2021 GHGSAT METHANE EMISSIONS REPORT



Global Monitoring and Emission Insights

GHGSat is the global leader in monitoring greenhouse gas emissions from space. We pioneered high-resolution methane detecting satellites and now operate the only constellation capable of delivering accurate emissions data to industry, governments, and financial markets.

Every day, we pinpoint the source of emissions at thousands of industrial sites across the world, enabling operators to take prompt and effective action. Our data is being used by the UN Environment Programme's International Methane Observatory, and GHGSat leads the way in charting emissions from landfills, coal mines, and agriculture.

In this report, we present highlights from our satellite emissions data from the past year, and explore trends in oil & gas, coal mining and waste management, with insights into regional variations.



*The Global warming potential (GWP) of a greenhouse gas is a conversion factor which makes it possible to compare their effect on the environment in reference to the impact of CO2. The resulting unit used is CO2e.

Global Methane Trends

Emissions are on the rise

GHGSat satellite data showed that the monthly average source emission rate increased threefold from January to December 2021, across all industries.







At least three quarters of emissions were undetectable by public satellites

We detect what others can't

Public satellite systems scan wide areas at coarse resolution and very high detection threshold to assess regional emissions and identify hotspots. GHGSat satellites pinpoint the precise source of much lower emissions, providing actionable data in hours to operators.

Fossil fuels and landfills dominated emissions

The majority of emissions we detected came from carbon-intensive energy industries despite massive emissions from waste management.





2021 Oil & Gas Trends



Central Asia, the highest emitter

In 2021, 2.6Mt of methane emissions measured in high-resolution emanated from oil & gas facilities. Combined, the five highest measurements from oil & gas sites released CO2e emissions equivalent to burning 42.4 million barrels of oil.



Asian Gas Emissions

of Oil & Gas methane emissions were detected in Asia

74% of these were in Turkmenistan.

74%

The five biggest emissions recorded for Turkmenistan in 2021 came from the same location and totalled 378,044 tonnes of greenhouse gas released - the equivalent of 2M+ cars on the road for a full year.

Date: 2021-06-15

Total source rate: 28.5 t/hr

Date: 2021-08-23

Total source rate: 45.1 t/hr

Turkmenistan

26%

Date: 2021-09-11 **Total source rate:** 27.4 t/hr

Largest emissions in North America were from the Permian

Location Turkmenistan Central Asia



The majority of our North American emission detections were attributable to oil & gas facilities in the Permian Basin, a region that accounts for nearly 40% of all oil production in the US, and around 15% of its natural gas.

2021 Coal Mine Trends



Five coal mines accounted for 47% of all coal mine methane emissions we observed last year.

Four of these sites are in China and one is an open pit in Kazakhstan.

Location Poland

1.7 MG

from coal mines in 2021



of emissions from 5 mines in Asia

GHGSat measured 1.7Mt of CH₄ emissions from coal mines in 2021, including from the world's top coal producing countries such as China, Australia, Russia, and India.



Date: 2021-04-05

Eastern Europe

In Europe, GHGSat detected emissions from the coal-producing region of Silesia in Poland. This capture shows underground mines emitting 11.1 t/hr. If they emitted constantly for a full year, it would be enough to power over 290,000 homes for the same period.

Satellite CH₄ Measurement



Large emissions detected from open pit mines

The view has long been held that methane emissions from surface mines could not be accurately measured in high-resolution from space, as the gas emits at low rates and disperses over a wide area. It was also thought unlikely that open cast mines could be major sources of greenhouse gases, despite 40% of all mines – including 10 of the biggest – being of this variety.

GHGSat observations conclude that open pits may be a more important source of greenhouse gas emissions than currently understood.

2021 Landfill Trends



With landfill accounting for 20% of all our recorded industrial emissions last year, GHGSat worked with operators and authorities to raise awareness of the major role waste emissions play in the global methane budget.



of the methane emissions we measured from landfills and dumpsites were in Asia, with India accounting for nearly half of these.

Landfills and dumpsites are persistent emitters

Landfills and unregulated dumpsites emit methane continuously and GHGSat evidenced this with repeated observations at major sites across the world.



of sites monitored had at least two emissions detected on separate days in the same quarter period 15%

of targeted sites had five or more methane emissions detected over the year



One example of a persistent emitter was a site in the Middle East. Out of 32 GHGSat observations in 2021, 28 showed emissions. Using the average emission rate from these observations, it would have released 24,825 tonnes of methane over the course of the year, if emitting continuously - sufficient to power 75,000 homes for one year.

Top 5 Largest Landfill Emissions 2021

	t/hr of CH₄
Buenos Aires	36
Hong Kong	27.5
Mumbai	20.1
Dhaka	16
Lahore	10



Landfill Buenos Aires, Argentina Date: 2021-05-18

800

background (ppb)

above

World-Changing Innovation

Our technology wins awards

Fast Company named GHGSat in its annual list of the <u>World's Most</u> <u>Innovative Companies</u> for 2021, and again in 2022. The European Association of Remote Sensing Companies awarded GHGSat methane monitoring solutions as its "<u>Product of the Year</u>".





GHGSat is currently the only organization operating high-resolution satellites designed to detect and measure facility-level emissions worldwide. In 2022, GHGSat's <u>constellation</u> is set to double with the launch of three new satellites: Luca, Penny and Diako.

GHGSat satellites measure methane emissions concentrations using a patented method described in this <u>peer-reviewed overview</u>. Emissions are detected using algorithms and verified by human operators. Source rates are estimates for each detected emission using peer-reviewed methods.



We successfully secured additional investment in 2021. This means GHGSat will have a constellation of 10 high-resolution satellites by 2023.

With leading-edge emission monitoring solutions, we deliver actionable metrics and insights critical to environmental, production and financial decision-making.

Our emission intelligence empowers carbon intensive industries and governments to achieve their emission reduction goals.

SENSING TOMORROW

For more information on our emission data services and our constellation of satellites, visit **ghgsat.com**





