

MADRID LANDFILL METHANE EMISSION QUANTIFICATION COMPARISON STUDY

Assessment of approaches to detect and quantify methane emissions from a major landfill.



DONOR:
Global Methane Hub



**BENEFITTING COUNTRIES
OR REGIONS:**
Spain



SECTOR:
Waste



Subsector, if applicable:
Municipal Solid Waste Landfill

STATUS: Analysis ongoing

TIMELINE: Measurements May-December 2025



**IMEO SCIENCE
OBJECTIVE:**

→ **Validation of measurement-based
approaches**



KEY FINDINGS

In progress

RATIONALE

Significant discrepancies have been found between estimated and measured landfill methane emissions globally, including at the study site, the Las Dehehas landfill near Madrid, Spain. Emission rates exceeding multiple tons of methane per hour have been reported from previous satellite retrievals near the Las Dehehas landfill, an order of magnitude greater than inventory estimates.



SIGNIFICANCE FOR DECISIONMAKERS

For policymakers: Validating different measurement-based approaches used to quantify and report emissions is critical as regulators implement data-driven mitigation policies. The project will contribute data to measurement-based models to better track progress toward emission targets. Data will help inform government policies to mitigate methane emissions from the waste sector.

For industry: The study will improve the accuracy and reliability of satellite-based landfill methane monitoring and provide high-quality emissions data, which will help landfill operators better understand their emissions and prioritize actions to mitigate them. Collected data will also help resolve the current inconsistencies between top-down and bottom-up emission estimates in the waste sector.



STUDY APPROACH/ACTIVITIES

The study will take near-simultaneous measurements of landfill emissions via aircraft, satellites and ground-based techniques, which are crucial to reconcile bottom-up and top-down landfill methane emissions measurements. Measurements will be performed during multiple field and remote-sensing campaigns. The measurement-based quantification will act as a ground-truthing measurement for satellite-based data.

The study will compare emission quantifications from the Tracer Dilution Method (TDM) with remote-sensing estimates of methane using aircraft- and satellite-based sensors. Currently established as the gold standard for landfill emissions quantification, TDM involves releasing known quantities of a tracer gas at the landfill surface in order to quantify a second gas, in this case, methane. After the tracer gas is released, its concentrations will be measured downwind from the landfill. The ratio of tracer gas to methane in the downwind plumes is then used to estimate methane emissions from the landfill. While the ground measurement campaign is occurring, aircraft and satellite observations will also be collected to identify major emission areas and quantify the landfill emissions.



RELATED PUBLICATIONS

In progress



CATALYZING ACTION

Multiple measurements will be performed to allow for validation under different climactic conditions. The ability of these techniques to track mitigation progress will be evaluated.

OTHER SUPPORTERS/STAKEHOLDERS

Principal Investigator: **Technical University of Denmark (DTU)**

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.