GHGSAT

AN INTEGRATED APPROACH TO METHANE REDUCTIONS IN IRAQ

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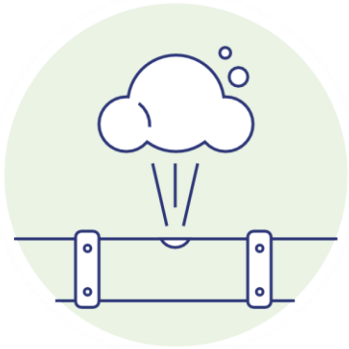
CHALLENGE

- In 2021, the UN Environmental Programme identified the reduction of anthropogenic methane emissions as critical to limiting global warming. Methane accounts for ~50% of net rise in global temperatures from pre-industrial levels.
- ~25% of anthropogenic methane emissions come from the oil and gas sector.
- Over 100 countries have committed to reducing global methane emissions to 30% of 2020 levels by 2030 through the Global Methane Pledge.
- To achieve this goal, accurate and timely data able to identify and quantify sources of emissions is required. However, current data sources and monitoring methods are insufficient.

High cost to find leaks using current methods

Infrequent monitoring means critical data gaps



Big leaks go undetected for months

Uneven performance caused by numerous variables

GHGSAT MONITORING

- GHGSAT has a constellation of satellites with high-resolution spectroscopic imagers tuned to detect elevated methane concentrations above the atmospheric background.
- System is designed to regularly monitor (every 1-2 days) potentially emitting sites anywhere in the world and detect emissions down to a very low leak rate (100 kgCH_4/hr).
- This allows for quick identification of fugitive methane emissions and alerting of operators for mitigation efforts.

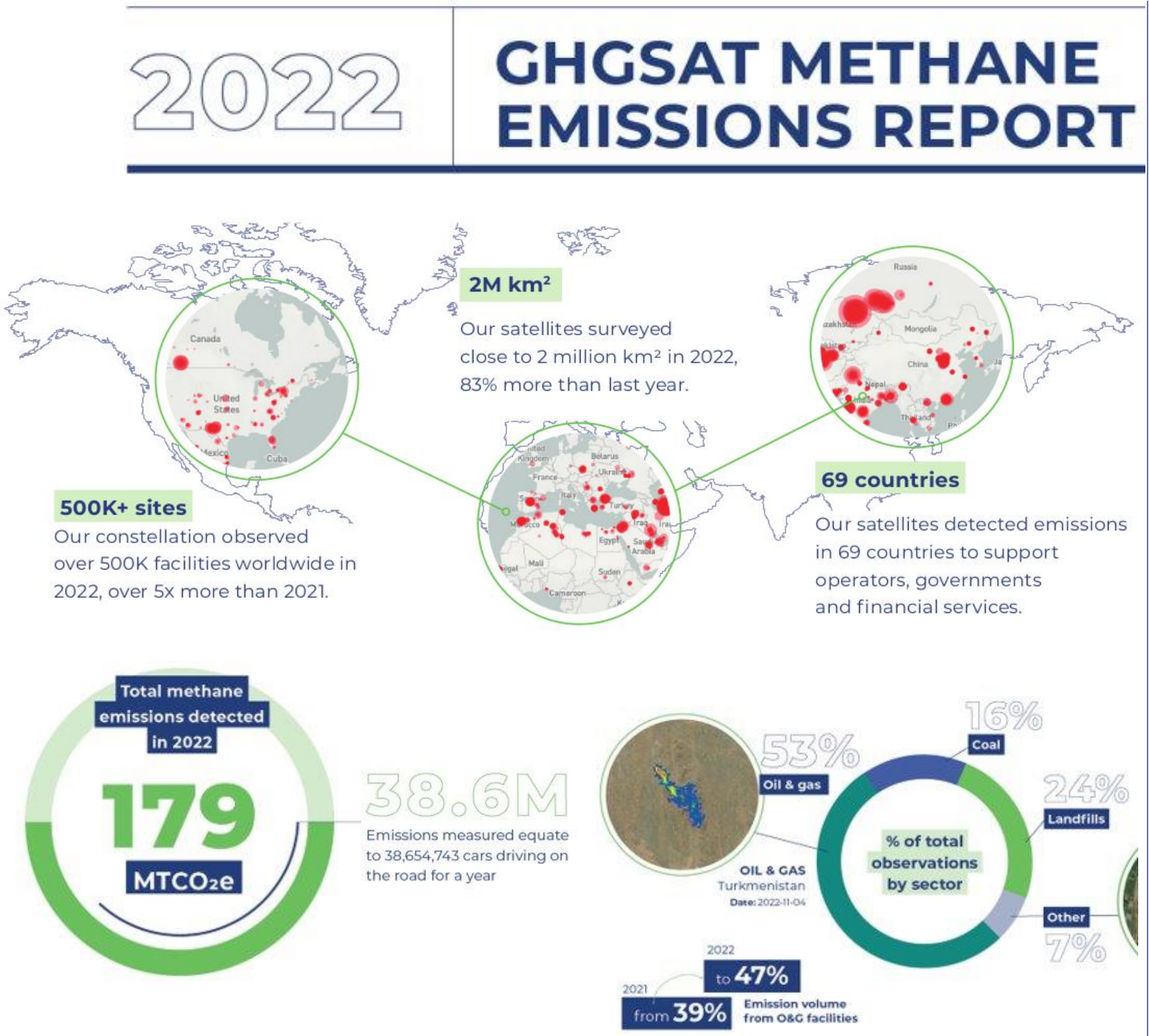
OUR SATELLITES

9 satellites in orbit + 3 launching in 2023

- Spatial resolution: ~25 m
- Spectral resolution: 0.3 nm (low noise level)
- Detection threshold: 100 kg/hr
- Field of View: 12km x 12km
- Size: Comparable to a microwave oven
- Weight: 15 kg
- Orbit: Sun-Synchronous Polar
- Revisit Time: 1-2 days with combined satellite revisit

EMISSION REDUCTIONS

- As GHGSAT's constellation has grown, global monitoring coverage has increased with more methane emissions detected.
- From GHGSAT's monitoring efforts in 2022, 2.7 $MTCO_2e$ was mitigated – equivalent to ~603,000 cars on the road for a year.
  - $MTCO_2e$ = megatons of carbon dioxide equivalent



MONITORING CAMPAIGN IN IRAQ

Methodology

- Collaboration with Oil and Gas Climate Initiative (OGCI), Carbon Limits, and GHGSAT.
- 9-month GHGSAT satellite monitoring campaign over 2021 – 2022 of 6 oil fields in Iraq.
- Sites were selected based on the likelihood of fugitive emissions as determined by: production volumes, presence of flares, and age of infrastructure.
- If emissions were detected, the facility operator was contacted and provided with technical support to investigate the source of the emissions and assess mitigation actions.

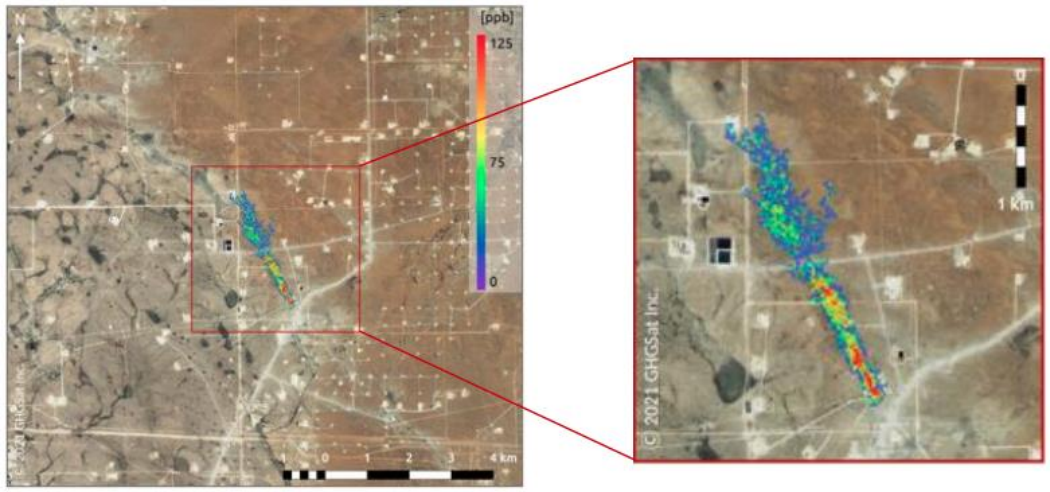


Figure 1: Example of oil and gas fugitive emission from GHGSAT data.

	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22
Site 1	0 (1)	4 (3)	2 (1)	1 (1)	0 (1)	2 (2)	1 (1)	0 (1)	0 (7)	0 (2)
Site 2	0 (1)	0 (1)	0 (2)	0 (1)	0 (1)	0 (1)	0 (2)	0 (5)	0 (10)	0 (2)
Site 3	0 (0)	0 (0)	0 (1)	0 (2)	0 (3)	0 (1)	0 (1)	0 (4)	0 (8)	0 (5)
Site 4	0 (0)	0 (1)	0 (1)	1 (2)	0 (1)	0 (1)	0 (2)	1 (4)	0 (8)	0 (5)
Site 5	0 (1)	1 (1)	0 (1)	0 (1)	7 (3)	0 (0)	0 (1)	0 (3)	2 (3)	0 (0)
Site 6	0 (0)	0 (0)	3 (2)	2 (1)	1 (1)	2 (1)	2 (2)	0 (3)	1 (4)	3 (1)

Figure 2: Number of emissions found per month for each monitored site with number of successful observations in brackets.

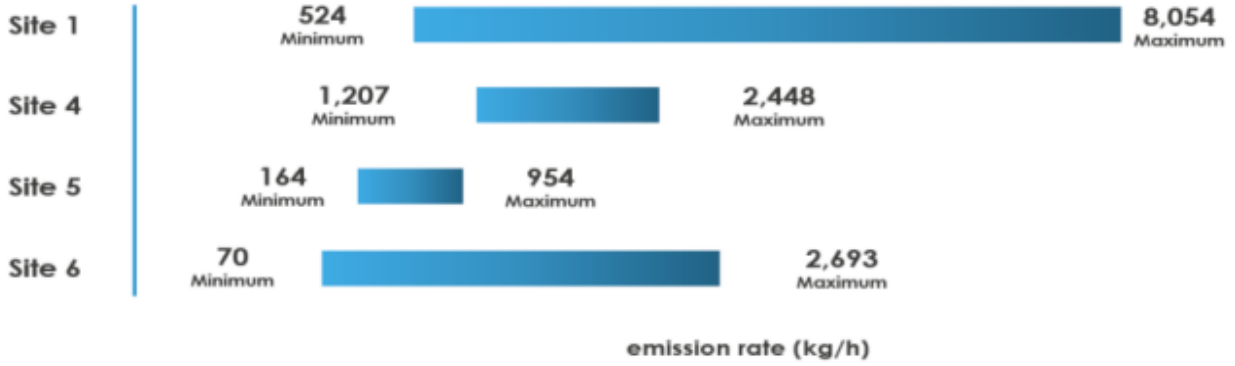


Figure 3: Range of emission rates found at each site over campaign.

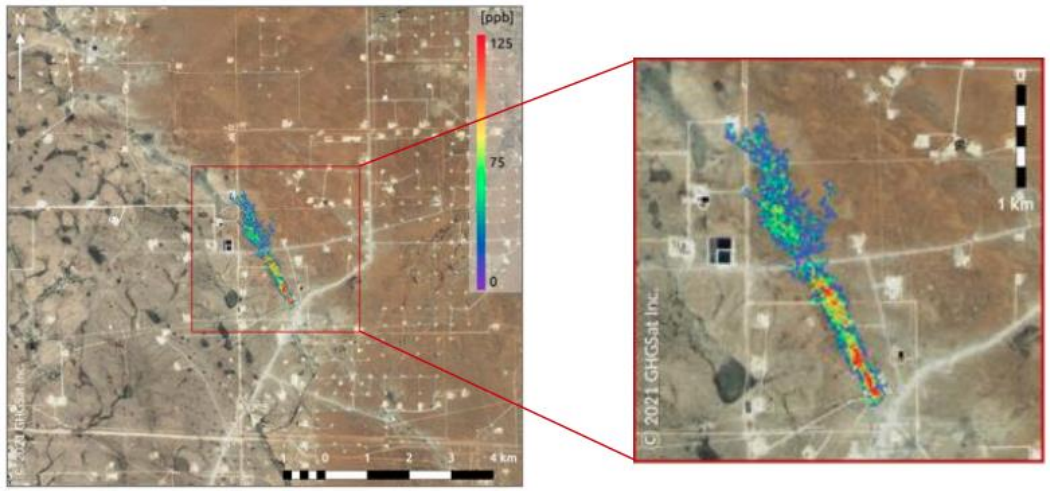
MONITORING CAMPAIGN IN IRAQ

Results

- 175 successful observations.
- 4 / 6 sites were emitting above GHGSAT's detection threshold with an average rate of 1,500 kgCH_4/hr.
- Sources of emissions were linked to gas flaring inefficiency due to older infrastructure and direct venting (e.g. unlit flares).
- Engagement with operators led to mitigations through operational process improvement and rerouting of gas to nearby facilities.

Next Steps

- Based on the success of this pilot project, the campaign has been extended to 20 additional sites across Iraq, Kazakhstan, Algeria, and Egypt.



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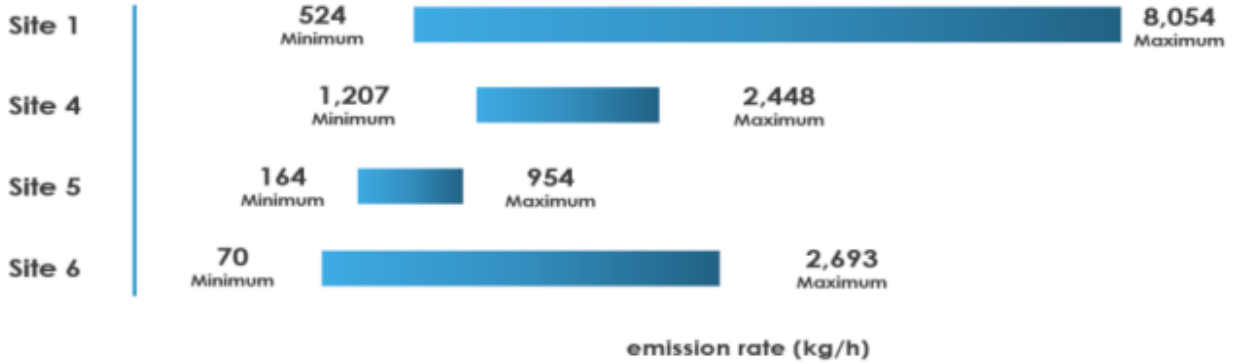

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ACCESSING EMISSION DATA

- Some of GHGSAT's data is publicly accessible for scientific research and application development.
  - SPECTRA: login.ghgsat.com
  - ESA Third Party Mission Programme: earth.esa.int/eogateway/catalog/ghgsat-archive-and-tasking
  - Satellite Applications Catapult (UK users only): sa.catapult.org.uk/projects/methane-monitoring
- If you have any questions or would like to learn more, please reach out to me at bolashle@ghgsat.com