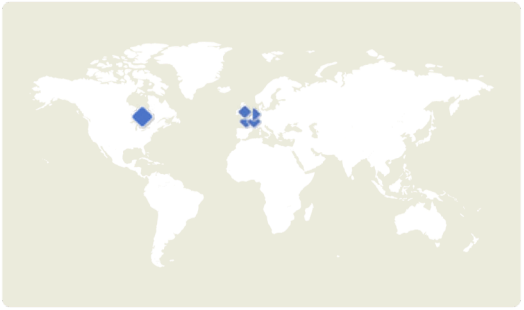
LOCAL DISTRIBUTION STUDIES

Assessing methane emissions from a dozen cities' local infrastructure.



DONOR:
Oil and Gas Climate Initiative (OGCI)

BENEFITTING COUNTRIES OR REGIONS: **Netherlands; Germany; France; United Kingdom; Canada**

SECTOR:
Oil & Gas

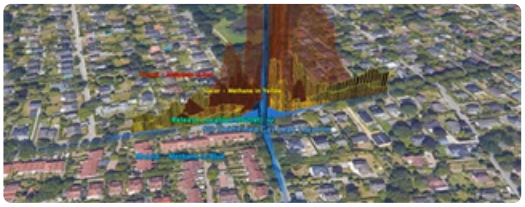
Subsector, if applicable:

STATUS: **Published**

TIMELINE: **Measurements 2017 to 2021; Latest publication 2024**

IMEO SCIENCE OBJECTIVE:

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



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KEY FINDINGS

This study provided evidence of methane leaks that can be mitigated and suggestions to target street-level methane emissions on natural gas distribution networks, sewage systems and furnaces.
The study found that the waste sector is the largest methane emitter in the Toronto area. It also found that engineered waterways (not currently in inventories) may be a significant source. Based on the measurements collected, compressor stations and leaks from natural gas distribution network also contribute to emissions, though more information/ measurements are needed to fully characterize.
The study demonstrated that not all methane leaks at ground level are gas distribution network infrastructure leaks. Large emissions also originate from the sewage network. This carries implications for measuring methane without also measuring co-emitted species for source identification – methane emissions may have been mis-categorized otherwise. In-building methane emissions (e.g., from stoves or boilers) may be missed in mobile street-level measurements.
This study found strong indications of a large biogenic source of methane in Hamburg, correlated with rising tide of its river estuary. The addition of river emissions improved the performance of emissions modeling.
The study found that all cities have a spectrum of small, medium and large methane sources in their domain.
The emission rates found follow a heavy-tailed distribution, and the top 10 per cent of emitters account for 60–80 per cent of total emissions, which implies that strategic repair planning could help reduce emissions quickly. Furthermore, while cities with larger reported emissions were found to generally also have larger observed emissions, there are clear discrepancies between observation-based and inventory-based emission estimates for our 12 cities.

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UN environment programme

RATIONALE

Previously, there was a lack of open, empirical data characterizing emissions from local distribution systems in Europe in comparison to systems elsewhere. These systems are important in the EU as they are a major source of non-imported oil and gas methane emissions. This study assessed emissions from a number of European (and Toronto) distribution systems and compared them to emissions from cities in the US and Canada. This set of studies also incorporated measurements of midstream facilities near sampling regions.

RELATED PUBLICATIONS

- Utrecht (NL) & Hamburg (DE) (Maazallahi *et al*., 2020); Paris
- (FR) (Defratkya *et al*., 2021);
- Toronto (Canada, for point of comparison) (Ars *et al*., 2020);
- Street-level emissions, Bucharest (Fernandez *et al*., 2022);
- Hamburg (DE) (Forstmaier *et al*., 2023);
- Synthesis, 12 cities, 8 countries (Vogel *et al*., 2024);

SIGNIFICANCE FOR DECISIONMAKERS

The results provide a more detailed understanding of methane emission sources across distribution networks so that mitigation efforts can be more effectively targeted while inventory models can be improved.

STUDY APPROACH/ACTIVITIES

To explore urban methane emissions in cities outside the U.S., where significant emissions were found previously, mobile measurements were performed in 12 cities across eight countries. The surveyed cities range from medium size, like Groningen, NL, to large size, like Toronto, CA, and London, UK. Furthermore, this survey spanned across European regions from Barcelona, ES, to Bucharest, RO. The joint analysis of all data allows us to focus on general emission behavior for cities with different infrastructure and environmental conditions.

CATALYZING ACTION

To mitigate methane emission from urban natural gas distribution systems, it is crucial to understand local leak rates, leak locations, and occurrence rates. In the city of Hamburg, the scientists collaborated with the local gas distribution operator to identify leaks and provide technology transfer about rapid methane detection technology. A follow-up project with this operator provided a comparison of multiple technologies to detect and quantify urban methane emissions (Maazallahi *et al*., 2023).

OTHER SUPPORTERS/STAKEHOLDERS

Principal Investigator: **Technical University of Munich, Germany; Autonomous University of Barcelona, Spain; University of Toronto, Canada; University of Groningen, Netherlands; Université de Versailles Saint-Quentin-en-Yvelines, France; Environment and Climate Change Canada, Canada**

Revision History: **29 October 2024**

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.