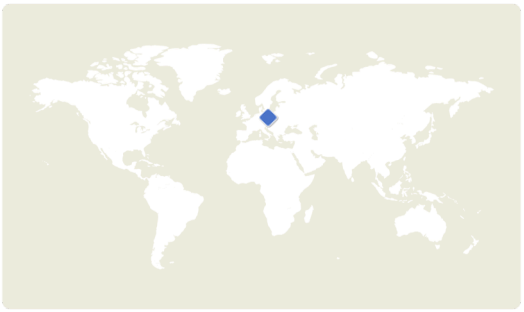
AERIAL AND GROUND-BASED MEASUREMENTS OF COAL MINE METHANE EMISSIONS IN POLAND

Assessing methods to quantify emissions from ventilation shafts, the single largest source of coal mine methane.



DONOR:
European Commission

BENEFITTING COUNTRIES OR REGIONS:
Poland

SECTOR:
Coal

Subsector, if applicable:

STATUS:
Analysis ongoing

TIMELINE:
Measurements 2022 to present

IMEO SCIENCE OBJECTIVE:

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

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KEY FINDINGS

Quantifying emissions from metallurgical coal mining in Poland's Upper Silesia Basin.

RATIONALE

Poland is the world's ninth largest coal producer and Europe's leading producer of high-quality metallurgical coal, which is associated with higher levels of methane emissions especially when compared to lower quality lignite coal. Understanding the scale and location of its coal sector emissions is needed to assess climate impact, target mitigation and track progress. Satellite observation shows Poland is a major hotspot of methane emissions in Europe due to its high density of coal mining operations, particularly in the Upper Silesia Basin. The largest source of emissions in this region (~70 per cent) are estimated to be from underground mines' ventilation shafts. A series of measurement campaigns have been designed to evaluate various atmospheric methods' ability to estimate emissions from ventilation shafts to validate current emissions inventories, which are based on generic emissions factors and not direct measurement. The results will subsequently be compared with in-mine methane safety sensors synchronized with the aerial and ground-based methods to provide more granular verification.

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SIGNIFICANCE FOR DECISIONMAKERS

For Policymakers Validating empirical measurement methods will enable more accurate inventories of coal sector methane emissions. More accurate inventories are needed to define the magnitude of emissions from the various economic sectors, enable comparison between processes or activities that can be considered as emission sources, and provide the foundational information for designing mitigation actions. Inventories backed by empirical data are needed to accurately report emissions and track reduction targets.

For Industry Improved quality of emissions estimates will enable coal producers, buyers, and importers to assess greenhouse gas intensity. This is particularly relevant for the iron and steel industry, which consumes metallurgical coal associated with higher methane emissions than thermal coal used for power generation. Accurate quantification of methane emissions will also enable more thorough lifecycle analysis of products' greenhouse gas emissions.

STUDY APPROACH/ACTIVITIES

The Upper Silesia Basin was selected for study as it is the most significant methane hotspot in Europe associated with coal mining and has many ventilation shafts that can be targeted for measurements. This study builds on prior research in this area by applying various spectroscopy-based methods to quantify ventilation air methane emissions. During the first two campaigns, instruments carried beneath a helicopter performed a series of mass balance estimates comparing upwind and downwind measurements (Helipod approach). In total, 15 successful research flights were conducted, supported by mobile ground monitoring.

A third campaign included a variety of static downwind ground-based methods supported with mobile monitoring. Further quantifications were made by the European Space Agency using point source imaging satellites and by the University of Heidelberg using a ground-based hyperspectral camera. An open path laser system measured across the top of a ventilation shaft to verify performance of an in-mine methane safety sensor over six weeks, supported by additional measurements inside the ventilation shaft. A fourth campaign that deploys a state-of-the-art aircraft based remote sensing instrument is supported by drone-based and in-mine measurements.
The results of all applied methods are referenced to in-mine safety sensor data. Comparison of measurements from within, above, near and far from the ventilation shaft is used to better understand emissions and the best measurement practices.

CATALYZING ACTION

The results from this study will enhance discussions related to the definition of emissions from coal mines, whether from inventories or different measurement-based approaches. This may help mining companies to better define emission estimates, through dual tasking of in-mine methane safety sensors for greenhouse gas reporting, while providing methods for independent validation.

OTHER SUPPORTERS/STAKEHOLDERS

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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.

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