Facilitating, Enabling, and Triggering Sectoral Transitions: Colombia

Case Study 17. Gas Flaring in Colombia

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Eliminating routine gas flaring must be central to decarbonization efforts. This burning of natural gas associated with oil extraction contributes to climate change and impacts the environment through CO_2, methane, and other emissions (World Bank 2021f). Each year, gas flaring contributes around 400 $MtCO_2e$ to global emissions; according to a World Bank study, it could cost as much as $100 billion to end all routine flaring (World Bank 2018c).

Reducing gas flaring provides energy conservation cobenefits, allowing the gas to be either conserved or used for productive purposes, such as generating power and expanding energy access. In 2021, the Global Gas Flaring Reduction Partnership estimated that more than 144 billion cubic meters of gas were flared at oil and gas production sites around the world (World Bank 2022g). This is enough to generate some 1,800 TWh of energy, almost two-thirds of the EU's net domestic electricity generation or equivalent to Sub-Saharan Africa's entire electricity generation capacity.

Colombia has made significant advancements in reducing gas flaring. Through a combination of government and business action, the volume of gas flared in Colombia has declined by almost 70 percent.

Context

Colombia is an emerging market economy with domestic oil reserves. Crude petroleum is Colombia's largest export (by value) and contributes almost $7.5 billion to the economy each year (OEC 2023). Its oil reserves are largely managed by the national oil company, Ecopetrol (EIA 2022). The majority of Colombia's gas is found in the form of associated gas, meaning the gas is produced as a by-product during crude oil extraction. Both oil and gas operations in Colombia have been troubled by strikes and protests.

Policy

Proactive company-led action helped kick-start progress on flare reduction. In 2010, Ecopetrol launched its current climate change strategy, which includes monitoring and reporting GHG emissions, reducing emissions from the company's operations and supply chain, engaging in research and development, and contributing to the national climate policy. The company developed a work plan to reduce flaring by 8 $MtCO_2e$ by 2021 and carried out some projects to reduce methane leaks from its equipment. Since 2010,

Ecopetrol has also committed to reducing its scope 1 and 2 emissions by 25 percent by 2030 compared with 2019 levels, and to achieving net zero emissions by 2050 (Ecopetrol 2020).

Ecopetrol has linked its targets to Colombia's NDC. At the end of 2020, Colombia submitted an updated NDC, increasing its commitment to reducing GHG emissions by 2030 from 20 percent to 51 percent, albeit from a slightly higher BAU scenario emission level. The new 2030 target for GHG emissions is 169 $MtCO_2e$, down from 265 $MtCO_2e$ in the original NDC submitted in 2018 (UNFCCC 2022b). The NDC notes gas utilization as an opportunity for emission reduction.

Government laws, regulations, and initiatives have supported gas utilization and flare reduction. The Colombian government has enabled progress by establishing a domestic gas market and implementing strong regulations that strictly prohibit and monetarily penalize unauthorized gas flaring. This has been led by the Ministry of Mines and Energy (MME), which is the principal governing body responsible for upstream oil and gas operations. The National Hydrocarbon Agency, Agencia National de Hidrocarburos, operates autonomously under the MME and is in charge of administering and regulating hydrocarbons, including granting flaring authorizations, setting measuring standards, and monitoring compliance. Key legislation related to gas flaring includes the following:

- *Law 10/1961*, which explicitly prohibited gas flaring in production fields for the first time. Article 14 requires all operators to avoid wasting any gas produced. If the operator does not stop wasting gas within three years, the government has the right to take ownership of gas free of charge to improve utilization.
- *MME Resolution 181495/2009*, which constitutes the main regulatory framework for exploring and producing hydrocarbons. Articles 52 and 53 prohibit gas flaring and wasting. Article 64 imposes a fine of up to $5,000 for violations.
- *MME Resolution 41251/2016*, which covers measurement and reporting requirements, including monthly reporting of flare volumes.
- *MME Resolution 40687/2017*, which establishes technical standards for offshore hydrocarbon exploration projects and regulates gas flaring and venting for these activities.
- *MME Resolution 40066/2022*, which updates provisions for flaring, venting, and fugitive methane emissions, with more detail on when flaring exemptions may be granted and greater financial penalties for infringements (fines of 2,000 to 100,000 times the legal monthly minimum wage for each breach).

Colombia has joined a global movement for tackling unnecessary flaring and methane emissions. In 2020, Ecopetrol endorsed the World Bank's Zero Routine Flaring by 2030 initiative. The following year during COP26, the government signed the Global Methane Pledge, demonstrating a commitment to voluntarily act toward reducing global methane emissions by at least 30 percent from 2020 levels by 2030. Adopting Resolution 40066/2022 has made Colombia one of the first countries to regulate flaring, venting, and fugitive methane emissions.

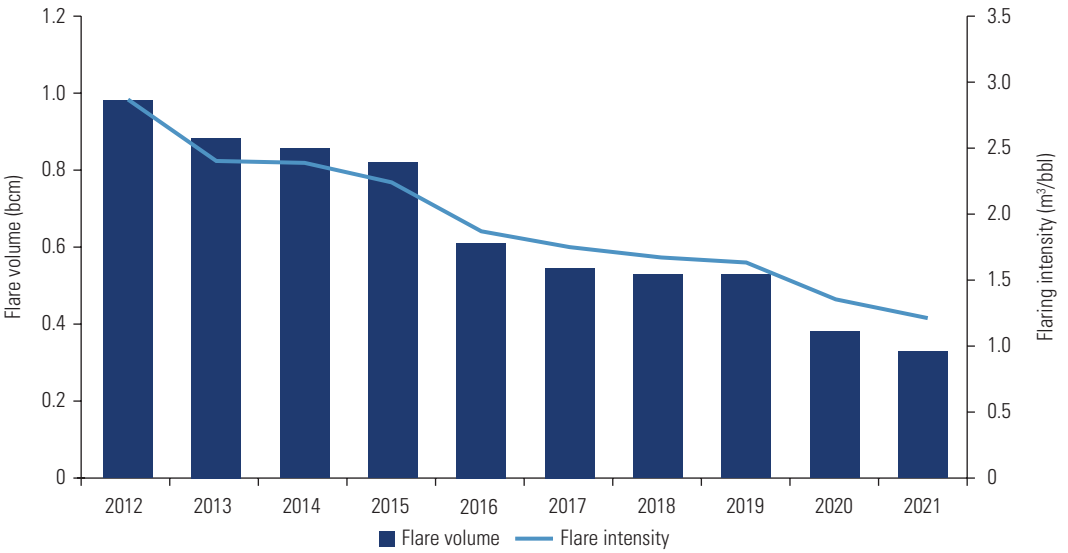
Results and Impacts

A combination of strong legal and regulatory action with proactive business leadership means that Colombia has made significant progress in reducing gas flaring over the past decade. The volume of gas flared has declined by almost 70 percent, from 1 billion cubic meters in 2012 to 0.3 billion cubic meters in 2021 (figure 3.17). Flaring intensity also declined steadily during this period, decreasing from 2.86 cubic meters of gas per barrel of oil produced in 2012 to 1.22 in 2021.

Gas flaring reductions have provided environmental, health, and economic cobenefits. Through the reductions made between 2012 and 2021, Colombia reduced its GHG emissions by 1.76 $MtCO_2e$, equivalent to 2 percent of its total emissions. These reductions have also decreased the volume of black carbon particulate matter released through flaring, which has been associated with adverse health effects. At a sales value of $2.5 per metric billion British thermal unit, the country avoided approximately $75 million of lost value in 2021, compared with 2012.

A focus on gas utilization has benefited Colombia's domestic energy supply**.** Unlike many other oil-producing nations, Colombia does not have an abundant supply of domestic natural gas. Its proven gas reserves have been in continuous decline since 2012, almost halving in volume between 2012 and 2020. In 2016, Colombia imported natural gas for the first time to meet the shortfall between domestic production and

FIGURE 3.17 Flare Volume and Intensity in Colombia, 2012–21



Source: World Bank 2021f. Taken from the National Oceanic and Atmospheric Administration, Payne Institute and Colorado School of Mines, Global Gas Flaring Reduction Partnership, and Energy Information Administration.

Note: bcm = billion cubic meters ; m^3/bbl = cubic meters of gas per barrel of oil produced.

demand (IEA 2020a). The focus on improving gas utilization through flare reduction has been an important measure for the country's energy self-sufficiency. Access to natural gas has also played a role in the nation's sustainable development goals. Over the past two decades, Colombia has made meaningful progress in improving access to clean cooking fuels and technologies, increasing population access rates from 78 percent in 2000 to 93 percent in 2020 (IEA 2022g). Clean-burning gas stovetops have contributed to some of these improvements.

Key Takeaways

The Colombian government has implemented widespread regulations around measuring, reporting, monitoring, and complying with regulations related to gas flaring. An autonomous government body, the National Hydrocarbon Agency, has monitored and enforced compliance with these regulations, making them more effective.

Establishing a domestic gas market has provided financial incentives for local operators to comply with regulations and reduce unnecessary flaring. Simultaneously, the presence of financial penalties for noncompliance provides further incentives for operators to conform.

Ecopetrol's proactive climate change strategies and commitments demonstrate how aligning business and government objectives on flare reduction can accelerate progress.

Looking to the Future

Reducing unnecessary flaring could help alleviate current gas shortages. Russia's invasion of Ukraine has sparked a global energy crisis and a large reduction in gas supplies flowing to the EU (IEA 2022d). Building new projects and infrastructure to address these shortages will take time, but the Colombian case study demonstrates that proactive action on flaring can return relatively fast results and deliver gas-saving benefits.

Further work is needed to achieve zero routine flaring. In 2015, the World Bank launched the Zero Routine Flaring by 2030 (ZRF) initiative to support cooperation between all relevant stakeholders to find solutions to gas flaring through appropriate regulation, application of technologies, and financial arrangements. To date, the ZRF initiative has garnered endorsements from 87 governments and companies, representing over 60 percent of global flaring (World Bank 2022o). Further work is needed to continue progress and eliminate routine flaring by 2030.