# Mining Sector Data Summary



## About the dataset

This report summarizes data from several CSV files related to the mining sector. The datasets cover iron and copper ownership, as well as country-level emissions for iron mining, bauxite mining, copper mining, sand quarrying, rock quarrying, and other mining and quarrying activities.

The iron and copper ownership datasets contain information about the ownership structure of mines, including the names and entity IDs of parent companies, their legal entity identifiers (LEI and PermID), registration and headquarter countries, and the percentage of ownership. The 'ownership_path' column provides a hierarchical view of ownership, while 'ownership_path_datasource_ids' indicates the data sources for the ownership information. The 'immediate_source_owner' and 'immediate_source_owner_entity_id' columns specify the direct owner of the mine. The sample data reveals ownership chains, such as "Khakassia Development Fund -> Abazinskiy Rudnik LLC -> Abakanskoye Mine," illustrating how ownership can be traced through multiple entities. The 'overall_share_percent' in the iron ownership data has a mean of 23.86 and a standard deviation of 36.06, indicating a wide range of ownership percentages.

The emissions datasets provide country-level CO2 equivalent emissions (co2e_100yr) for various mining subsectors on an annual basis. Key columns include 'iso3_country', 'sector', 'subsector', 'start_time', 'end_time', 'gas', 'emissions_quantity', and 'temporal_granularity'. The emissions data spans from 2015 to 2024. The sample data shows that some countries, like ABW (Aruba), report 0.0 emissions for certain mining subsectors in specific years. The 'emissions_quantity' column varies significantly across subsectors, with iron mining having a mean of 399513.03 and copper mining having a mean of 344540.16, while sand quarrying has a much lower mean of 2257.89.

## Relevant Inquiries

**Q1.What is the trend of CO2 emissions from iron mining globally from 2015 to 2024? Please show the YoY growth rate.**

**Q2.Which country had the highest CO2 emissions from copper mining in 2023? Please show the top 10 countries.**

**Q3.What is the percentage contribution of each mining subsector (iron, copper, bauxite, etc.) to the total emissions in 2022?**
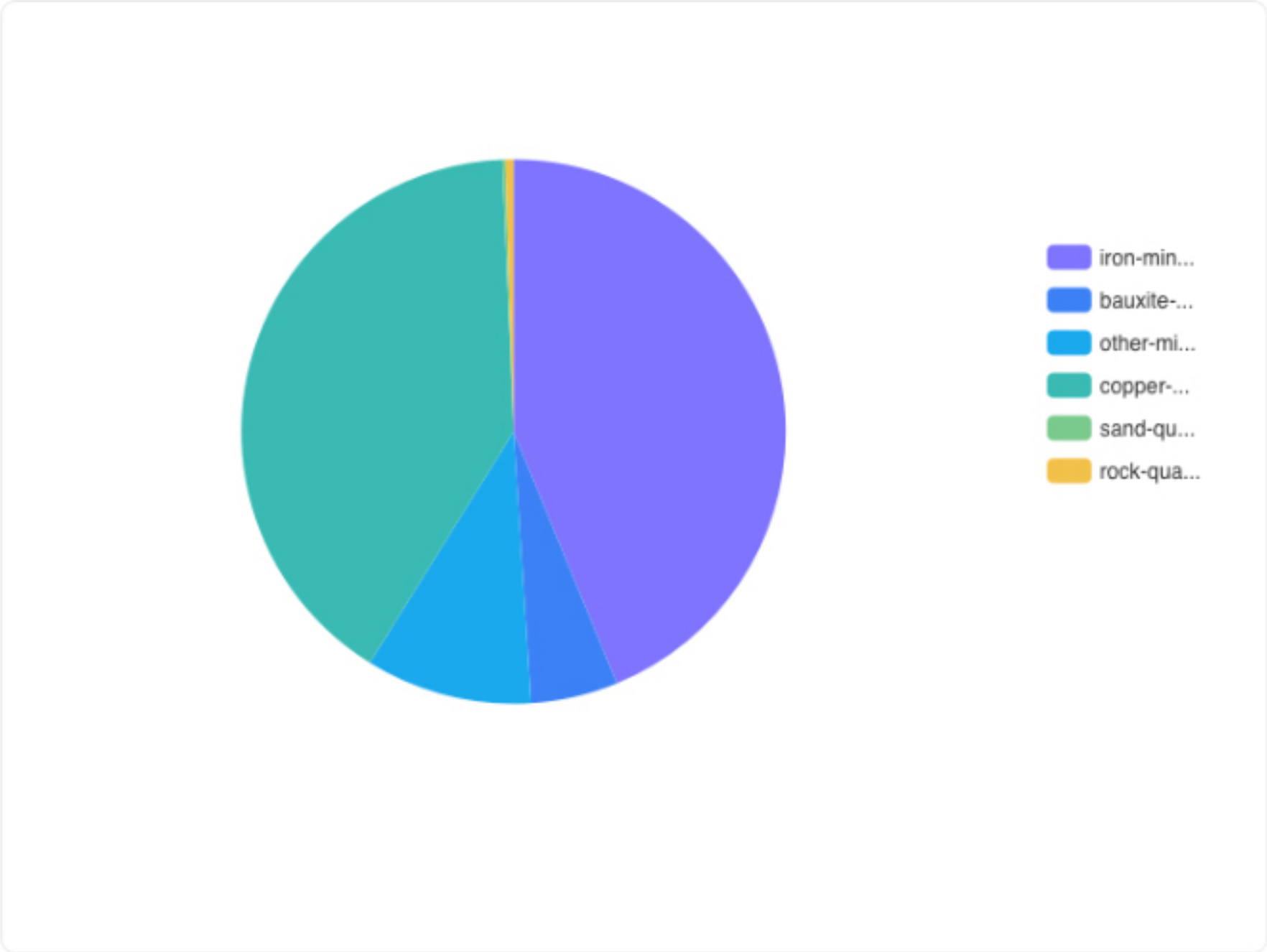


### Subsectoral Emissions Contributions

- **Iron-mining**: Contributed the largest share, accounting for **43.80%** of the total emissions.

- **Copper-mining**: Was the second-largest contributor, responsible for **40.49%** of the total emissions.

- **Other-mining-quarrying**: Accounted for **9.88%** of the total emissions.

- **Bauxite-mining**: Contributed **5.17%** to the total emissions.

- **Rock-quarrying**: Had a minor contribution of **0.46%** to the total emissions.

- **Sand-quarrying**: Contributed the smallest share, at **0.20%** of the total emissions.

### Conclusion and Insights

- **Dominant Contributors**: Iron-mining (43.80%) and **Copper-mining (40.49%)** are the two most significant contributors to total emissions among the analyzed subsectors in 2022, together accounting for over 84% of the total.

- **Moderate Contribution**: "Other-mining-quarrying" and "bauxite-mining" represent a moderate portion of the emissions, collectively contributing about 15%.

- **Minor Impact**: "Sand-quarrying" and "rock-quarrying" have a negligible impact on the overall emissions, with contributions less than 1% combined.

**Q4.Are there any countries with anomalous CO2 emissions from bauxite mining between 2015 and 2024? Please use the boxplot method to identify outliers.**

**Q5.What is the distribution of iron mine ownership by parent entity? Please show the top 10 parent entities by total share percentage.**

**Q6.Is there a statistically significant correlation between the overall share percentage of parent entities in iron mines and the CO2 emissions of the corresponding countries?**

**Q7.What is the distribution of ownership in copper mines by parent entity type (legal entity, person, state, etc.)? Please show the total share percentage for each entity type.**

**Q8.Compare the CO2 emissions from sand quarrying with those from other mineral extraction subsectors (e.g., iron-mining, copper-mining, bauxite-mining, rock-quarrying) for the year 2023. Which subsector contributes the most to overall emissions, and how does the geographical distribution of these emissions differ?**

The provided context does not contain any data to perform the requested analysis. The `combined_2023_emissions_data`, `total_emissions_per_subsector`, and `geographical_emissions_data` are all empty, as indicated by `ROWS data="0"` and the empty `DETAIL_DATA` sections in the observations.

To complete the task, please provide the actual data for the `combined_2023_emissions_data` or the subsequent aggregated dataframes (`total_emissions_per_subsector` and `geographical_emissions_data`).

**Q9.What is the total CO2 emissions footprint of the top 5 parent companies involved in iron and copper mining, broken down by country and subsector?**
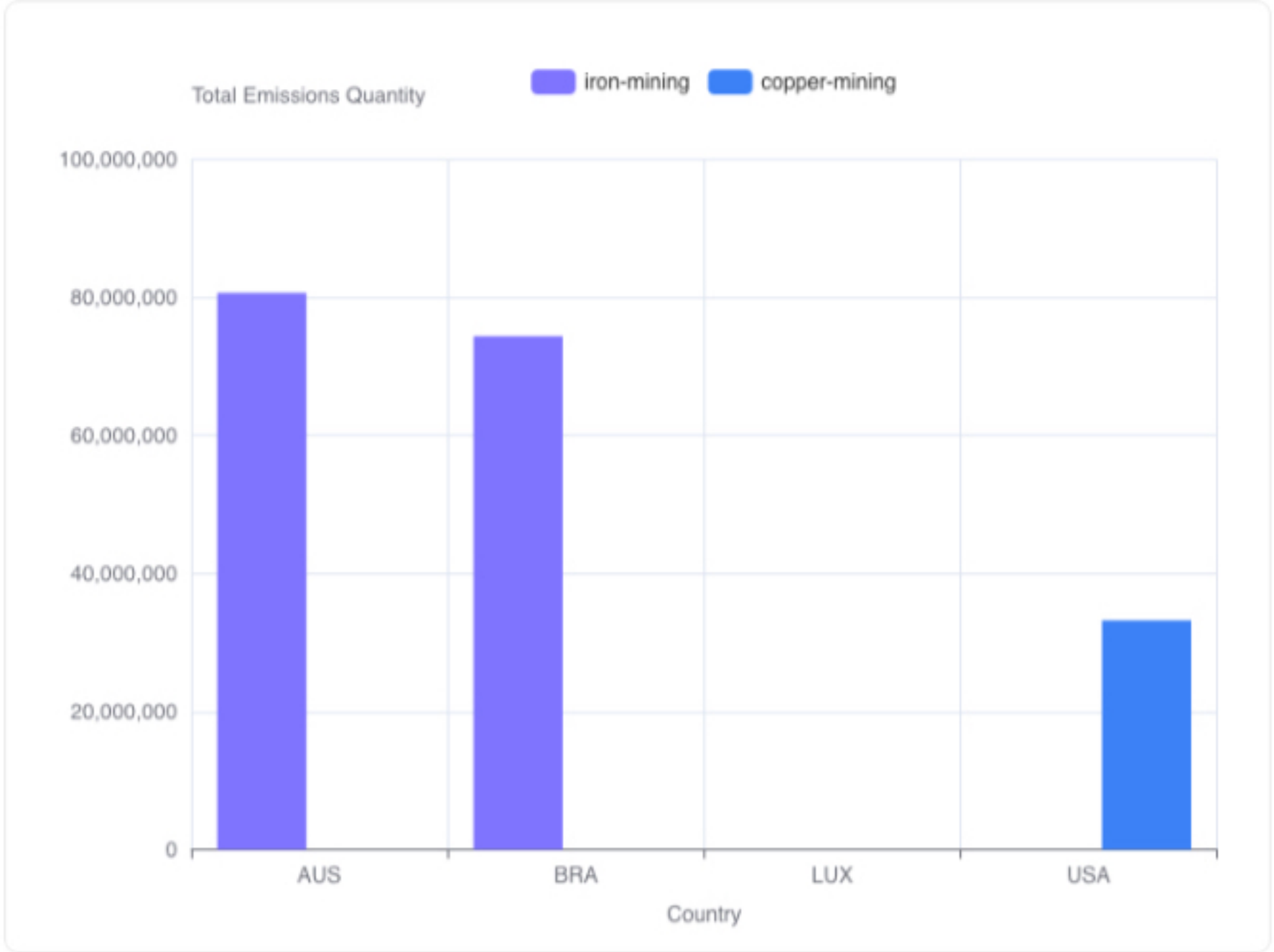


### Iron Mining Emissions

- **Top Headquarters Countries**: The top 5 parent companies in iron mining have headquarters in **Brazil (BRA)**, **Luxembourg (LUX)**, and **Australia (AUS)**.
- **Australia's Emissions**: Australia (AUS) accounts for **80,661,299.5** units of CO2 emissions from the iron-mining subsector.
- **Brazil's Emissions**: Brazil (BRA) accounts for **74,397,356.35** units of CO2 emissions from the iron-mining subsector.
- **Luxembourg's Emissions**: Luxembourg (LUX) shows **0.0** units of CO2 emissions from the iron-mining subsector, indicating no significant emissions from this subsector in the country for the top companies.

### Copper Mining Emissions

- **Top Headquarters Country**: The top 5 parent companies in copper mining have headquarters in the **United States of America (USA)**.
- **USA's Emissions**: The United States (USA) accounts for **33,218,552.57** units of CO2 emissions from the copper-mining subsector.

### Combined Emissions Overview

- **Overall Emissions Distribution**: The combined analysis of emissions from the headquarters countries of top iron and copper mining companies reveals distinct patterns.
- **Dominant Iron Mining Emissions**: **Australia (AUS)** and **Brazil (BRA)** are the primary contributors to iron-mining emissions among the identified headquarters countries.
- **Sole Copper Mining Emissions**: The **United States (USA)** is the only country among the identified headquarters to show significant copper-mining emissions.
- **Zero Emissions in Luxembourg**: Luxembourg (LUX) has no recorded emissions for the iron-mining subsector from the top companies.

### Conclusion and Insights

- **Significant Iron Mining Footprint**: The top iron mining companies, primarily headquartered in **Australia and Brazil**, have a substantial CO2 emissions footprint, with Australia leading at over 80 million units and Brazil close behind at over 74 million units.
- **Concentrated Copper Mining Footprint**: The CO2 emissions from the top copper mining companies are concentrated in the **United States**, with over 33 million units.
- **Geographic Specialization**: The data suggests a clear geographic specialization in emissions, with iron mining emissions predominantly from Australia and Brazil, and copper mining emissions from the USA, reflecting the operational bases or headquarters' influence on reported emissions.
- **Zero Emissions for Luxembourg**: The absence of emissions for Luxembourg in the iron-mining subsector, despite being a headquarters country for a top iron mining company, indicates that the operational emissions for these companies are not attributed to their headquarters country in this dataset, or that the companies headquartered there have negligible direct emissions from iron mining within Luxembourg itself.

**Q10.What is the relationship between the parent registration country and the parent headquarter country in terms of ownership share in iron and copper mines? Please visualize the correlation using a heatmap.**

Oops! No suitable data was found to answer this question