IMI Satellite Methane Emissions Fact Sheet for Turkmenistan

What is the IMI

The Integrated Methane Inversion (IMI; https://carboninversion.com) is an open-source software tool developed at Harvard University that uses satellite data to provide an independent, top-down check on national methane emissions. The IMI is designed to complement national inventories, not replace them: it starts from each country's own reported data and evaluates it with independent satellite evidence.

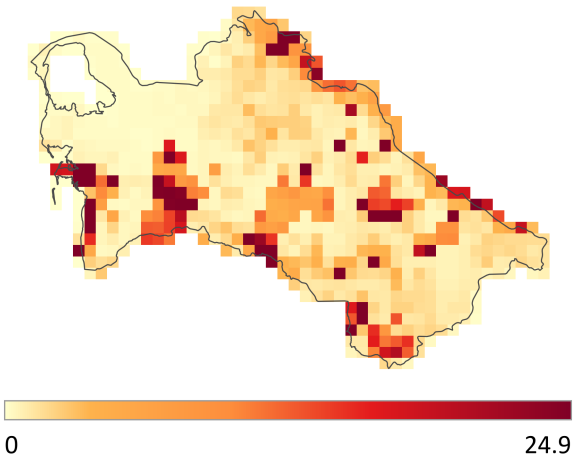
Unlike commercial point-source products which detect emissions from individual facilities, the IMI quantifies **total emissions from all sources across an entire country**, giving a complete national picture rather than a partial one. Because the IMI applies the same satellite-based method consistently across all countries, it also enables direct comparison of national methane emissions worldwide. Countries can partner with the Harvard IMI team to validate their 2026 BTR submissions using IMI data.

Adding the top-down analysis helps to strengthen confidence in the reported inventory while also identifying sectors or regions worth a closer look. The IMI's estimates for Turkmenistan in 2024 are summarized below:

	Bottom-Up National Inventory	IMI Satellite-Based Estimate
Anthropogenic Emissions	1.72 Mt CH_4/yr 142 Mt CO_2e/yr GWP 20** 51.1 Mt CO_2e/yr GWP 100	6.95 (3.96, 7.80)* Mt CH_4/yr 573 (326, 643) Mt CO_2e/yr GWP 20 207 (118, 232) Mt CO_2e/yr GWP 100

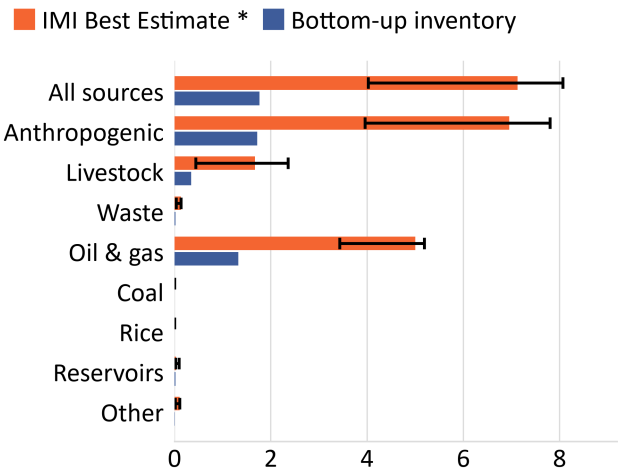
IMI GRIDDED METHANE EMISSIONS

kt CH_4/yr



METHANE EMISSIONS BY SECTOR

Mt CH_4/yr



To arrange a briefing or discuss how IMI data can support Turkmenistan's reporting (at no cost), contact:

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* Best estimate and confidence range. 2024 results are preliminary.
** CO_2e estimates use IPCC AR6 fossil methane global warming potentials (GWP20 = 82.5; GWP100 = 29.8). GWP20 and GWP100 represent methane's estimated warming effect over 20- and 100-year time horizons, respectively.

Advancing Satellite-Based Methane Reporting to Support International Climate Policy Processes

A Harvard University project to help countries strengthen their methane inventories and climate reporting

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The **Integrated Methane Inversion (IMI)** is a free, open-source software tool that uses satellite observations to estimate how much methane a country emits at national, subnational, and sector levels. Developed at Harvard University's Salata Institute for Climate and Sustainability, it helps countries check and improve the emissions figures they report to the United Nations.

How It Works:

- The IMI starts with a country's own national methane inventory: its estimates to the UN from sources such as oil and gas operations, agriculture, and waste.
- It combines that starting estimate with daily, global observations of atmospheric methane from the TROPOMI satellite instrument (operating since 2018), plus data from other satellites that detect individual sources. Weather data help the tool account for how winds carry methane from its source to the places where satellites observe it.
- Using this evidence, the IMI adjusts the country's initial estimate. The results show estimated emissions across the country in areas roughly 12-25 kilometers across, along with a range that expresses the uncertainty in each estimate.
- The IMI also shows national totals for emissions from human activity and estimates by sector.

What Makes It Different: Some satellite tools measure releases from individual sites, such as a leaking oil or gas facility. Those measurements help identify large emitters, but they do not provide a country's total annual emissions. Importantly, the IMI uses a common methodology for every country, allowing users to compare the results.

Why It's Trustworthy: The IMI uses established scientific methods described in over 50 peer-reviewed publications. Its code is publicly available, its methods are documented, and it is designed for non-expert use. A 2025 study by East and colleagues reports its estimates of methane emissions from human activity worldwide, country by country. Users can explore the results through an interactive web interface.

Supporting National Climate Reporting:

Countries can use IMI results to check the methane figures in their **Biennial Transparency Reports (BTRs) to the United Nations**, including those due at the end of 2026. The Harvard team can help governments, NGOs, and international institutions interpret the results, explore the website, and assess how the estimates could support reporting for a particular country or region.

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