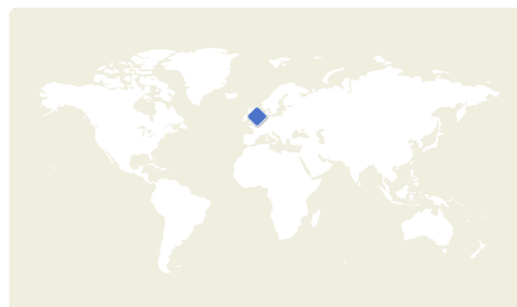


SYNTHESIS REPORT ON NORD STREAM GAS LEAKS



Data synthesis and revised analyses reveal that the Nord Stream pipeline emitted 465 ± 20 thousand metric tons of methane into the atmosphere between 26 September and 3 October 2022.



DONOR:
European Commission



**BENEFITTING COUNTRIES
OR REGIONS:**
European countries



SECTOR:
Oil & Gas



Subsector, if applicable:
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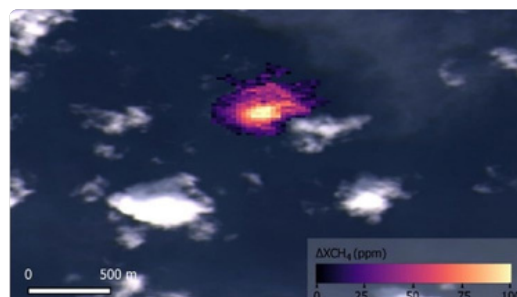
STATUS: Published

TIMELINE: Published in 2025



**IMEO SCIENCE
OBJECTIVE:**

→ **Advance reconciliation and data
integration approaches for multi-scale
emissions data.**



KEY FINDINGS

By reconciling modelled atmospheric emissions with top-down emission estimates, the study concluded that the Nord Stream pipeline emitted 465 ± 20 thousand metric tons of methane into the atmosphere between 26 September and 3 October 2022. Although this represents the largest recorded emission of methane to the atmosphere from a single transient event, this amount is equivalent to only 0.1 per cent of anthropogenic methane emissions for 2022 — and just two days' worth of the global oil and gas industry's methane footprint. The synthesis report shows how diverse, complementary measurement approaches are most effective for quantifying more accurately methane emissions, the Nord Stream pipeline leaks being a case in point.

RATIONALE

The 2022 Nord Stream underwater pipeline explosions are thought to have caused one of the largest anthropogenic methane emission events ever recorded. Despite numerous individual assessments of its impact on the global atmospheric methane budget, there is high uncertainty as to the exact amount of methane released from the pipelines. The goal of this study was to compile and reconcile emissions estimates from the Nord Stream pipeline leaks to present a more accurate methane emission estimate from the incident. Furthermore, the report showcases the different measurement approaches available (marine, airborne, tall-tower and satellite-based), for quantifying methane emissions in similar contexts. Finally, it explains and contextualizes reported emissions to a wider scientific audience.



RELATED PUBLICATIONS

- [Harris et al., 2025](#), Methane emissions from the Nord Stream subsea pipeline leaks.



SIGNIFICANCE FOR DECISIONMAKERS

Accurate, verified data is crucial to inform decisions and drive action in support of global emission reduction targets. Given the wide variety of estimates published on the Nord Stream pipeline leaks, the study provides a more accurate view on the impact of the events on the 2022 global methane budget. The synthesis report also presents the utility and limitations of measurement approaches as applied to the Nord Stream underwater pipeline leaks, and their implications for applying them to future offshore oil and gas emission events globally.



STUDY APPROACH/ACTIVITIES

IMEO led and collaborated with a team of 67 researchers affiliated with 30 international organizations to synthesize and revise methane emission estimates from the Nord Stream pipeline leaks. The researchers simulated and integrated pipeline rupture emission rates with methane dissolution and sea-surface outgassing estimates to model the evolution of atmospheric emissions from the leaks. They went on to verify atmospheric emissions by comparing them with top-down point-in-time emission rate estimates and cumulative emission estimates derived from airborne, satellite, and new tall-tower quantifications. They then used reconciled bottom-up and top-down estimates to derive a final emission estimate from the event.



CATALYZING ACTION

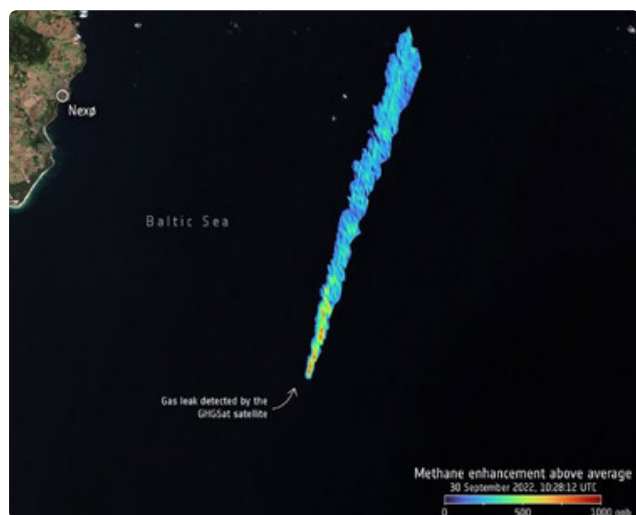
These findings are informing efforts to integrate multiple sources and scales of methane data, in addition to global methane budgets.

OTHER SUPPORTERS/STAKEHOLDERS

Principal Investigator: **IMEO**

Participating international institutions: **Environmental Defense Fund, Royal Holloway University of London, Universitat Politècnica de València, SRON Netherlands Institute for Space Research, Vrije Universiteit Amsterdam, University of Gothenburg, Queen Mary University of London, Laboratoire des Sciences du Climat et de l'Environnement, Voice of the Ocean Foundation, Leibniz Institute for Baltic Sea Research Warnemünde, German Environment Agency, Université Paris-Saclay, Deutscher Wetterdienst, Norwegian Institute for Air Research, University of Leeds, Alfred Wegener Institute for Polar and Marine Research, Toegepast Natuurwetenschappelijk Onderzoek, Nanjing University, Rutherford Appleton Laboratory, Technische Universität Braunschweig, Enagás Transporte, GHGSat, Deutsches Zentrum für Luft- und Raumfahrt (DLR), University of Leicester, Harvard University, Westlake University.**

Revision History: **Feb 2025**



The UN Environment Programme's International Methane Emissions Observatory (IMEO) exists to provide open, reliable, and actionable data to the individuals with the agency to reduce methane emissions. IMEO does this by integrating and reconciling data across sources, including its global methane science studies. IMEO supports measurement and research studies around the world to close the knowledge gap on methane emissions and provide policy-relevant insights to decisionmakers.