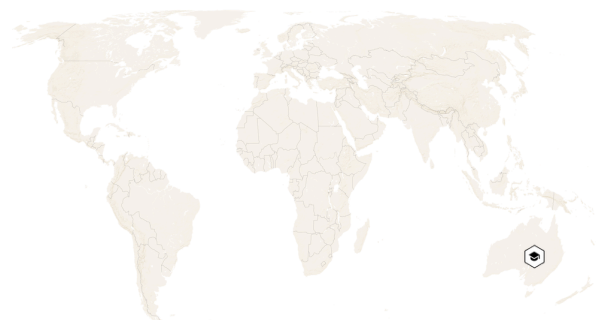


AUSTRALIA BOWEN BASIN PILOT

Confirming feasibility of airborne methods to quantify methane emissions from open-cut coal mines.



DONOR:
European Commission



**BENEFITTING COUNTRIES
OR REGIONS:**
Australia



SECTOR:
Coal



Subsector, if applicable:
—

STATUS:
Published

TIMELINE:
Measurements 2022



**IMEO SCIENCE
OBJECTIVE:**

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



Photo Attribution: Jorg Haeder Airborne Research Australia (ARA)

KEY FINDINGS

The airborne mass balance approach was successfully applied to accurately quantify methane emissions from four open-cut coal mines. Analysis of 10 airborne quantifications at Hail Creek, a major mine in the Bowen Basin, found emissions are 3-8 times higher than operator-reported emissions.

RATIONALE

Australia is the world's fifth-largest coal producer and second-largest exporter. Understanding the magnitude of coal mine methane emissions is critical for assessing the sector's climate impact and targeting mitigation opportunities. This pilot study evaluates the feasibility of the aircraft mass balance approach for estimating emissions from large surface mines in Australia's Bowen Basin. Validating this measurement-based approach is an important step for assessing the accuracy of emission estimates from satellite and inventory methods for open-cut surface mines in Australia.

Prior research using TROPOMI satellite flux estimates suggested that methane fluxes in Queensland's Bowen Basin are higher than inventories report. In addition, 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 (UNFCCC) may be underreported by 82 per cent.



RELATED PUBLICATIONS

Insights into elevated methane emissions from an Australian open-cut coal mine ([Borchardt et al., 2025](#))



SIGNIFICANCE FOR DECISIONMAKERS

For policymakers

Governments worldwide are seeking methods to accurately estimate their methane inventories, particularly in the open-cut coal mining sector, where quantifying facility-level emissions remains challenging and robust verification methods are not yet widespread. The study demonstrates the importance of independently validating methane emission reporting from open-cut coal mines and shows aircraft-based measurement platforms are a powerful tool for doing so. Inventories backed by empirical data are needed to accurately report emissions, identify mitigation opportunities and track reduction targets.

For industry

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

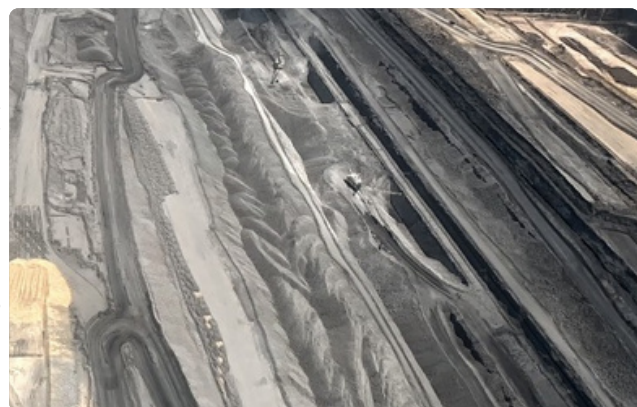


Photo Attribution: Joop Hacker Airborne Research Australia (ARA)



STUDY APPROACH/ACTIVITIES

The research team focused on the Bowen Basin after satellite observations showed unusually high emissions that could not be explained by existing inventory data. In addition, the region is a major coal-producing area that lacks other methane sources that could interfere with atmospheric quantification. The team identified four open-cut mines and conducted five flights. This mass balance method consists of contrasting upwind and downwind methane measurements and applying wind field data to quantify total emissions from individual coal mines.



CATALYZING ACTION

This study has shown the need for further evaluating both reporting methods and atmospheric quantification methodologies. In 2026, IMEO will implement a world-first controlled release study (SIMFLEX Coal Australia) designed for open-cut coal mines in Australia, bringing together academics, the Australian coal industry, and Australia's Department of Climate Change, Energy, the Environment and Water (DCCEEW). The Bowen Basin pilot also informs the work of an expert panel established by DCCEEW in 2025 to review how top-down approaches could enhance Australia's methane emissions reporting.

OTHER SUPPORTERS/STAKEHOLDERS

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

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.