

Assessing Methane Emissions Policy and Climate Commitments in Azerbaijan's Hydrocarbon Economy

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Abstract

This article examines methane emissions policy and climate commitments in Azerbaijan's hydrocarbon-dependent economy, with particular attention to the oil and gas sector, which accounts for the overwhelming majority of the country's greenhouse gas (GHG) emissions. Drawing on national emissions data, international climate commitments, policy documents, and independent assessments, the study evaluates Azerbaijan's progress in methane mitigation and its broader energy transition strategy. The analysis highlights the growing discrepancy between Azerbaijan's climate pledges—including its commitments under the Paris Agreement, the Global Methane Pledge, and various international methane reduction initiatives—and the continued expansion of fossil fuel production and exports. The article argues that methane emissions from oil and gas extraction, transmission, venting, flaring, and aging infrastructure remain a major environmental challenge, while limitations in emissions measurement, transparency, and independent verification continue to undermine the credibility of official reporting. Furthermore, the study examines the environmental and economic risks associated with continued hydrocarbon dependence in a country already experiencing increasing climate vulnerability, including rising temperatures, water scarcity, land degradation, and pressure on agricultural systems. The findings suggest that meaningful methane mitigation will require modernization of energy infrastructure, enhanced monitoring and reporting mechanisms, stronger institutional transparency, and a gradual shift toward renewable energy development. Without substantial structural reforms and a credible decarbonization strategy, Azerbaijan risks falling short of its climate objectives while remaining exposed to the long-term economic and environmental costs of hydrocarbon dependence.

Keywords

Azerbaijan; Methane Emissions; Climate Change; Climate Policy; Greenhouse Gas Emissions; Oil and Gas Sector; Hydrocarbon Economy; Energy Transition; Decarbonization; Global Methane Pledge; Paris Agreement; Methane Mitigation; Energy Governance; Environmental Sustainability; Renewable Energy; Gas Flaring; Venting Emissions; Climate Vulnerability; COP29; SOCAR.

Introduction

Azerbaijan is becoming increasingly vulnerable to a broad spectrum of environmental and climate-related risks, including the declining water level of the Caspian Sea, land degradation, deforestation, water scarcity, and rising greenhouse gas emissions. These pressures are intensified by the country's continued dependence on hydrocarbon extraction and export-oriented economic development. International ecological risk assessments rank Azerbaijan among the world's more climate-vulnerable states, placing 24th out of 191 countries in the Index Risk Inform 2022 (DRMKC, 2022).¹ Despite being water-scarce, Azerbaijan is also one of the most flood-prone areas in the world, and extreme weather events cost the country approximately \$70-80 million annually.²

Azerbaijan is getting hotter and drier. Among the most pressing climate-related challenges are rising temperatures and growing hydrological stress. Recent reports indicate that the average temperature in Azerbaijan has risen, with temperature anomalies reaching 1.1°C over the past 25 years. In 2025 specifically, the average temperature was 1.6°C higher than in previous periods. Some regions, particularly highlands, have seen rises averaging between 1.1–1.3°C.³

Projections suggest that by 2030 Azerbaijan could face one of the lowest levels of per capita water availability in the South Caucasus region. These developments pose serious implications for agricultural productivity, food security, biodiversity, and rural livelihoods, particularly given the increasing frequency of droughts, heat stress, irregular precipitation patterns, and extreme weather events.

At the same time, the ongoing decline in the Caspian Sea's water level is creating additional ecological and economic pressures on coastal ecosystems, infrastructure, fisheries, and regional economic activity. Azerbaijan's climate vulnerability is further complicated by its substantial dependence on transboundary water resources: more than 70% of the country's freshwater supply originates outside its national borders.⁴ Consequently, climate adaptation and water security policies are closely linked not only to domestic environmental governance but also to regional cooperation and transboundary climate diplomacy.

Although Azerbaijan, with a population of approximately 10.22 million in 2025,⁵ contributes only around 0.15% of global greenhouse gas emissions,⁶ the structure of its emissions profile remains highly carbon-intensive. The energy sector overwhelmingly dominates national greenhouse gas emissions, reflecting the central role of oil and gas production in the country's economy.

Despite Azerbaijan's growing participation in international climate initiatives, significant contradictions remain between climate commitments and energy policy priorities. Climate Action Tracker has classified Azerbaijan's overall climate action as “critically insufficient,”⁷

¹ <https://drmkc.jrc.ec.europa.eu/inform-index/Portals/0/InfoRM/2022/INFORM%20Annual%20Report%202022.pdf>

² <https://reliefweb.int/report/azerbaijan/azerbaijan-climate-country-profile-november-2024>

³ <https://report.az/en/aic/temperature-anomaly-in-azerbaijan-reaches-1-1-c>

⁴ <https://eu4climate.eu/countries/azerbaijan>

⁵ <https://www.stat.gov.az/source/demography/>

⁶ <https://www.worldometers.info/greenhouse-gas-emissions/azerbaijan-greenhouse-gas-emissions/>

⁷ <https://climateactiontracker.org/publications/azerbaijan-country-assessment-september-2024/>

noting that although certain reductions in gas flaring have been observed, total greenhouse gas emissions are projected to increase alongside planned expansion of hydrocarbon production.

This widening gap between international climate rhetoric and domestic energy strategy reflects a broader structural contradiction in Azerbaijan's development model. As discussed in previous analyses on Azerbaijan's energy strategy and political economy, including in the Crude Accountability report, "Azerbaijan Taps into Fossil Fuel Expansion Post-COP29,"⁸ state policies continue to prioritize hydrocarbon expansion and energy-driven geopolitical influence over long-term decarbonization and sustainable transition pathways.

These contradictions became even more evident in the post-COP29 period. On behalf of the Azerbaijani state, the State Oil Company of the Republic of Azerbaijan (SOCAR) intensified both domestic and international investments in the oil and gas sector, signaling continued prioritization of fossil-fuel expansion despite increased climate commitments. One of the most recent and significant examples was SOCAR's acquisition of 99.82% of the shares of Italiana Petroli (IP) from API Holding on May 12, 2026.⁹ The transaction, initially announced in September 2025 and finalized following all required regulatory approvals—including approval from the European Commission in early 2026—marked a substantial expansion of SOCAR's international energy portfolio.

Following this acquisition, SOCAR expanded its ownership to four oil refineries: one in Azerbaijan with an actual refining capacity of approximately 6.5 million tons, one in Turkey with a refining capacity of 13 million tons, and two additional refineries in Italy with a combined capacity of approximately 10 million tons. Beyond refining infrastructure, Italiana Petroli's assets include extensive logistics and distribution networks, including petroleum storage facilities and approximately 4,500 filling stations, making it one of Italy's largest fuel retail networks.¹⁰

Against this backdrop, this article critically examines Azerbaijan's greenhouse gas emissions profile and energy transition trajectory, with particular emphasis on the governance, measurement, and mitigation of methane emissions within the oil and gas sector. The analysis further explores the tensions between Azerbaijan's international climate commitments and its continued reliance on fossil fuel expansion as a central pillar of economic development.

⁸ Crude Accountability (2026), New Report: Azerbaijan Taps into Fossil Fuel Expansion Post-COP29. <https://crudeaccountability.org/wp-content/uploads/analysis-policy-implications-of-azerbaijan-energy-strategy.pdf>

⁹ <https://interfax.com/newsroom/top-stories/117500/>

¹⁰ <https://www.euronews.com/2026/05/12/socar-acquisition-of-italys-italiana-petroli-finalised-after-eu-clearance>

The Current State of Greenhouse Gas Emissions and Energy Transition

On April 22, 2016, the Republic of Azerbaijan signed the Paris Agreement,¹¹ thereby formally joining the global framework aimed at combating climate change and reducing greenhouse gas emissions. The Government of Azerbaijan aims to reduce greenhouse gas emissions by 35% by 2030 relative to the 1990 baseline year.¹² Furthermore, during COP26 in Glasgow¹³ in November 2021, Azerbaijan committed to reducing emissions by 40% by 2050 and achieving net-zero emissions over the long term.¹⁴

Azerbaijan acceded to the Climate and Clean Air Coalition (CCAC)¹⁵ as a State Partner in 2024 through its Ministry of Ecology and Natural Resources. By endorsing the CCAC Framework and Strategy 2030, the government has formally committed to addressing short-lived climate pollutants (SLCPs), including methane, black carbon, tropospheric ozone, and hydrofluorocarbons (HFCs).¹⁶

In policy terms, Azerbaijan has identified the integration of SLCP mitigation into national climate planning as a strategic priority, alongside targeted interventions in key emitting sectors, namely energy, agriculture, waste management, and heavy-duty transport. These sectoral priorities are consistent with international best practice; however, their effectiveness will depend on the establishment of robust regulatory frameworks, credible measurement, reporting, and verification (MRV) systems, and sustained institutional capacity.

Complementing these commitments, Azerbaijan joined the Global Methane Pledge,¹⁷ committing to reduce methane emissions by at least 30% by 2030 relative to baseline levels.¹⁸ The country has also played a visible role in advancing multilateral initiatives, including supporting and promoting the implementation of the COP29 Declaration on Reducing Methane from Organic Waste,¹⁹ which targets a major source of methane emissions through improved organic waste management practices.

Despite its elevated diplomatic profile—as host of COP29 in Baku and as a member of the UNFCCC Troika spanning COP28 to COP30²⁰—Azerbaijan has yet to fully translate this positioning into substantive agenda-setting leadership on SLCPs. In particular, there is limited evidence that the country is systematically leveraging its convening power to prioritize SLCP mitigation within international climate negotiations or to advance more ambitious, time-bound commitments at the multilateral level.

¹¹ <https://www.un.org/sustainabledevelopment/blog/2016/04/parisagreementsingatures/>

¹² https://unfccc.int/sites/default/files/NDC/2023-10/Second%20NDC_Azerbaijan_ENG_Final%20%281%29.pdf

¹³ <https://www.un.org/en/climatechange/cop26>

¹⁴ <https://hagueresearch.org/a-comparative-analysis/>

¹⁵ <https://www.ccacoalition.org/content/short-lived-climate-pollutants>

¹⁶ <https://www.ccacoalition.org/partners/azerbaijan>

¹⁷ <https://www.globalmethanepledge.org/>

¹⁸ https://unfccc.int/sites/default/files/2025-11/NDC%203.0%20Report_Azerbaijan.pdf

¹⁹ <https://cop29.az/en/pages/cop29-declaration-on-reducing-methane-from-organic-waste>

²⁰ https://unfccc.int/sites/default/files/resource/COP_29_Sustainability_Report.pdf

However, prospective assessments, particularly those emerging in the context of post-COP29 engagement strategies,²¹ indicate that the government intends to expand fossil gas production by more than 30% over the coming decade.²² This planned expansion raises critical questions regarding policy coherence, given Azerbaijan’s parallel commitments to climate mitigation and methane emissions reduction.

Table 1 presents the trends in greenhouse gas emissions by sector in Azerbaijan over the period 2015–2023. The table provides a comparative overview of emissions from energy, industry, agriculture, waste, and land use, land-use change and forestry (LULUCF), enabling an assessment of sectoral contributions to total greenhouse gas emissions over time.

Table 1. Greenhouse Gas Emissions by Sector in Azerbaijan (2015–2023, million tons CO₂ equivalent)

Sector	2015	2016	2017	2018	2019	2020	2021	2022	2023
Energy	47.7	48.1	47.4	47.5	49.0	49.8	53.4	54.3	54.4
Industry	3.7	3.1	3.2	3.4	3.3	3.2	3.3	4.1	3.6
Agriculture	8.6	8.7	8.7	8.7	8.0	8.0	7.6	8.1	5.9
Waste	1.3	1.3	1.3	1.3	1.4	1.4	1.5	1.5	2.2
LULUCF	-7.1	-7.2	-7.2	-7.2	-7.5	-8.5	-7.7	-8.9	-8.9
Total (including LULUCF)	54.2	54.0	53.4	53.6	54.1	53.9	58.1	59.1	57.2
Total (excluding LULUCF)	61.3	61.2	60.6	60.8	61.6	62.4	65.8	68.0	66.1
Energy share in total including LULUCF (%)	88.0	89.1	88.8	88.6	90.6	92.4	91.9	91.9	95.1
Energy share in total excluding LULUCF (%)	77.8	78.6	78.2	78.1	79.5	79.8	81.2	79.9	82.3

Source: Prepared by the author based on data from the Ministry of Ecology and Natural Resources of the Republic of Azerbaijan.

Note 1: Minus (“-“) is used to indicate absorption of gas creating heat effect.

Note 2: Comprehensive sectoral greenhouse gas emissions data for 2024 and 2025 have not yet been officially published by Azerbaijan’s national statistical or environmental authorities.

The data demonstrate that the energy sector overwhelmingly dominated Azerbaijan’s greenhouse gas (GHG) emissions profile throughout the 2015–2023 period. The sector consistently accounted for the largest share of total emissions under both accounting methodologies—namely, totals including and excluding land use, land-use change and forestry (LULUCF).

²¹ <https://crudeaccountability.org/wp-content/uploads/analysis-policy-implications-of-azerbaijan-energy-strategy.pdf>

²² <https://climateactiontracker.org/publications/azerbaijan-country-assessment-september-2024/>

When LULUCF is included, the energy sector’s contribution increased from approximately 88.0% in 2015 to 95.1% in 2023. This upward trend reflects both the expanding role of fossil fuel production within the national economy and the offsetting effect of negative LULUCF emissions, which reduce the total emissions denominator and thereby increase the relative weight of the energy sector.

Even when excluding LULUCF, the energy sector remained responsible for a dominant share of emissions, rising from 77.8% in 2015 to 82.3% in 2023. The particularly notable increase after 2020 coincides with the post-pandemic recovery in hydrocarbon production and energy-related activities, as well as the continued expansion of natural gas extraction and export infrastructure.

The findings underscore the structural carbon dependency of Azerbaijan’s economy and highlight the central role of the energy sector in shaping the country’s overall climate trajectory. They further suggest that meaningful progress toward national decarbonization targets and methane reduction commitments will remain unattainable without substantial reforms in fossil fuel production practices, energy efficiency policies, methane abatement technologies, and the reduction of routine gas flaring and venting.

Consequently, the effectiveness of Azerbaijan’s climate strategy remains critically dependent on the pace, scale, and credibility of its transition from an oil- and gas-dependent energy system toward renewable energy sources.

Against this backdrop, Table 2 presents data on energy supply from renewable sources in Azerbaijan for the period 2015–2024, providing an overview of recent developments and the current state of progress in the country’s renewable energy transition.

Table 2. Energy Supply from Renewable Sources in Azerbaijan (2015–2024, thousand TOE/NET)

Indicator	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Total energy supply	15,569.4	15,419.9	15,506.8	15,590.7	17,085.6	16,642.8	17,566.6	18,655.4	18,850.2	18,480.8
Hydropower	140.8	168.5	150.2	152.0	134.6	92.0	109.8	137.2	151.6	258.7
Share (%)	0.9	1.1	1.0	1.0	0.8	0.5	0.6	0.7	0.8	1.4
Biomass & waste	160.7	100.8	102.4	110.7	115.9	108.4	102.6	96.1	97.9	101.2
Share (%)	1.0	0.7	0.7	0.7	0.7	0.7	0.6	0.5	0.5	0.5
Wind energy	0.4	2.0	1.9	7.1	9.1	8.3	7.9	7.2	4.8	4.4
Share (%)	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0
Solar energy	0.4	3.0	3.2	3.4	3.8	4.0	4.8	5.2	6.9	47.9
Share (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3
Total renewable	302.3	274.3	257.7	273.2	263.4	212.7	225.1	245.7	261.2	412.2

Indicator	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
energy supply										
Share (%)	1.9	1.8	1.7	1.8	1.6	1.3	1.3	1.3	1.4	2.2

Source: Prepared by the author based on data from the State Statistical Committee of the Republic of Azerbaijan and national energy balance statistics.

Table 2 presents the dynamics of energy supply from renewable sources in Azerbaijan during the period 2015–2024, demonstrating that renewable energy continues to occupy a relatively limited position within the country’s overall energy balance despite recent policy commitments aimed at accelerating the energy transition.

Throughout the examined period, total renewable energy supply remained modest in comparison to total energy supply. The share of renewables fluctuated between 1.3% and 2.2%, underscoring Azerbaijan’s continued dependence on fossil fuels as the dominant source of energy generation and consumption. The lowest renewable share was recorded in 2020 (1.3%), while the highest level was observed in 2024 (2.2%), primarily driven by the expansion of hydropower and solar energy generation.

An important factor contributing to this positive trend has been the increasing attraction of investments into renewable energy projects in the Karabakh and Eastern Zangezur economic regions following their return to Azerbaijani control in 2020. In particular, investments in hydroelectric power stations have played a significant role in increasing the share of green energy in electricity generation during the subsequent period (see Table 3).

Hydropower remained the largest renewable energy source throughout the entire period, although its contribution exhibited considerable volatility due to changing hydrological conditions and fluctuations in water availability. After declining significantly in 2020, hydropower supply increased sharply to 258.7 thousand TOE in 2024, accounting for 1.4% of total energy supply.

Biomass and waste constituted the second-largest renewable energy category; however, their relative importance gradually declined over time. Their share decreased from 1.0% in 2015 to 0.5% in 2024, indicating limited technological modernization and insufficient expansion of bioenergy infrastructure.

Wind energy made only a marginal contribution to the national energy mix. Although moderate growth was observed between 2018 and 2021, the sector stagnated thereafter, with its share remaining close to zero throughout the period. This trend points to continuing structural, financial, and infrastructural barriers constraining the development of large-scale wind generation capacity.

The most significant recent development occurred in solar energy. While solar supply remained negligible for most of the decade, a substantial increase was recorded in 2024, when solar energy

supply rose to 47.9 thousand TOE. This sharp growth likely reflects the commissioning of new solar projects and the growing involvement of foreign investment in Azerbaijan’s renewable energy sector.

Overall, the data suggest that Azerbaijan’s renewable energy transition remains at an early stage. Although recent developments indicate some diversification of the energy mix, particularly through hydropower and solar expansion, the scale of renewable deployment remains insufficient to substantially alter the country’s hydrocarbon-dependent energy structure.

Table 3 presents the share of green energy in electricity production in Azerbaijan during the period 2015–2025.

Table 3. Share of Green Energy in Electricity Production in Azerbaijan (%)

Indicator	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Share of green energy in electricity production (%)	6.6	7.8	7.2	7.0	6.0	4.1	5.8	6.4	7.1	10.6	12.5

Source: Prepared by the author based on data from the Ministry of Ecology and Natural Resources of the Republic of Azerbaijan.

Table 3 illustrates the evolution of the share of green energy in electricity production in Azerbaijan during the period 2015–2025. The data indicate a generally upward long-term trend, although the trajectory has been uneven and characterized by periods of stagnation and decline.

Between 2015 and 2018, the share of green energy remained relatively stable, fluctuating between 6.6% and 7.8%. A noticeable decline emerged in 2019 and became particularly pronounced in 2020, when the indicator fell to 4.1%, the lowest level recorded during the examined period. This decline was largely associated with reduced hydropower generation caused by unfavorable hydrological conditions, as well as the continued dominance of fossil fuels in electricity generation.

Beginning in 2021, however, the share of green energy gradually recovered, increasing from 5.8% in 2021 to 7.1% in 2023. The most substantial growth occurred in 2024 and 2025, when the indicator rose sharply to 10.6% and 12.5%, respectively. This upward trend reflects the acceleration of investments in renewable energy infrastructure, particularly in hydropower and solar energy projects.

A significant contribution to this growth originated from renewable energy initiatives implemented in the Karabakh and Eastern Zangezur economic regions following 2020. The construction and rehabilitation of hydroelectric power stations in these territories, together with

the launch of new solar and wind projects supported by foreign investment, strengthened the role of green energy within Azerbaijan's electricity generation mix.²³

Within the framework of Azerbaijan's National Priorities for Socio-Economic Development, the Socio-Economic Development Strategy for 2022–2026 identifies the expansion of renewable energy as a key strategic objective.²⁴ The strategy²⁵ targets increasing the share of renewable energy in installed electricity generation capacity to 24% by 2026 and to 30% by 2030.

To achieve these targets, the government has planned and initiated a number of large-scale renewable energy projects. Among the most significant initiatives are the construction of two renewable power plants with a combined capacity of 470 MW—comprising wind and solar generation facilities—in the Khizi and Absheron regions in cooperation with ACWA Power and Masdar.²⁶

Additional projects include the development of a 240 MW solar power plant in the Jabrayil region in partnership with BP,²⁷ as well as plans for the construction of 400 MW wind power plants in the Kalbajar and Lachin districts.²⁸

Despite these positive developments, the overall share of renewable electricity remains relatively modest when compared with international decarbonization targets and renewable energy transition trajectories observed in many other countries. The findings therefore suggest that, although Azerbaijan has recently accelerated renewable energy deployment, the country's electricity sector remains structurally dependent on fossil fuels—particularly natural gas. This dependence continues to have important implications for greenhouse gas emissions, especially methane emissions associated with upstream oil and gas operations managed by SOCAR.

²³ Ibadoghlu, Gubad (2022), Problems and Prospects of Transition to Alternative Energy in Azerbaijan. Available at SSRN: <https://ssrn.com/abstract=4249068> or <http://dx.doi.org/10.2139/ssrn.4249068>

²⁴ <https://www.azernews.az/analysis/232575.html>

²⁵

<https://brussels.mfa.gov.az/files/shares/2022%202026%20Social%20and%20Economic%20Development%20Strategy.pdf>

²⁶ <https://caspiannews.com/news-detail/azerbaijan-accelerates-green-energy-transition-with-major-wind-and-solar-projects-2026-3-5-0/>

²⁷ https://www.bp.com/en_az/azerbaijan/home/who-we-are/operationsprojects/Shafag-solar-project.html

²⁸ <https://caliber.az/en/post/azerbaijan-to-build-wind-power-plant-in-lachin-kalbajar-region>

Methane Emissions and Climate Governance

Methane emissions have emerged as one of the most critical dimensions of Azerbaijan's climate governance challenge. As a highly potent greenhouse gas primarily associated with oil and gas production, methane represents a key indicator of both the environmental sustainability and operational efficiency of the country's hydrocarbon sector.

Azerbaijan's energy sector emissions indicators underscore a structurally entrenched dependence on fossil fuel extraction, which continues to shape the country's macroeconomic trajectory and emissions profile. Retrospective data reveal that hydrocarbons dominate export revenues and fiscal inflows, reinforcing a carbon-intensive development pathway.²⁹

According to the International Energy Agency Global Methane Tracker,³⁰ Azerbaijan ranks 64th globally in total methane emissions and 47th in methane emissions originating from the energy sector. Methane emissions constitute a particularly significant component of the country's greenhouse gas profile, accounting for an estimated 35–37% of total emissions.

Methane is a highly potent greenhouse gas with a substantially greater short-term warming potential than carbon dioxide. Over a 20-year period, methane's warming effect is estimated to be approximately 86 times stronger than that of CO₂, while over a 100-year timeframe it remains roughly 28 times more powerful.³¹ Beyond its direct contribution to radiative forcing, methane also contributes to the formation of tropospheric ozone, thereby exacerbating both climate change and adverse public health outcomes.

In recent years, methane governance has become an increasingly important component of international climate policy. Since 2024, Crude Accountability³² has led initiatives aimed at improving transparency and public accessibility of methane-related environmental and health data in the region. Through cooperation with scientists, environmental experts, and local communities, these efforts seek to strengthen independent monitoring capacity and develop practical roadmaps for methane mitigation.

As a participant in the Global Methane Pledge, Azerbaijan has committed to reducing methane emissions by at least 30% from 2020 levels by 2030.³³ However, progress toward this objective continues to be constrained by aging infrastructure, limited monitoring and verification capacity, institutional opacity, and persistent uncertainties in emissions reporting.

Table 4 presents the dynamics of methane emissions in Azerbaijan between 2005 and 2024, including methane's contribution to total greenhouse gas emissions measured in CO₂ equivalent and methane emissions originating from stationary sources.

²⁹ <https://crudeaccountability.org/energy-power-and-repression-political-economy-insights-from-azerbaijan/>

³⁰ <https://www.iea.org/data-and-statistics/data-tools/methane-tracker>

³¹ <https://www.ccacoalition.org/short-lived-climate-pollutants/methane>

³² <https://crudeaccountability.org/tracking-methane-pollution/>

³³ <https://www.ccacoalition.org/partners/azerbaijan>

Table 4. Methane Emissions in Azerbaijan, (2005-2024)

Indicator	Unit	2005	2010	2015	2017	2018	2019	2020	2021	2022	2023	2024
Methane (CH ₄) share in total greenhouse gas emissions	million tons CO ₂ equivalent	10.3	15.0	16.4	18.3	18.7	19.9	20.5	21.9	21.5	21.76	—
Methane (CH ₄) emissions from stationary sources	thousand tons	24.3	18.3	34.1	34.6	18.2	17.5	14.2	14.0	15.1	40.5	34.2

Source: Prepared by the author based on data from the Ministry of Ecology and Natural Resources of the Republic of Azerbaijan.

Note: Preliminary estimates based on available international datasets and sectoral methane indicators suggest that Azerbaijan’s methane emissions in 2024 likely remained within the range of approximately 20–22 million tons of CO₂ equivalent, broadly consistent with the elevated levels observed in 2023. However, officially verified national methane inventory data for 2024 have not yet been published.

The data presented in Table 4 reveal a substantial long-term increase in methane emissions within Azerbaijan’s greenhouse gas emissions profile. Methane emissions measured in CO₂ equivalent more than doubled between 2005 and 2023, rising from 10.3 million tons to approximately 21.76 million tons. This trend reflects the growing scale of hydrocarbon extraction, natural gas production, and associated energy-sector activities over the examined period.

The particularly sharp increase observed after 2015 coincided with the expansion of Azerbaijan’s natural gas production and export infrastructure, including intensified upstream operations in the Caspian Sea. By 2021, methane emissions reached 21.9 million tons of CO₂ equivalent, remaining at persistently elevated levels thereafter. These findings highlight methane’s increasing contribution to Azerbaijan’s overall greenhouse gas emissions and underscore the climate significance of the country’s oil and gas sector.

At the same time, methane emissions from stationary sources display a more volatile trajectory. Following relatively high levels recorded in 2015 and 2017, emissions from stationary sources declined considerably between 2018 and 2021. This reduction may partially reflect improvements in operational efficiency, temporary declines in industrial activity during the COVID-19 pandemic, and the implementation of methane management initiatives, including leak detection and repair (LDAR) programs.

However, the dramatic increase in stationary-source methane emissions recorded in 2023—from 15.1 thousand tons in 2022 to 40.5 thousand tons in 2023—suggests that emissions reductions remain unstable and vulnerable to reversal. Although emissions declined again to 34.2 thousand

tons in 2024, they remained substantially above the levels observed during 2018–2022. This volatility points to continuing structural inefficiencies, aging infrastructure, inconsistent emissions management practices, and limitations in monitoring and reporting systems.

To better understand the structure and sources of methane emissions in Azerbaijan, Tables 5 and 6 present sectoral estimates developed by the IEA. Table 4 provides an overview of methane emissions by major sectors of the economy, while Table 5 disaggregates methane emissions within the energy sector by source and operational category. Together, these tables illustrate the dominant role of offshore oil and gas activities in Azerbaijan’s methane emissions profile and highlight the central importance of the energy sector in shaping the country’s climate and decarbonization challenges.

Table 4. Azerbaijan Methane Emissions by Sector, IEA Estimates

Sector	Estimated Share of Total Methane Emissions (%)
Energy	50
Agriculture	33
Waste	17
Other	0

Source: Prepared by the author based on International Energy Agency Methane Tracker estimates for Azerbaijan.

Table 5. Azerbaijan Methane Emissions from the Energy Sector by Source, IEA Estimates

Source of Methane Emissions	Share within Energy-Sector Methane Emissions (%)
Offshore oil	47
Offshore gas	30
Gas pipelines and LNG facilities	8
Satellite-detected large oil and gas emissions	5
Abandoned facilities	4
Onshore oil	3
Other from oil and gas	2
Bioenergy	0
Onshore gas	0

Source: Prepared by the author based on International Energy Agency Methane Tracker estimates for Azerbaijan.

The data presented in Tables 4 and 5 illustrate the dominant role of the energy sector in Azerbaijan's methane emissions profile. According to the International Energy Agency estimates, approximately half of the country's methane emissions originate from energy-related activities, while agriculture and waste account for 33% and 17%, respectively. These findings reinforce the centrality of the hydrocarbon sector within Azerbaijan's overall greenhouse gas emissions structure.

More specifically, methane emissions within the energy sector are heavily concentrated in offshore oil and gas operations. Offshore oil production alone accounts for 47% of energy-sector methane emissions, followed by offshore gas operations with 30%. This distribution reflects Azerbaijan's strong dependence on offshore hydrocarbon extraction in the Caspian Sea and highlights the environmental risks associated with aging offshore infrastructure, venting practices, and operational leakages.

The relatively significant contribution of gas pipelines and LNG-related facilities (8%) further indicates the importance of transmission and transportation losses within the natural gas supply chain. In addition, satellite-detected large emission events and abandoned facilities together account for nearly 9% of energy-sector methane emissions, suggesting the existence of substantial unmonitored or insufficiently controlled emission sources.

Overall, the data indicate that methane emissions from the oil and gas sector constitute one of the central environmental and climate governance challenges facing Azerbaijan. As the country's principal oil and gas producer, SOCAR is considered one of the largest corporate sources of methane emissions in the national economy. Gas leakages, venting emissions, and routine gas flaring associated with extraction and production processes represent significant components of the company's overall emissions profile.

SOCAR,³⁴ as the country's principal oil and gas producer, is considered one of the largest corporate sources of methane emissions in Azerbaijan. Gas leakages, venting emissions, and routine gas flaring occurring during the production process constitute significant components of the company's overall emissions profile.

A substantial portion of SOCAR's infrastructure used in extraction, transportation, and processing operations is outdated, while the continued practice of routine gas flaring further contributes to rising methane emissions. This accelerates the release of methane—a greenhouse gas with a particularly high global warming potential—into the atmosphere, creating serious challenges for both climate change mitigation and environmental sustainability.

SOCAR has been cooperating with the Global Gas Flaring Reduction Partnership of the World Bank since 2008 on initiatives aimed at reducing routine gas flaring.³⁵

³⁴ <https://socar.az/en/page/about-us>

³⁵

<https://documents1.worldbank.org/curated/en/400881467997261628/pdf/904020BRI0Resu00Box385307B00PUBLI C0.pdf>

In 2014, the company joined the World Bank’s “Zero Routine Flaring by 2030” initiative,³⁶ thereby committing to eliminate the routine flaring of associated gas during standard oil production operations by 2030.

SOCAR has joined the Oil and Gas Methane Partnership 2.0 (OGMP 2.0), a global initiative aimed at reducing methane emissions in the oil and gas sector. OGMP 2.0 was established in 2014 by the United Nations Environment Programme (UNEP) as an international framework designed to improve methane emissions measurement, mitigation, and reporting practices across the oil and gas industry.

The initiative seeks to enhance the availability and accuracy of methane emissions data, promote emissions reduction activities, and strengthen transparent reporting through the implementation of internationally recognized best practices and monitoring methodologies. By joining OGMP 2.0, SOCAR has formally committed to aligning its methane accounting and reporting practices with evolving international climate governance standards.

Beginning in 2015, SOCAR, in cooperation with the United Nations Development Programme, implemented the “Nationally Appropriate Mitigation Actions” (NAMA) project entitled National Action Plan for Reducing Carbon Emissions in Azerbaijan’s Fuel Consumption Sector.³⁷ The project aimed to strengthen carbon mitigation mechanisms within the energy sector and was completed at the end of 2020.

Following the Republic of Azerbaijan’s accession to the Paris Agreement in 2016, SOCAR adopted the principle of “zero emissions” as one of its core environmental objectives and declared its commitment to supporting the implementation of the Paris Agreement’s climate obligations.

In 2019, SOCAR also joined the Methane Guiding Principles initiative.³⁸ Within this framework, the company has undertaken collaborative efforts with BP and other major international energy corporations to improve methane emissions inventories and develop mitigation measures aimed at reducing methane emissions across oil and gas operations.

In response to mounting international pressure and evolving climate governance standards, SOCAR announced a comprehensive decarbonization strategy in December 2023.³⁹ At COP29, SOCAR’s efforts to reduce emissions in the oil and gas sector were prominently highlighted and reaffirmed. SOCAR committed to eliminating routine gas flaring across all facilities by 2030,⁴⁰ reducing emissions intensity in its upstream operations by 30% relative to 2022 levels by 2030,⁴¹ lowering corporate emissions intensity by 30% and absolute emissions by 20% by 2035,

³⁶ <https://www.worldbank.org/en/programs/zero-routine-flaring-by-2030>

³⁷ https://azertag.az/en/xeber/undp_socar_launch_project_for_low_carbon_end_use_sectors-932506

³⁸ https://csis-website-prod.s3.amazonaws.com/s3fs-public/2024-07/240723_Cahill_NOCs_Reduction.pdf?VersionId=6m923WiKusgZJoxp7.wnyOECOassV3LA

³⁹ <https://socar.de/en/2023/12/socar-hosted-a-decarbonization-strategy-and-future-prospects-event-in-karabakh-and-eastern-zangazur-as-part-of-cop-28/>

⁴⁰ <https://report.az/en/energy/socar-announces-decarbonization-targets-for-next-5-10-years>

⁴¹ <https://report.az/en/energy/socar-taking-serious-steps-to-reduce-carbon-emissions>

reducing methane emissions in upstream assets to below 0.2% by 2035, and achieving carbon neutrality (net zero) by 2050.

Nevertheless, recent emissions data call into question the credibility and feasibility of these commitments. According to the data, SOCAR's total GHG emissions for 2023 reached 8,367,450 tons of CO₂ equivalent, a notable increase from 7,852,900 tons in 2022 and 7,537,700 tons in 2021.⁴² Reported emissions reached approximately 200,000 tons in 2024,⁴³ with a marked increase relative to 2023 levels, highlighting both implementation gaps and the technical difficulty of rapid methane abatement in legacy systems.

At the operational level, SOCAR has implemented leak detection and repair (LDAR) programs⁴⁴ aimed at identifying and mitigating methane leaks across its upstream infrastructure. These initiatives have contributed to emissions reductions while also enabling the monetization of avoided emissions through carbon-saving mechanisms. Nevertheless, questions remain regarding the scale, transparency, and independent verification of these reported gains.

In recent years, SOCAR has also expanded international cooperation on methane monitoring and emissions management technologies. In partnership with TotalEnergies,⁴⁵ the company launched a methane detection and quantification initiative covering offshore operations in the Caspian Sea. The project utilizes drones equipped with AUSEA (Airborne Ultralight Spectrometer for Environmental Applications) technology to improve emissions detection accuracy.

Additional cooperation agreements have been concluded with Sirius on emissions-source identification, emissions quantification, mitigation design, and carbon capture, utilization, and storage (CCUS) solutions. SOCAR has also established a partnership framework with ADNOC to explore collaboration in low-carbon energy technologies, including blue hydrogen, CCUS, and geothermal energy development.⁴⁶

Parallel to these initiatives, SOCAR is preparing a satellite-based methane measurement campaign under the framework of the Oil and Gas Climate Initiative (OGCI) to identify large-scale methane emissions across its operations.⁴⁷ Within the framework of the United Nations Environment Programme International Methane Emissions Observatory (IMEO), the company is also reviewing a memorandum of understanding with the German Aerospace Center to conduct drone-based instrumental emissions measurement surveys across SOCAR assets.

Furthermore, SOCAR has begun assessing its methane footprint using the Oil and Gas Methane Partnership (OGMP) methodology across upstream, midstream, and gas retail operations. Pilot ground-based measurement campaigns at selected upstream facilities have also been launched as preliminary steps toward alignment with emerging OGMP reporting standards.

⁴² <https://www.trend.az/business/green-economy/3960488.html>

⁴³ <https://socar.az/en/page/sustainable-development-reports>

⁴⁴ <https://methaneguidingprinciples.org/wp-content/uploads/2024/05/Socar-MGP-Report-2024.pdf>

⁴⁵ <https://xalqqazeti.az/en/iqtisadiyyat/151860-totalenergies-and-socar-join-forces>

⁴⁶ <https://www.adnoc.ae/en/news-and-media/press-releases/2023/adnoc-and-socar-to-collaborate-on-hydrogen-carbon-management-and-geothermal-technologies>

⁴⁷ <https://www.ogdc.org/case-study/socars-methane-ai-platform-2/>

These developments indicate that Azerbaijan is gradually adopting more advanced methane monitoring and reporting technologies consistent with evolving international climate governance frameworks. However, the effectiveness of these initiatives will ultimately depend on whether technological modernization is accompanied by stronger regulatory oversight, transparent public disclosure practices, independent emissions verification mechanisms, and measurable reductions in absolute methane emissions. Without such institutional strengthening, the risk remains that methane governance reforms may function primarily as instruments of international climate diplomacy and reputational management rather than as drivers of substantive emissions reduction.

The financial report of company states that in 2023,⁴⁸ SOCAR allocated approximately 97% of its capital expenditures to oil and gas projects. Although the company launched a “green energy division” several weeks after Azerbaijan hosted COP29⁴⁹ and announced plans to invest in wind, solar, and carbon capture technologies, the report concludes that SOCAR’s renewable energy portfolio remains marginal in scale relative to its continued investment in hydrocarbon development.

⁴⁸ <https://socar.az/az/page/maliyye-hesabatlari>

⁴⁹ https://www.urgewald.org/sites/default/files/media-files/urgewald_Report_SOCAR_2024.pdf

Conclusion

This study demonstrates that Azerbaijan's climate trajectory continues to be fundamentally shaped by the structural dominance of the oil and gas sector and the slow diversification of the national economy.⁵⁰ Despite the country's increasing engagement with international climate governance frameworks—including accession to the Paris Agreement, participation in the Climate and Clean Air Coalition (CCAC), endorsement of the Global Methane Pledge, and its role as host of COP29—the country continues to pursue a development model heavily dependent on hydrocarbon extraction and the expansion of natural gas exports.

The findings indicate that the energy sector overwhelmingly dominates Azerbaijan's greenhouse gas emissions profile, accounting for more than four-fifths of total emissions throughout the examined period. Methane emissions, in particular, constitute approximately one-third of total greenhouse gas emissions and represent one of the most critical and rapidly expanding dimensions of the country's climate challenge. Although Azerbaijan and SOCAR have announced ambitious methane mitigation and decarbonization commitments, recent emissions trends reveal persistent implementation gaps, weak institutional accountability, and continuing growth in methane-related emissions.

At the same time, the institutional environment necessary for effective climate governance and independent environmental accountability has significantly deteriorated. The dismantling of independent civil society,⁵¹ the closure or restriction of genuine non-governmental organizations and independent media outlets⁵²—particularly those monitoring the energy sector—and the limited public availability of environmental data have created serious obstacles to transparent emissions assessment and policy evaluation. The suppression of the Confederation of Workers' Desk Trade Unions,⁵³ and public oversight mechanisms, alongside restrictions on field-based monitoring activities, undermines the credibility and verifiability of both domestic and internationally supported climate initiatives. In recent years, independent journalists, environmental activists, and civil society organizations have increasingly become targets of political repression.

These developments also raise broader concerns regarding Azerbaijan's compliance with international environmental and human rights obligations, including principles reflected in Organization for Economic Co-operation and Development standards⁵⁴ on responsible business conduct, transparency, stakeholder participation, environmental accountability, and access to information. The absence of meaningful public participation mechanisms, restrictions on environmental defenders and independent researchers, and the limited transparency of

⁵⁰ Ibadoghlu, Gubad (2025), *The Politics of Energy and Climate Commitments: Azerbaijan's Post-COP29 Fossil Fuel Strategy*. Available at SSRN: <https://ssrn.com/abstract=5261615> or <http://dx.doi.org/10.2139/ssrn.5261615>

⁵¹ <https://humanrightshouse.org/statements/civil-society-in-azerbaijan-is-decimated-the-people-who-did-the-work-are-all-now-behind-bars/>

⁵² <https://www.hrw.org/world-report/2026/country-chapters/azerbaijan>

⁵³ <https://www.amnesty.org/en/location/europe-and-central-asia/eastern-europe-and-central-asia/azerbaijan/report-azerbaijan/>

⁵⁴ https://www.oecd.org/en/publications/oecd-guidelines-for-multinational-enterprises-on-responsible-business-conduct_81f92357-en.html

environmental governance practices weaken institutional accountability and constrain independent evaluation of climate-related policies and emissions data.

Nevertheless, the analysis suggests that Azerbaijan's climate and energy policies remain characterized by deep structural contradictions. While renewable energy targets and green energy investments have expanded in recent years—particularly in hydropower and solar energy projects—the overall scale of renewable deployment remains limited relative to the continued prioritization of fossil fuel development. Available evidence indicates that hydrocarbons continue to dominate state investment strategies, export revenues, fiscal planning, and long-term energy infrastructure development.

Moreover, Azerbaijan faces growing climate vulnerability, including increasing water scarcity, rising temperatures, degradation of agricultural systems, desertification risks, and ecological pressures associated with the declining level of the Caspian Sea. These risks are further intensified by transboundary water dependencies and broader regional climate pressures. Consequently, the long-term sustainability of Azerbaijan's economic model will depend not only on emissions mitigation efforts but also on the country's capacity to implement effective climate adaptation, environmental governance, and regional cooperation mechanisms.

Overall, we conclude that Azerbaijan currently occupies a complex and inherently contradictory position within global climate governance. On the one hand, the country seeks to strengthen its international climate profile through participation in multilateral climate initiatives and the promotion of renewable energy projects. On the other hand, the planned expansion of fossil gas production and exports, together with the continued centrality of the hydrocarbon sector within the national economy, risks undermining the credibility, coherence, and long-term effectiveness of these climate commitments.

Meaningful progress toward decarbonization and methane reduction will therefore require more than technological modernization and international climate diplomacy alone. It will necessitate deeper structural reforms, including stronger regulatory oversight, transparent and independently verified emissions reporting systems, the restoration of public accountability and participatory governance mechanisms, the protection of environmental defenders and independent civil society actors, accelerated deployment of renewable energy, substantial reductions in routine flaring and venting practices, and the modernization of aging oil and gas infrastructure. Equally important will be the implementation of a gradual yet credible transition away from structural dependence on fossil fuel extraction and exports.

Without such systemic transformation, Azerbaijan's climate commitments are likely to remain constrained by the political economy of hydrocarbon expansion, weak institutional accountability, and the persistence of carbon-intensive development pathways.

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