
Methodology

Data Sources

- [UNFCCC reporting for Annex -1](#)
- [UNFCCC reporting for non-Annex -1](#)
- [IEA Methane Tracker](#)
- [GEM Global Coal Mine Tracker](#)
- [TROPOMI satellite observations by Shen et al.](#)
- [EIA coal production data](#)

Methodology for assessing confidence in reported national coal mine methane (CMM) emissions

In Ember's "Coal Mine Methane Emissions Tracker" datatool, Ember assigns a confidence score to each country's UNFCCC reported CMM emissions.

The confidence score ranges from 0 (low confidence in coal mine methane reporting) to 6 (high confidence in coal mine methane reporting) and is based on a combined assessment of three key categories:

- (1) Recency of reporting to the UNFCCC (United Nations Framework Convention on Climate Change)
- (2) Similarity to other independent estimates
- (3) Robustness of the methods used to estimate emissions (Tier of estimation used when reporting to UNFCCC)

Each category is scored from 0-2, the highest number being the best.

The confidence score is the sum total of the three subscores.

(1) Recency of reporting to the UNFCCC

This score is based on when the country last reported, and the representativeness of the last reported year to 2022 emissions.

2 points: Country reported in 2019 or more recently

1 point: Country has reported emissions, but previous to 2019.

0 points: Missing data

Additional Criteria - To address the issue of comparing outdated reported emissions to current estimates.

If a country's coal production has significantly changed (by +/- 50%) since its last UNFCCC reporting year, a point will be deducted from the above scoring.

(2) Similarity to other independent estimates

This score is based on the difference between government reported CMM emissions and three independent estimates; IEA, GEM, and satellite data by Shen et al. (2023)

The percentage difference between UNFCCC reported and the three independent estimates is calculated, points are assigned in the following order:

2 points: A country has less than 50% difference between its reported emissions and the independent estimate.

1 point: A country has less than 100% difference between its reported emissions and the independent estimate.

0 points: There is more than 100% difference between the country's reported emissions and the independent estimate.

The country is awarded the average number of points from the three independent estimates.

Small emissions

Countries that emit less than 5 thousand tonnes of methane per year are evaluated using the absolute difference rather than the percentage differences so as to not bias against low emitting countries.

Note on comparison with independent estimates

The IEA, GEM, and satellite derived data all differ in estimation methodology and sources. We also note that the GEM database does not account for any methane abatement which could be taking place in some countries. None of the estimates account for methane emitted from abandoned and closed coal mines.

These datasets estimate CMM emissions on a global scale, and have substantial differences between them. They are used to give an indication of how well independent estimates agree with reported emissions. They are therefore only used as part of the criteria, and are not used as "ground truths".

(3) Robustness of the methods used to estimate emissions

A country is scored on the methods (UNFCCC tier) used to estimate their reported emissions. In this assessment, the percentage of surface vs underground mines is also taken into consideration, since surface mines never measure methane emissions.

2 points: Using Tier 3 methodology and >50% of coal is mined in underground mines.

1 point: Using Tier 2 methodology

0 points: Using Tier 1 methodology

For countries using multiple tiers for their methane sources, the highest tier was used when assigning points.

Assumptions

Here Ember assumes that the highest tier generally represents the active, underground mine emissions, whilst lower tiers are generally used to estimate smaller sources such as post mining, or abandoned mine emissions. The maximum tier for surface mines is currently Tier 2, therefore any country with greater than 50% of coal mined in surface mines can get a maximum score of 2.

Not Ranked

Countries with reported, or independently estimated CMM emissions less than 1 kT per year were excluded from the scoring and labelled as “not ranked”. Emissions of this size are too small to be compared given the large uncertainties in many estimates.

The data for these countries is still available to see on the Dashboard.

Other cases

In a number of cases, a country may have reported or estimated CMM emissions data, but no coal production data is available. Such cases are given a default bubble size. This can be due to a lack of data on current coal production, or in the cases of countries with a history of coal production, emissions are likely to be due to abandoned and closed mines.

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