METHANE IN CENTRAL ASIA EMISSIONS, TRENDS, ACTIONS



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This report provides a snapshot of methane emissions in Central Asia and natural gas and energy trends by country and for the region, and explores the opportunities for actions to reduce methane emissions.

Introduction

Central Asia includes three large desert countries rich in oil and gas — Turkmenistan, Uzbekistan and Kazakhstan — and the two smaller mountain countries — Kyrgyzstan and Tajikistan — with negligible oil and gas, but significant hydropower production. Turkmenistan has the world's 4th largest natural gas reserves estimated at 18–20 trillion m³. Uzbekistan has an estimated 1.8 trillion m³ of natural gas reserves, and produces a similar volume of gas as Turkmenistan: 50–60 billion m³/year, but most of this is consumed domestically. Kazakhstan is a leading oil producer, and natural gas is mainly produced there in association with oil. Until recently, the volume of gas reinjected to keep pressure in oil wells in western Kazakhstan was similar to that for domestic use.

Natural gas is primarily composed of methane, which is very potent greenhouse gas. Scientific assessments suggest that much of the methane emitted from the oil and gas facilities can be reduced in a cost-effective manner and contribute to near-term climate change targets. At the UNFCCC CoP-26 in Glasgow (2021), the US, the EU and other countries launched the <u>Global Methane Pledge</u>. Participants in the methane pledge, including Kyrgyzstan and Uzbekistan — the smallest and largest methane emitters of Central Asia — agree to take voluntary actions under a collective effort to reduce global methane emissions at least 30 per cent from 2020 levels by 2030. In addition to the energy sector, methane emissions also originate from landfills, wastewater plants, and livestock.



Natural gas production and consumption





China has replaced Russia as the main export destination for Central Asian gas. Gas exports to China in 2019 reached 50 billion m³, including 33 billion m³ from Turkmenistan, 10 billion m³ from Uzbekistan and 7 billion m³ from Kazakhstan. In recent years, gas exports to Russia ranged from 15 to 20 billion m³/year, and intra-regional trade about 6 billion m³/year.

TURKMENISTAN Methane emissions profile Sure: notional report 20 20 20 0 20

Turkmenistan's annual emissions exceed 65–75 million tonnes of CO_2 -eqv, which comes to 10–12 tonnes per person. Methane emissions — largely from natural gas production and leaks — account for nearly half (27–35 million tonnes of CO_2 -eqv) of the total emissions, but the national GHG inventory lags behind by 10 years. The country's nationally determined contributions (<u>NDCs</u>) indicate that GHG emissions may double by 2030 — a peak year when emissions will either stabilize or start declining, subject to financial and technical support.

Remote sensing data suggest that large methane leaks (10–40 tonnes per hour or 150 000 tonnes per year) occur at some gas compressor stations in Turkmenistan. The country's leading actor in the natural gas sector — <u>Turkmengaz</u> national company — is responsible for most gas projects, domestic and foreign sales. Domestic gas consumption in Turkmenistan is estimated at 14–20 billion m³/year, half used for power and heat production and by the petrochemical industry. Nearly all households have access to natural gas, which had previously been free. Gasoline is low-cost, too. Foreign actors, primarily the Chinese National Petroleum Corporation produce about one-quarter of the gas, mainly for export.

GHG emission trends and contribution of methane Million tonnes

80



TURKMENISTAN Energy balance and flows

Production Refineries Transport Gas 🖉 Production Industry Other and residential Power stations Export Power losses **Export** Own use

Energy production and imports 79 million tonnes of oil equivalent **Total final energy consumption** 18 million tonnes of oil equivalent

Until 2009, Russia was the main export destination for Turkmen gas, up to 40 billion m³ in peak years, with some gas trade with Iran until 2017. Turkmen gas exports to China began in 2009 and since then (Dec 2009 — May 2022) amounted to 335 billion m³. The Galkynysh and Bagtyarlyk fields are the main sources of natural gas exported to China at 30 billion m³/year.

The 2 000 km Central Asia-China pipeline (A, B, C lines) starting in Turkmenistan and crossing Uzbekistan and Kazakhstan is now

used to its full capacity of 50 billion m³/year. When its fourth line (D) is built, pipeline capacity will expand to 80 billion m³/year. Another major gas export project in the making is the Turkmenistan– Afghanistan-Pakistan-India (TAPI) pipeline with 33 billion m³/year capacity. In Turkmenistan, TAPI infrastructure is ready, but due to security and technical constraints, sections in Afghanistan and Pakistan are not build yet.

UZBEKISTAN Methane emissions profile

Source: national report to the UNFCCC (unfccc.int)



The annual GHG emissions in the most populous country of Central Asia — Uzbekistan — remained largely stable and declined slightly over the past 15 years, ranging between 180 to 200 million tonnes of CO₂-eqv or 5 tonnes per person. The energy sector is responsible for 75–80 per cent of GHG emissions, including 50 per cent from fuel combustion and 25–30 per cent from methane leaks in the coal, oil, and gas sector or 50 million tonnes of CO₂-eqv. Energy emissions in Uzbekistan have been declining in contrast, methane emissions in agriculture are growing due to an increase in livestock, and now come to 21 million tonnes per year. Emissions from waste are growing rapidly and stand at 4 million tonnes.

Uzbekistan has demonstrated success in decoupling GHG emissions from economic growth, and intends (<u>NDC 2021</u>) to reduce the specific GHG emissions per GDP by 35 per cent by 2030 compared to the 2010 level. From 1990 to 2017 the country's GHG emissions per GDP have declined by 40 per cent thanks to the economy's transition and modernization, energy efficiency measures and Clean Development Mechanism projects.





UZBEKISTAN Energy balance and flows



57 million tonnes of oil equivalent

Total final energy consumption

29 million tonnes of oil equivalent



Uzbekistan produces around 50-60 billion m³ of gas per year and consumes three-quarters of this gas for power generation, the petrochemical industry and to meet demand from the population and transport. More than 50 per cent of all vehicles run on natural gas. Uzbekneftegaz national company produces 65 per cent of the gas, followed by Russian Lukoil at 25 per cent and other local and foreign companies. The Mubarek oil-and-gas field and plant is the largest gas production area. New gas discoveries have been made in the Ustyurt region and the former Aral Sea.

Power losses Own use

Uzbekistan exports 4-8 billion m³ of gas to China, and smaller volumes to Russia (4 billion m³/year), Kazakhstan (1-4 billion m³/ year), Kyrgyzstan and Tajikistan (0.1–0.2 billion m³/year). Domestic prices for gas and electricity vary and are subsidized at USD 3-4 billion/year. There are tensions between gas export demand and growing domestic gas consumption.



Kazakhstan is the largest GHG emitter among Central Asia countries. In 2018 its emissions at 388 million tonnes of CO₂-eqv exceeded the 1990 level or about 20 tonnes per person. That same year, Kazakhstan's gas exports reached a record high level of 18 billion m³, including deliveries to China of 6 billion m³.

The national GHG inventory shows a declining trend in total methane emissions from over 70 million tonnes of CO₂-eqv to 35 million thanks to the reduction in gas flaring, other measures in the oiland-gas sector and a shift from underground to surface coal mining. Current levels of gas flaring are estimated at 1–2 billion m³ per year. Coal still dominates power generation and industrial consumption and is the main source of GHG emissions: 170 million tonnes per year. The energy-related methane emissions (11 million tonnes per year) now come to about half of the agriculture-related methane emissions (22 million tonnes per year), while in the past this ratio was reversed.



Million tonnes



KAZAKHSTAN Energy balance and flows



Energy production and imports 188 million tonnes of oil equivalent Total final energy consumption

Domestic gas consumption in Kazakhstan is growing and currently comes to 20–25 billion m³/year. Some gas for domestic use is imported (5–7 billion m³) from Russia, Turkmenistan and Uzbekistan. Most gas (75 per cent) is produced at the three giant oil fields — Karachaganak, Tengiz, and Kashagan in western Kazakhstan (Caspian Sea region). Large volumes of gas — 10–13 billion m³ — are annually reinjected into oil fields to keep wells operational. About 50 per cent of the domestic gas consumption goes to power generation, 35 per cent to residential and commercial users. North, central and east sections of the country have limited or no gas networks, while southern regions (Shymkent and Almaty) are served by transit and local pipelines. Gasification projects, switching power generation from coal to gas and the actions of the petrochemical industry are contributing to the increase in domestic gas demand and reduction in export capacity.

KYRGYZSTAN Methane emissions profile

Source: national report to the UNFCCC (unfccc.int)



Kyrgyzstan is a low GHG emitter. While its emissions have grown over the past 10 years and are projected to increase beyond 2030 (\underline{NDC}), they amount to 15 million tonnes of CO₂-eqv or about 2 tonnes per person per year. Methane emissions (3 million tonnes per year) mainly occur in agriculture.

Kyrgyzstan's national gas company was acquired by Russia's Gazprom in 2014 and renamed "Gazprom Kyrgyzstan". Outdated gas infrastructure was modernized in the northern section of the country to serve Bishkek city, with new links to Kant and Tokmok. Southern Kyrgyzstan relies on an Uzbekistan gas pipeline that often experience interruptions.

Coal production has increased in the past five years to 3 million tonnes/year. Due to growing use of coal and limited gasification, in winter Bishkek is affected by severe air pollution. Gasification and a switch from coal to gas is one of the solutions proposed by citizens and authorities, but progress is slow.

GHG emission trends and contribution of methane

Million tonnes



KYRGYZSTAN Energy balance and flows

Energy production and imports

5 million tonnes of oil equivalent Production Import Refineries Transport Oilproducts H Import Production Industry Coal Import Import Gas Other and residential Power stations Production Power Non-energy use Export Power losses Export Own use

Kyrgyzstan's domestic production of natural gas is negligible (22 million m³/year) and the country is relying on oil and gas imports from Russia and Kazakhstan. The cost of heat and power in Kyrgyzstan is one of the lowest in Central Asia and is subsidized, while the national energy system needs major upgrades and expansion.

Total final energy consumption

5 million tonnes of oil equivalent

TAJIKISTAN Methane emissions profile

Source: national report to the UNFCCC (unfccc.int)



Tajikistan is the lowest energy consumer and GHG emitter in the region. At the same time, due to rugged mountain terrain, the high proportion of rural population living in disaster-prone areas and major glacier and snow reserves affected by climate change, the country is considered highly vulnerable to climate change.

Until recently Tajikistan's emissions were below 10 million tonnes of CO_2 -eqv or less than 2 tonnes per person (NDC). At the beginning of independence, Tajikistan experienced a drop in GHG emissions by a factor of three from the peak of 35 million tonnes of CO_2 -eqv in 1990. Most of that reduction is related to the post-Soviet energy deficit and the transition as the country had to rely mainly on its own hydropower. Methane emissions (currently about 3 million tonnes CO_2 -eqv per year) mainly occur in agriculture with some emissions from waste and will continue to grow due to expansion of agriculture and cities.

Tajikistan is poor in fossil fuels, but rich in hydropower. The rapidly growing population and energy needs create recurring energy deficit in many rural areas. Tajikistan's top political and energy priority is to develop its vast hydropower potential for domestic use and for export. The construction of the Rogun hydropower station of 3 600 MW capacity with 335 metre high dam, which started in the Soviet era, is progressing and expected to be completed by 2030–2035.

GHG emission trends and contribution of methane

Million tonnes



TAJIKISTAN Energy balance and flows

Energy production and imports

Oilproducts Production Gas Import Power stations Power Transport Industry Other and residential

4 million tonnes of oil equivalent

Total final energy consumption

3 million tonnes of oil equivalent

Power losses **Export**

The energy balance of Tajikistan is dominated by hydropower, but in the last 5–7 years coal production and consumption increased from negligible levels to over 2 million tonnes per year. All oil and gas products are imported from Russia and Kazakhstan, and the prices are the highest in Central Asia. It is one of the reasons why 60 percent of all vehicles run on compressed natural gas. New coal-fired power and cement plants increase demand for coal. If the construction of the Central Asia-China gas pipeline D continues, Tajikistan will become a gas transit country. Prospects for its own oil and gas production remain limited.

Methane actions

The GHG emission profiles, technical capabilities, governance and financial feasibility define the methane actions that Central Asia could implement. The most promising actions in the energy sector and large-scale projects are the following:





- Reduction in gas flaring, regular monitoring, technical checks and modernization of gas stations and pipelines
- Increase in renewable energy, especially in fossil fuel-rich countries and gradual reduction in fossil fuel subsidies
- Transition of individual and public transport to low-carbon fuels and electricity
- Transition of coal-fired energy and industrial processes to gas, and increase in energy use efficiency

In all countries, methane reduction actions could also be implemented at the site level and by individuals. The technical and economic feasibility of these actions will depend on local incentives, motivation, know-how and technologies.



- Reduction of leaks and smarter use of gas in the residential sector, increase of gasification and energy efficiency
- Better use of bio-fuels, better management of livestock
- Reduction in urban waste disposal, increase in landfill gas capture
- More wastewater and waste recycling, greater contribution to a circular economy

Regional level

In 2022, the natural gas sector of Central Asia, Eurasia, and perhaps globally, is going through special times. The Ukraine-Russia conflict, sanctions and restrictions applied on Russia's significant oil and gas exports, volatile prices and changing export origins and destinations for gas all add a number of unknowns and adjustments to the region's energy transition and climate plans. It is likely that interest in Central Asia's gas from Asia and Europe will increase. The gas pipelines to China and south Asia (India and Pakistan via TAPI) will likely expand. Domestic use of natural gas, particularly in Turkmenistan, Kazakhstan and Uzbekistan, is poised to grow. Trans-Caspian oil-and-gas connectivity and exports to Europe may expand too: Turkmenistan can use northern Iran infrastructure for gas delivery up to 3 billion m³ to Azerbaijan, which could be transported via Turkey to Europe. Given Russia's economic and geo-political influence in Central Asia, including in the energy sector, combined with influences from China, Asia and Europe, natural gas and methane issues warrant attention. Technical and regulatory activities aiming at methane emissions monitoring, verification and reporting (MRV) and reductions in the energy sector are being promoted by UNECE and UNEP.

Turkmenistan

On the global methane emission maps, Turkmenistan often looks red. Its vast gas reserves, high production levels and high leakage at gas producing fields, compressor stations and pipelines contribute to the excessive methane emissions. While the country is taking steps to modernize its energy and industrial sectors, its gas production volumes and methane emissions will likely increase, and one of the feasible climate targets is the decoupling of emissions from economic and energy growth. The role and contribution of civil society actors in the gas industry as well as Turkmenistan's climate mitigation actions are marginal. The Ministry of Environment and Agriculture along with the Ministry of Energy are the main players on climate actions. Considering the central role of state in planning, regulation and funding of gas projects, governance-related support including modern energy efficiency standards, methane monitoring and leak reduction actions could be welcomed and useful interventions.

Uzbekistan

Uzbekistan embraces green growth, renewable energy projects solar and wind are booming — and even nuclear power. Country has a long experience in CDM projects under the Kyoto Protocol. In May 2022 Uzbekistan joined the Global Methane Pledge and is pursuing reforms in the energy sector, including low- and zero-carbon power generation by 2050. Reduction in gas leaks and scaling up renewables could help reduce natural gas consumption and methane emissions. The Ministry of Energy is a key domestic player on energy transition, the Ministry of Economy and Poverty Reduction is a coordinator for a green transition and the Methane Pledge, and the State Committee on Ecology is in charge of the environment at large, including waste. Uzbekistan's Ecological Party, well represented in the parliament, is a strong political player in the environmental agenda, but the contribution of civil society to climate mitigation and its interest in methane action is limited. Due to the high significance of gas in the domestic energy supply and as a fuel for transport, support for natural gas among the population and businesses is high.

Kazakhstan

Government, the population and businesses are all interested in expansion of the country's gasification, and the energy sector transition is moving from coal to natural gas, so the demand for gas is likely to grow. In 2021 more than half of population (11 million) had access to natural gas. Between 2010 and 2021, the volume of domestic gas consumption increased from 9 to 17 billion m³. The country's track record in emission reductions in the energy sector, particularly in oil and coal industry, is positive, and there is political will and technical options for achieving more reductions. The Ministry of Energy and the Ministry of Ecology, Geology and Natural Resources are the main state players in the energy transition and climate agenda. Associations of oil, gas, renewable energy, waste and agriculture are all relevant to the methane action. Kazakhstan's environmental activists focus on air guality and polluting industries. The Regional Environmental Centre of Central Asia (CAREC) based in Almaty is involved in regional climate adaptation activities, and organizes regional climate change conferences and facilitates region's presence and international visibility in the IPCC and UNFCCC processes and events.

Kyrgyzstan

Making urban air clean in Bishkek and other cities of Kyrgyzstan is a strong political and public motivation. Expansion of natural gas use instead of coal is one of the solutions envisaged by authorities. An increase in hydropower and investments in electric transport offer long-term mitigation potential. Local solutions on energy efficiency, bio-gas generation, landfill gas capture and waste reduction are attractive for the public and promoted by local NGOs. Kyrgyz civil society organizations are vibrant and vocal, including on clean air, energy and climate, and have the potential to bring change at the city, province and even country levels. The new Ministry of Natural Resources, Ecology and Technical Supervision is in charge of climate actions, but its ability to act is limited by staff shortages, capacities and lack of funding. Considering that Kyrgyzstan is participant of the Global Methane Pledge, further support to the country to pursue low methane emission pathway is encouraged.

Tajikistan

Tajikistan has been living in an energy deficit for years. The main use of the imported (compressed) natural gas is a fuel for transport and household needs. Its very low total and per capita GHG emissions and very high vulnerability to climate change attracts domestic and international attention mostly to adaptation actions. The country remains the main recipient of international climate financing among Central Asia states for disaster risk reduction, climate resiliency and hydrometeorology. Civil society organizations and associations are underdeveloped. The State Committee on Environment is in charge of climate actions. Tajikistan is a potential gas transit country for the Central Asia-China pipeline D, and may benefit from technical and governance assistance to monitor and reduce methane leaks.

Methane emission scenarios



In the energy sector of Central Asia, we can see developments moving in several scenarios. The production, domestic use and export of natural gas will likely further increase by 2030. Remote sensing to detect and minimize leaks and future-proofing of infrastructure may help decouple growth in natural gas from growth in methane emissions. Emissions may remain stable as countries transition from coal to gas in the power and domestic sectors, and the greater energy efficiency along with decentralized local solutions may compensate an overall increase in energy demand. The race to low-carbon or zero emissions in the energy sector and the use of renewables, particularly in Uzbekistan and Kazakhstan, can help reduce demand for natural gas and cut other carbon emissions. The energy transition needs to reach the final consumers such as individual houses, industries and large pumping stations in the irrigation system.



As population and agriculture increase, methane emission will continue to rise, particularly from agriculture and waste, as shown in the national GHG inventory reports and projections. City- and site-specific individualized measures on reduction of methane from waste, higher waste recycling, livestock feeding and natural carbon sinks may, in combination, reduce or compensate for growth in emissions. An increase in individual transport is likely to lead to an increase in natural gas and other fuel demand, unless viable incentives and new infrastructure help to boost the transition to electric and hydrogen- or hybrid-based cars. National custom, climate and environmental regulations, regional trade and continental car production and importation patterns will further define the look of Central Asia transport.

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