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Methane Abatement in Libya's Oil and Gas Sector

This fact sheet presents findings for Libya 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]

1,221 kt methane

(36.4 Mt CO_2e)

Emissions analyzed[2]

962 kt methane

(79% of estimated emissions)

Technical abatement possible from analyzed technologies

55%

of estimated emissions

Low-cost abatement potential from analyzed technologies[3]

55%

of estimated emissions

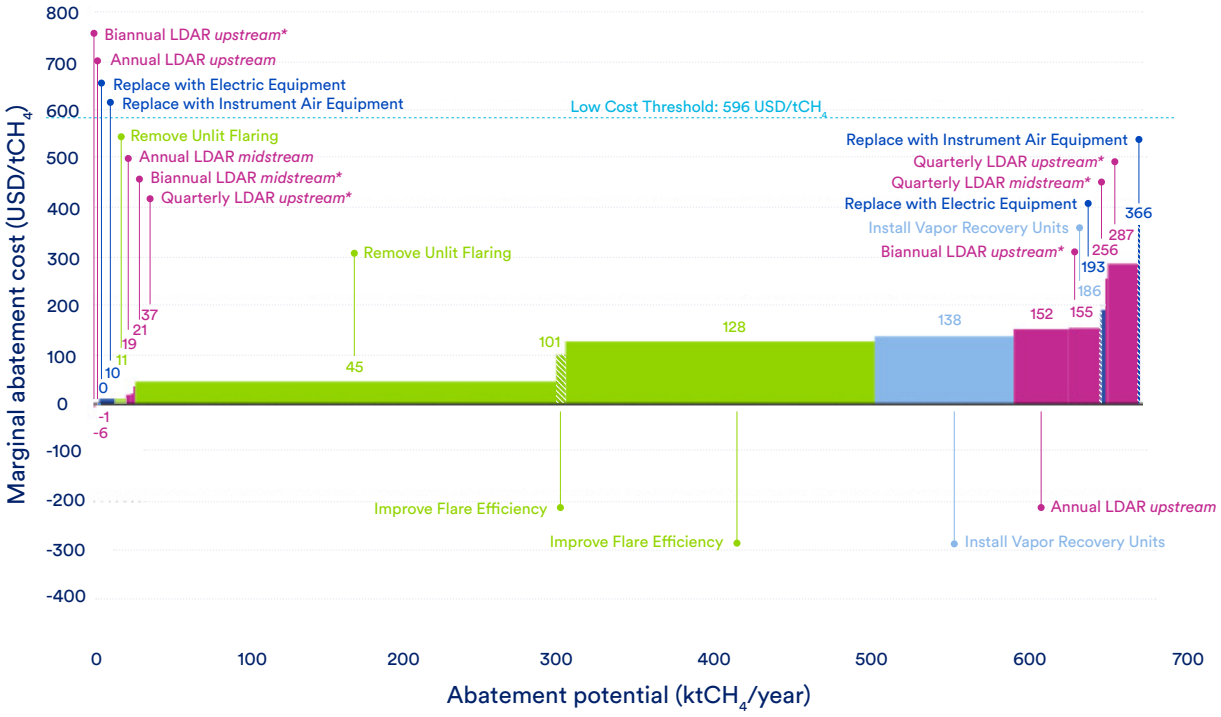
Current policies and practices

Libya currently lacks a dedicated methane regulatory framework for the oil and gas sector. Emissions are addressed indirectly through general environmental and petroleum laws[4,5], based on broad pollution control obligations and compliance with the sector's best practices. While earlier laws did not explicitly prohibit routine flaring or venting, a recent regulation[6] marks a shift by classifying excessive flaring as a waste of national resources and restricting it to testing or emergency situations subject to approval. Although implementation and enforcement remain at an early stage, this regulation represents a step toward stronger control of methane emissions from flaring.

Libya's gas sector is closely linked to oil production, with high volumes of associated gas. Most gas is consumed domestically, primarily for power generation, while a smaller share is exported. However, **export capacity is not fully utilized** due to declining production and rising local demand. At the same time, **aging and insufficient gas gathering, processing, and transport infrastructure** continue to limit gas utilization and contribute to flaring in some areas, despite recent efforts to expand capacity.

Methane mitigation in Libya faces **several technical and operational barriers**, including **high upfront capital costs, limited access to financing, security and logistical constraints, infrastructure gaps, and import restrictions**[7] affecting specialized mitigation equipment. At the same time, **external market pressures could become an important driver for mitigation efforts**, as the European Union (the largest destination[8] for Libyan oil and gas exports) implements the EU Methane Regulation[9].

Libya Marginal Abatement Cost Curve for Selected Mitigation Options



Abatement technologies

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

**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, marginal abatement costs fall, and when it is flared or reinjected, costs rise. This dynamic explains why some measures, despite representing small volumes, show negative abatement costs, as recovered gas generates net savings. These savings rely on assumptions regarding gas marketability and prices. In this analysis, it is assumed that 100% of recovered gas in the midstream segment can be brought to market at a price of 10 USD/MMBtu, while 40% of recovered gas upstream can be brought to market at a price of 5 USD/MMBtu. Under these assumptions, all mitigation measures assessed fall well below the low-cost threshold of 596 USD/t CH_4 (20 USD/t CO_2e).

Within this cost range, the elimination of unlit flaring in the onshore upstream segment delivers the largest single abatement potential, with approximately 271 kt of methane emissions reductions per year at a marginal abatement cost of around 45 USD/t CH_4. Improvements in flaring destruction efficiency also remain below the low-cost threshold. Although these measures require additional investment and do not generate economic value as gas continues to be flared, the significant volumes flared in Libya mean that such upgrades can still deliver substantial emissions reductions at a relatively low cost. The installation of vapor recovery units provides a significant methane emissions reduction opportunity, reflecting their currently limited deployment, while remaining within the low-cost abatement range.

Overall, deploying the full portfolio of considered abatement measures could result in 672 kt of methane emissions reductions per year at a net cost of around USD 66 million/year. *If all recovered upstream gas were assumed to be saleable at 5 USD/MMBtu, net abatement costs could decline to around USD 48 million /year.*

Summary of analyzed mitigation technologies in Libya

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
Difficult	Low adoption	87 kt CH_4 abatable	170 USD/tCH_4

- Libya currently has no regulations requiring LDAR programs or specifying inspection frequency, technologies, or reporting standards. LDAR deployment remains limited and uneven across operators, though some international joint ventures have conducted targeted measurement campaigns. Major gaps include limited access to equipment such as optical gas imaging cameras and drones and a limited number of trained personnel. Import approval procedures and security clearances further delay deployment. The combination of these factors makes LDAR deployment difficult.

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	482 kt CH_4 abatable	94 USD/tCH_4

- Libya does not impose detailed performance, monitoring, or maintenance requirements for flaring systems. Regulation is limited to controlling flaring and gas losses under petroleum legislation[6], although implementation and enforcement remain at an early stage.
- In practice, operators prioritize reducing flared volumes rather than optimizing flare performance, investing instead in gas utilization or monetization solutions which also supports methane emissions reduction, but fall outside the scope of this analysis. Initiatives such as one of NOC's subsidiaries aiming near-zero flaring targets for 2030 provide strategic direction, but implementation is constrained by financing, infrastructure needs, and weak regulatory enforcement.

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
Difficult	Low adoption	90 kt CH_4 abatable	139 USD/tCH_4

- There are no regulatory requirements mandating the installation of vapor recovery units (VRUs) on storage tanks, and deployment depends on operator investment decisions and available gas utilization pathways. In practice, VRUs have been applied selectively, mainly at light crude storage sites and newer facilities, with early projects demonstrating strong economic and emissions benefits. However, wider deployment remains constrained by upfront costs, aging infrastructure, and limited incentives. Opportunities primarily exist where recovered gas can be used on-site or integrated into nearby systems.

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	High adoption	13 kt CH_4 abatable	51 USD/tCH_4

- Libya does not impose specific regulatory requirements targeting methane emissions from natural gas-driven pneumatic equipment, leaving technology choices to operators. In practice, such equipment is not widely used in the oil and gas sector, with most assets already relying on electric or instrument-air alternatives.

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

Libya has not established a dedicated methane regulatory framework, with emissions addressed through broader environmental and petroleum provisions. This regulatory gap may create growing exposure as the EU Methane Regulation extends to imports from 2027 onward, directly impacting Libya, whose oil and gas exports are predominantly destined for the EU. **In the near term**, Libya could **introduce targeted regulations addressing the most cost-effective mitigation opportunities**, while progressively implementing its zero-flaring ambition for 2030. Establishing flaring performance standards, such as setting minimum efficiency thresholds or eliminating unlit flaring, would provide a high-impact entry point. These measures, alongside the deployment of VRUs where gas can be monetized, offer strong abatement potential at low costs.

Over the medium term, Libya could **expand its regulatory framework to include additional mitigation measures** such as LDAR programs and the replacement of gas-driven pneumatic systems, which could incentivize the conversion of remaining units to zero-emitting alternatives. **Targeted financial instruments**, such as concessional loans or fiscal incentives, could support investments in VRUs, particularly where infrastructure constraints limit returns. In parallel, **addressing import restrictions on key equipment** would also ease the deployment of mitigation technologies.

In the longer term, addressing structural constraints will be essential to sustain methane mitigation efforts. **Continued development of gas processing and transmission infrastructure** could improve the economics of methane recovery by expanding monetization opportunities. Projects that capture and utilize previously flared gas could further lower the effective cost of mitigation measures and support sustained emissions reductions over time.

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 fifteen interviews with stakeholders operating in Libya, including 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 State of Libya. (1955). *Petroleum Law No. 25 of 1955*. Available at: https://security-legislation.ly/latest-laws/law-no-25-of-1955-on-the-petroleum-law/
5 State of Libya. (2003). *Law No. 15 of 2003 on Protection and Improvement of the Environment.* Available at: https://environment.gov.ly/law-no-15/
6 Ministry of Oil and Gas (State of Libya). (2024). *Petroleum Regulation #10 For the Conservation of Oil & Gas Ressources, Health, Safety & Environment.* Available at: https://ogm.gov.ly/ar/wp-content/uploads/2025/10/Petroleum-Regulation-10.pdf
7 State of Libya. (2010). *Law No. 10 of 2010 On Customs*. Available at: https://security-legislation.ly/latest-laws/law-no-10-of-2010-on-customs/
8 U.S. Energy Information Administration. (2024). *Libya Analysis*. Available at: https://www.eia.gov/international/analysis/country/LBY
9 European Union. (2024). *Regulation (EU) 2024/1781 on the reduction of methane emissions in the energy sector and amending Regulation (EU) 2019/942.* Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=OJ:L_202401787