

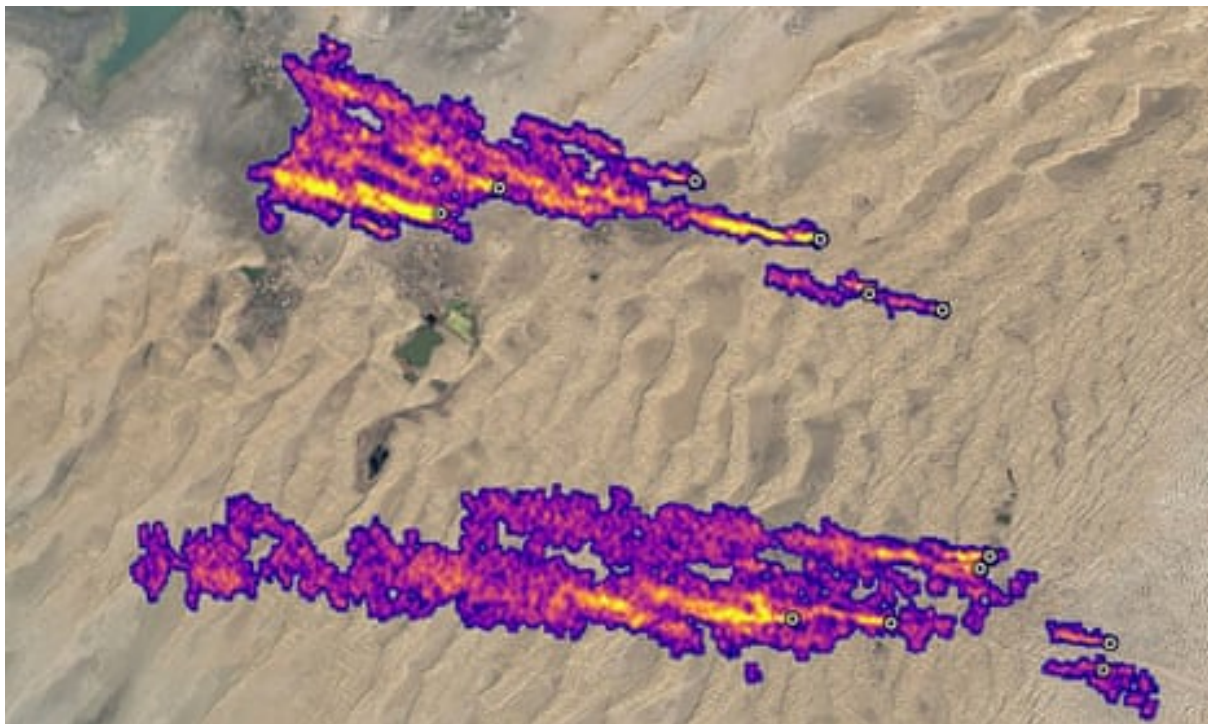
‘Mind-boggling’ methane emissions from Turkmenistan revealed

Leaks of potent greenhouse gas could be easily fixed, say experts, and would rapidly reduce global heating

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- A Nasa satellite image of methane plumes east of Hazar, Turkmenistan, in October 2022. Photograph: Nasa/JPL-Caltech/AFP/Getty

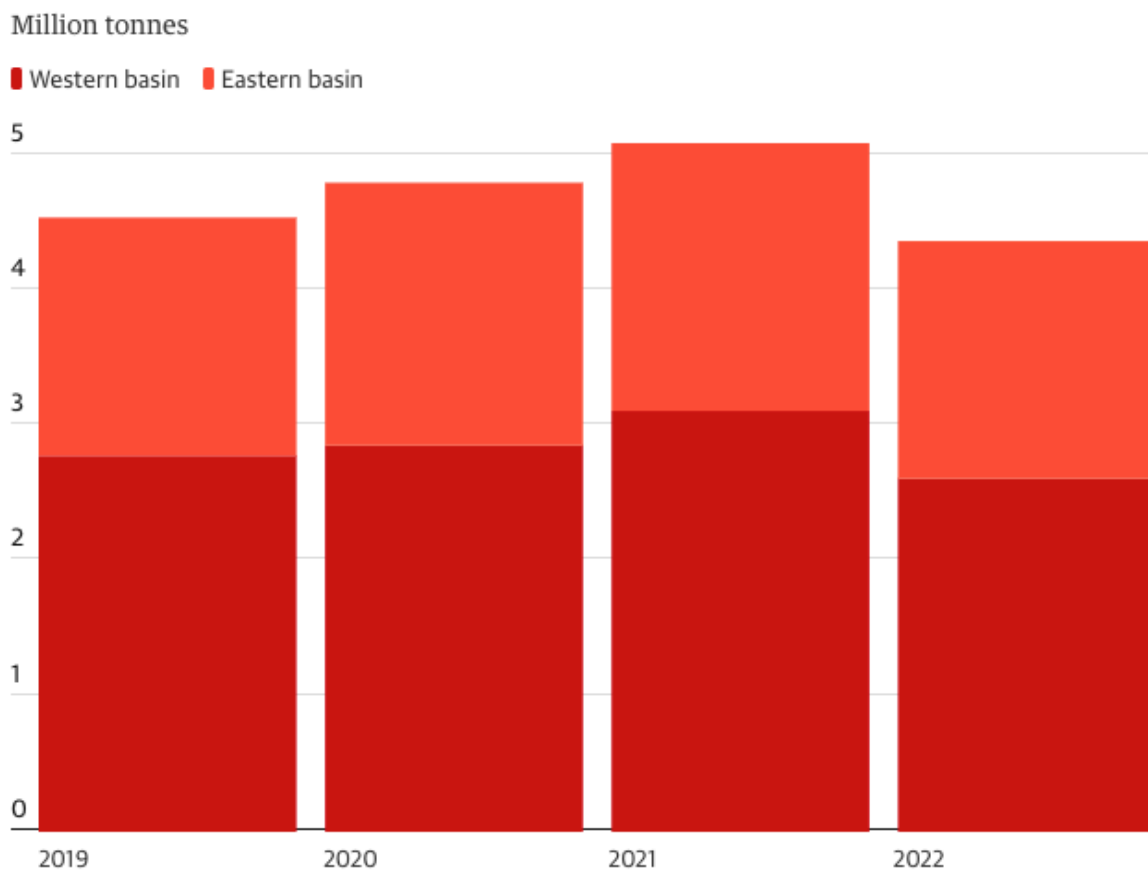
Methane leaks alone from Turkmenistan’s two main fossil fuel fields caused more global heating in 2022 than the entire carbon emissions of the UK, satellite data has revealed.

Emissions of the potent greenhouse gas from the oil- and gas-rich country are “mind-boggling”, and an “infuriating” problem that should be easy to fix, experts have told the Guardian.

The data produced by **Kayrros** for the Guardian found that the western fossil fuel field in Turkmenistan, on the Caspian coast, leaked 2.6m tonnes of methane in 2022. The eastern field emitted 1.8m tonnes. Together, the two fields released emissions equivalent to 366m tonnes of CO₂, more than the UK's annual emissions, which are the 17th-biggest in the world.

Methane emissions have surged alarmingly since 2007 and this acceleration may be the biggest threat to keeping below 1.5C of global heating, according to scientists. It also seriously risks triggering **catastrophic climate tipping points**, researchers say.

Methane emissions from Turkmenistan's fossil fuel fields



Guardian graphic | Source: Kayrros

The Guardian recently revealed that **Turkmenistan was the worst in the world for methane “super emitting” leaks**. Separate research suggests a switch from the flaring of methane to venting may be behind some of these vast outpourings.

Flaring is used to burn unwanted gas, putting CO₂ into the atmosphere, but is easy to detect and has been increasingly frowned upon in recent years. Venting

simply releases the invisible methane into the air unburned, which, until recent developments in satellite technology, had been hard to detect. Methane traps 80 times more heat than CO₂ over 20 years, making venting far worse for the climate.

Experts told the Guardian that the Cop28 UN climate summit being hosted in the United Arab Emirates in December was an opportunity to drive methane-cutting action in Turkmenistan. The two petrostates have close ties and there is pressure on the **UAE to dispel doubts that a big oil and gas producer** can deliver strong outcomes from the summit.

Tackling leaks from fossil fuel sites is the fastest and cheapest way to slash methane emissions, and therefore global heating. Action to stem leaks often pays for itself, as the gas captured can be sold. But the maintenance of infrastructure in Turkmenistan is very poor, according to experts.

‘Out of control’

“Methane is responsible for almost half of short-term [climate] warming and has absolutely not been managed up to now – it was completely out of control,” said Antoine Rostand, the president of Kayrros.

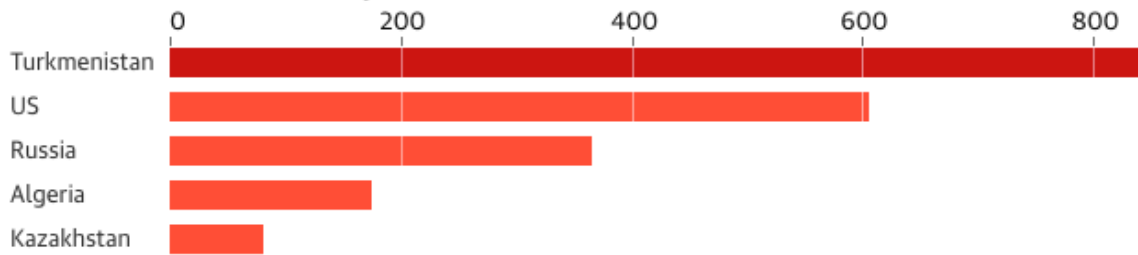
“We know where the super emitters are and who is doing it,” he said. “We just need the policymakers and investors to do their job, which is to crack down on methane emissions. There is no comparable action in terms of [reducing] short-term climate impacts.”

Super-emissions from oil and gas installations were readily ended, Rostand said, by fixing valves or pipes or, at the very least, relighting flares: “It’s very simple to do, it has no cost for the citizen, and for the producers, the cost is completely marginal.”

The satellite data used by Kayrros to detect methane has been collected since the start of 2019 and Turkmenistan’s overall emissions show a level trend since then. Satellites have also detected 840 super-emitting events, ie leaks from single wells, tanks or pipes at a rate of a few tonnes an hour or more, the most from any nation.

Turkmenistan has the most methane super-emitter events in the world

Number of events recorded by satellite 2019-2022



Guardian graphic | Source: Kayrros

Most of the facilities leaking the methane were owned by Turkmenoil, the national oil company, Kayrros said. Further undetected methane emissions will be coming from Turkmenistan's offshore oil and gas installations in the Caspian Sea, but the ability of satellites to measure methane leaks over water is still being developed.

Kayrros also did some high-resolution monitoring of the North Bugdayly field in western Turkmenistan. The number of super-emitter events there doubled to almost 60 between 2021 and 2022, with one recent super-emitter pouring out methane for almost six weeks.

Turkmenistan is China's biggest supplier of gas and is planning to **double its exports** to the country. Until 2018, Turkmen citizens had received **free gas and electricity**. However, the country is also very vulnerable to the impacts of the climate crisis, with the likelihood of **severe drought projected to increase "very significantly"** over the 21st century and yields of major crops expected to fall.

'Huge opportunity'

Speaking freely about the repressive and authoritarian state is difficult but sources told the Guardian it was a "very depressing" situation, with Turkmenistan probably the worst country in the world in dealing with methane leaks.

They said preventing or fixing the leaks represented a "huge opportunity" but that the lack of action was "infuriating". Turkmenistan could stop the leaks from ageing Soviet-era equipment and practices, they said, and the country could be

the “world’s biggest methane reducer”. But the huge gas resources on tap meant “they never cared if it leaked”.

It was also not a priority for the president, **Serdar Berdimuhamedov**, they said, without whose approval little happens. This is despite Berdimuhamedov, then deputy chair of the cabinet of ministers, **telling the UN climate summit Cop26** in Glasgow in 2021 that Turkmenistan was reducing greenhouse gas emissions “by introducing modern technologies in all spheres of the state’s economy”, with “special attention” to the reduction of methane emissions.



Turkmenistan’s president, Serdar Berdimuhamedov, at his inauguration ceremony in Ashgabat, Turkmenistan, in March 2022. Photograph: AP

Berdimuhamedov also welcomed the **Global Methane Pledge (GMP)** to cut emissions, but Turkmenistan has failed to join the 150 nations now signed. Neither are Turkmenoil and Turkengas, the state companies, **members of a voluntary UN initiative** to cut leaks, the Oil and Gas Methane Partnership 2.0 (OGMP2), which covers about 40% of global oil and gas production. “The president hasn’t followed up,” said a source.

Largest hotspot

Recent scientific research, **published in the journal Environmental Science and Technology**, found that the west coast of Turkmenistan was “one of the largest methane hotspots in the world”.

Detailed analysis of satellite data revealed 29 different super-emitter events between 2017 and 2020, although older satellite data showed that “this type of emission has been occurring for decades”.

The researchers said 24 of the 29 super-emitter events came from flare stacks that had been extinguished and were then venting methane directly into the air, and that all were managed by state companies. The other five were linked to pipeline leaks. The scientists said that “the more frequent emitters would conflict with Turkmen law, which bans continuous gas flaring and venting”.

“Flaring is very easy to identify from the flame itself,” said Itziar Irakulis-Loitxate, of the Universitat Politècnica de València in Spain, who led the study. “But venting was something that you could not identify easily until two years ago.” The switch to venting, a far worse environmental practice, was “mind-boggling”, according to another expert.

The scientists said the prevalence of venting “points to the risks of penalising flaring without effective measures to control venting”. The World Bank founded a **global initiative to end flaring** in 2015.

‘Forcing mechanism’

The UN climate summit in December represented an opportunity for change, sources said, as it is being hosted by the UAE, which has strong links with Turkmenistan and expertise in oil and gas production. The most recent visit by Sheikh Mansour bin Zayed, the UAE’s deputy prime minister, to Turkmenistan **was in February**. He met Berdimuhamedov and discussed with him bilateral cooperation “in vital sectors such as oil and gas”.

The UAE is a member of the Global Methane Pledge and the state oil company, Adnoc, is a member of the OGMP2. **Adnoc recently announced a partnership** to develop a “supergiant gas field” called Galkynysh and other energy projects in Turkmenistan. However, Adnoc did not respond to a request for information on how the company would help limit methane emissions in the country.

The Guardian understands diplomatic efforts are being made to urge Turkmenistan to cut its methane emissions. “We are really hoping Cop28 is a forcing mechanism,” a source said.

The Guardian contacted Turkmenoil, Turkmengaz, the Turkmenistan ministry of foreign affairs and the Turkmen embassy in the UK for comment, but none responded.