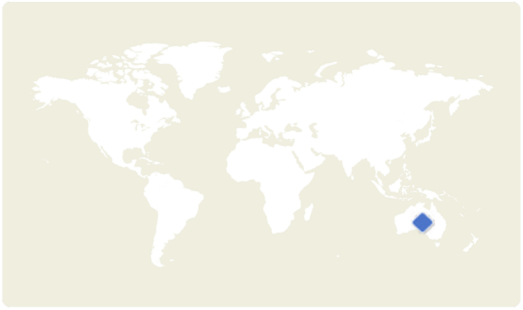
VALIDATION OF COAL MINE METHANE EMISSIONS WITH TOP-DOWN DATA IN AUSTRALIA'S BOWEN BASIN

Providing the first comprehensive airborne measurement-based estimates of coal mine methane from Australia's largest coal producing region.



DONOR:
European Commission

BENEFITTING COUNTRIES OR REGIONS:
Australia

SECTOR:
Coal

Subsector, if applicable:
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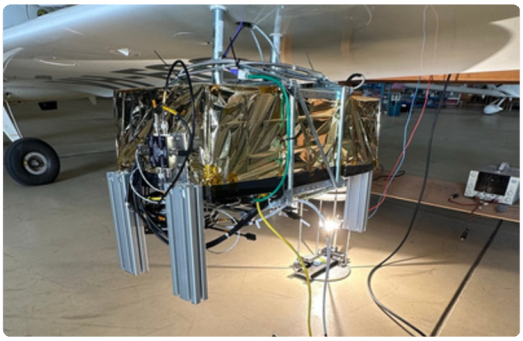
STATUS:
Analysis ongoing

TIMELINE:
Measurements 2023

IMEO SCIENCE OBJECTIVE:

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



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KEY FINDINGS

Quantifying methane emissions from coal mines in Australia's Bowen Basin.

RATIONALE

Australia is the world's fifth largest coal producer and second largest exporter. Understanding the scale and location of its coal sector emissions is needed to assess total climate impact, target mitigation, and track progress. This comprehensive study aims to deploy two independent airborne methods to determine methane emissions from both underground and large surface mines in Australia's Bowen Basin. Using precise but technically contrasting methods yields the high-quality empirical data needed to independently assess the accuracy of emissions estimates from satellite and inventory methods in the coal sector. Satellite studies indicate that coal mine methane emissions in Queensland's Bowen Basin are many times higher than emission inventories suggest. Meanwhile, the International Energy Agency's 2023 Global Methane Tracker indicates Australia's coal mine emissions reported through the United Nations Framework Convention on Climate Change may be underreported by 82 per cent.

United Nations Environment Programme | International Methane Emissions Observatory
1 rue Miollis 75015 Paris, France | www.unep.org/imeo
For more information, please contact imeo@un.org

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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 research team selected the Bowen Basin as their study area based on satellite studies that indicated it to be an area with high emissions that could not be explained through an analysis of inventory data. This was confirmed by a pilot study that performed in-situ airborne measurements.

The team selected an airborne approach to ensure a comprehensive validation study. Initially, the team conducted a pilot study comprising five flights to show the feasibility of applying the mass balance approach to measure and quantify methane emissions from coal mines in the Bowen Basin. This method contrasts upwind and downwind methane levels to successfully quantify total emissions from coal mines, however it cannot pinpoint exact emission locations or processes. Subsequently, a second aircraft performed remote sensing measurements to quantify individual point sources. This dual aircraft approach with simultaneous measurements also allowed for a comparison between the two methods. While emissions from underground coal mines are well-known point sources (through ventilation shafts), those from open pit mines are often viewed as diffuse. This study tests this assumption. Through a total of 47 research flights, the team quantified emissions from 32 coal mines, of which 20 were open pit, nine were underground, and three were mixed. Cloudy conditions during the study precluded simultaneous satellite quantifications.

CATALYZING ACTION

The Inventory, Reporting, and Engagement Team of the National and International Reporting Branch of the Emissions Reduction Division of the Australian Department of Climate Change, Energy, Environment, and Water were informed about the study. The results from this study will guide discussions on the definition of emissions from coal mines, whether the data comes from inventories or from other measurement- based approaches. It will also provide new methods for independent validation. In addition, mining companies are likely to be able to better estimate emissions.

OTHER SUPPORTERS/STAKEHOLDERS

Principal Investigator: **University of Bremen, supported by Airborne Research Australia**

Revision History: **13 August 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.