence on imported solutions), **limited technical capacity, competing priorities**, as well as ongoing gas infrastructure gaps. Since Nigeria encourages the use of local labor for methane mitigation services, international service providers will have to plan for this to deploy methane mitigation technologies in the country.

Nigeria Marginal Abatement Cost Curve for Selected Mitigation Options



Abatement technologies

- Leak detection and repair (LDAR)
- Replace natural gas driven equipment
- Offshore
- Improve flaring practices
- Install vapor recovery units (VRU) for storage tanks

**Biannual costs reflect costs of increasing from annual to biannual. Quarterly costs reflect costs of increasing from biannual to quarterly*
Based on emissions data from International Energy Agency (2025) Methane Tracker Database - IEA; as modified by Carbon Limits/CATF

Analysis

Mitigation economics largely depends on whether recovered methane can be monetized: when gas can be sold, abatement costs fall, and when it is flared or reinjected, costs rise. This dynamic explains why some measures, such as replacing natural gas-driven equipment with electric or air-driven alternatives and implementing onshore midstream LDAR, show negative abatement costs, as recovered gas generates net savings. These savings depend on assumptions regarding gas marketability and prices. The ability to sell gas is especially important in Nigeria, where flared volumes may incur penalties, further weakening the economics of measures that do not enable commercialization. In this analysis, it is assumed that 100% of recovered gas in the midstream segment can currently be brought to market at a price of 10 USD/MMBtu, while 80% of onshore upstream recovered gas and 50% of offshore upstream recovered gas can currently be brought to market at a price of 5 USD/MMBtu. Under these assumptions, most mitigation measures assessed fall below the low-cost threshold of 596 USD/t CH_4 (20 USD/t CO_2e).

Technology-specific factors also shape costs: vapor recovery units are cheaper onshore than offshore due to space and feasibility constraints, while flaring-related measures always have positive costs because the gas is still flared and does not generate any additional source of revenue. Reducing unlit flaring can be achieved using relatively low-cost technologies, while improving flaring efficiency requires significant capital and operational resources.

Beyond gas monetization, abatement costs are influenced by a range of implementation factors, including import costs (such as taxes and permitting requirements), the need to mobilize foreign service providers for LDAR activities or technology installation, site accessibility constraints, and higher travel and logistics costs for offshore assets compared to onshore operations.

Overall, deploying the full portfolio of considered abatement measures could result in 533 kt of methane emissions reductions per year at a total cost of around USD 95 million/year. *If all recovered upstream gas were assumed to be saleable at 5 USD/MMBtu, total abatement costs could decline to around USD 65 million/year.*

Summary of analyzed mitigation technologies in Nigeria

For further details, please refer to the mitigation technology fact sheets for each abatement technology.

Leak detection and repair (LDAR)

Implementation of Leak detection and repair programs at quarterly inspection frequency

Ease of deployment	Current practices	Abatement potential	Marginal abatement cost
Easy	Medium adoption	198 kt CH_4 abatable	48 USD/tCH_4

- For upstream operations, the current regulation[4] requires quarterly LDAR inspections, with companies operating over 10 facilities allowed to use phased inspections covering 50% of sites over two years, and sets out timelines according to which detected leaks should be repaired.
- LDAR deployment is led by international operators, while some local operators have begun implementing detection programs, often carried out in partnership with international service providers. Nonetheless, adoption of LDAR remains comparatively lower among indigenous operators.
- Despite challenges around funding and equipment costs, the policy framework is increasingly encouraging operators to strengthen LDAR practices.

Improve flaring practices

Improvement of flaring practices through increased flare efficiency and elimination of unlit flaring

Ease of deployment	Current practices	Abatement potential	Marginal abatement cost
Intermediate	Low adoption	133 kt CH_4 abatable	486 USD/tCH_4

- The current regulation[4] requires all flared gas to be combusted using an auto-igniter or continuous pilot and mandates that operations maintain a minimum 98% destruction removal efficiency (DRE) for hydrocarbons. If a flare is found unlit while venting gas, operators shall restore ignition within 48 hours.
- Average destruction removal efficiency is currently estimated at 96%, and most operators prioritize reducing flare volume over optimizing flare performance. To avoid flaring penalties, companies are investing in gas utilization or monetization solutions, including reinjection where immediate use isn't feasible.

Install vapor recovery units for storage tanks

Installation of vapor recovery units (VRUs) on storage tanks

Ease of deployment	Current practices	Abatement potential	Marginal abatement cost
Intermediate	Low adoption	121 kt CH_4 abatable	157 USD/tCH_4

- The current regulation[4] requires storage tanks with potential to emit more than 2 tons per year of volatile organic compounds to have vapor recovery units or to send vapors to a combustion system. International and local operators are gradually installing this technology.
- Adoption remains limited by the high cost of vapor recovery unit installation and the need for recovered gas to have on-site or market value for the investment to pay off (typically within a couple of years). Integration challenges further slow deployment, especially offshore where space, weight, and safety constraints can make retrofits more complex and expensive.

Replace natural gas driven equipment

Replacement of natural gas-driven pumps and controllers with electric or air-driven alternatives

Ease of deployment	Current practices	Abatement potential	Marginal abatement cost
Intermediate	Medium adoption	82 kt CH_4 abatable	43 USD/tCH_4

- The current regulation[4] bans natural-gas-driven controllers and pumps, requiring operators to retrofit with zero-bleed electric or devices, or route emissions to a vapor-recovery system by 2027.
- In practice, companies have begun reducing reliance on continuous bleed pneumatic equipment using improved pneumatic designs, electric drives, or instrument air systems, particularly on newer assets.

Legend
Ease of deployment: indicator of how easily an abatement measure can be deployed at scale, considering regulatory, logistical, and infrastructure constraints.
Current practices: indicator of the level of existing deployment of an abatement measure in the country.

Policy recommendations

Nigeria has developed a relatively comprehensive regulatory framework covering the methane mitigation technologies assessed and is now **transitioning from policy development to implementation.** The marginal abatement cost curve (MACC) indicates that, if effectively implemented, methane mitigation measures could deliver net economic benefits while addressing remaining adoption barriers. Near-term priorities could therefore focus on **strengthening implementation and enforcement of existing regulations**, alongside the development of effective measurement, reporting and verification (MRV) systems and improved institutional coordination across the gas value chain. Several mitigation options (notably LDAR, VRU installation, and replacement of natural gas-driven equipment) show low or negative marginal abatement costs, thanks mainly to the possible return from saved gas outweighing the cost of the measures. For these low-cost measures, regulatory action, including strict enforcement of existing bans, equipment standards and emissions limits can further support their implementation, as well as capacity-building programs for operators.

Over the medium term, targeted policy instruments such as concessional loans, tax incentives, or fiscal transfers could help address financial barriers, particularly where ownership structures affect who captures the value of recovered gas. **Continued investment in gas processing and transport infrastructure** would further improve commercialization prospects.

In the longer term, creating an enabling environment for sustained financing and investment would support the scaling methane mitigation. Within this context, **international climate or carbon finance** could be used where appropriate to support higher-cost measures.

Methodology

This study estimates methane abatement potential and costs using a bottom-up marginal abatement cost curve (MACC) approach. The analysis covers four emission sources in the oil and gas sector (flaring, fugitive equipment leaks, tanks, and natural gas-driven pneumatic equipment) and evaluates a set of abatement measures for each source.

Abatement potential and costs were refined through nineteen interviews with stakeholders operating in Nigeria, including government representatives, oil and gas companies, and technology and service providers. These interviews were complemented by a comprehensive literature review and informed assumptions on technology deployment, applicability, performance, implementation costs, and operational practices, ensuring the analysis reflects local conditions. Where recovered gas can be sold, revenues are deducted using local gas prices where available, or international benchmark prices adjusted to netback values. Country-specific MACCs were then developed using local discount rates to reflect national investment conditions and financial risks.

While this study focuses primarily on abatement costs, methane mitigation is driven by a broader set of benefits, including improved operational safety and asset integrity, enhanced local air quality, immediate climate gains due to methane's high short-term warming potential, reduced social costs of methane emissions, improved operational excellence or international regulatory compliance.

Scan the QR code at the start of this document for a full description of the methodology and key assumptions. Disclaimer: The figures presented in this fact sheet are based on national-level estimated data and analytical assumptions from 2025. Actual emissions, abatement potential, and costs may vary due to data limitations, site specific conditions, operational constraints, and cost structures. This document is intended for informational purposes only and should not be relied upon as the sole basis for investment, operational, or policy decisions. Regulators are invited to reach out to CATF for further discussions on understanding the assumptions underlying the cost curves and for guidance on the adoption and implementation of methane regulation.

1 Based on data from International Energy Agency (2025) *Methane Tracker Database - IEA*; as modified by Carbon Limits and CATF. For further details, please refer to the methodology report.
2 Emissions analyzed refer to the share of total methane emissions impacted by the abatement measures studied.
3 Low cost refers to a cost less than 596 USD/tCH_4 (20 USD/tCO_2e using GWP 100)
4 Nigerian Upstream Petroleum Regulatory Commission (NUPRC). (2022). *Guidelines For Management Of Fugitive Methane And Greenhouse Gases Emissions In The Upstream Oil And Gas Operations In Nigeria.* Available at: https://www.nuprc.gov.ng/wp-content/uploads/2022/11/METHANE-GUIDELINES-FINAL-NOVEMBER-10-2022.pdf
5 Federal Republic of Nigeria. (2023). *Gas Flaring, Venting and Methane Emissions (Prevention of Waste and Pollution) Regulations, 2023.* Available at: https://www.nuprc.gov.ng/wp-content/uploads/2023/07/GAS-FLARING-REGULATIONS.pdf
6 The Nigerian Gas Flare Commercialization Project was launched to enable private investors to bid for flare sites and develop infrastructure to capture and utilize the gas for domestic consumption.