

Manufacturing sector: Chemicals, Pulp and Paper Manufacturing Emissions



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1. Introduction

Chemical and pulp and paper industries are both energy and emissions intensive and account for 2% and 0.5% of global carbon dioxide (CO₂) emissions annually, respectively (IEA, 2022a; 2022b). Chemical production serves enormous value in society, such as through the production of ammonia fertilizer which is responsible for 50% of the world's food supply (Boerner, 2019). Pulp and paper have a relatively greener production process where waste products from the pulp making process are often used to generate its own power. However, production has increased 25% since 2000 and with it an increase in energy demand by 6%. In this work we lay out the foundational work for estimating timely and granular emissions in the chemicals and pulp and paper industry.

2. Materials and Methods

We investigated each major processing route independently using a combination of publicly reported data and academic papers. This section provides a high-level overview of the datasets and associated pipelines used to derive emission estimates for the chemicals (further split into: ammonia, methanol, and soda ash) and pulp and paper industries.

Given the lack of source-level emission data publicly available, a standardized “bottom-up” approach was used to quantify the emissions. This process was characterized by first estimating production levels for each plant (in tons of product) before then subsequently applying a calculated emissions factor (tons of CO₂ per ton of product) to estimate emissions.

To estimate source level production, a disaggregation method was applied to identified plants for years 2015 and 2022. This was determined by calculating each plant's share of national capacity, before multiplying this number by the country's production to derive the plant's contribution for the given year. To generate country-level emissions, each point-source within a country was aggregated to estimate total emissions.

2.1 Datasets employed

For each of the aforementioned industries (chemicals, pulp and paper) we ascertained source level (where possible) data, country-level production data and respective emissions factors.

2.1.1 Emitting source inventory data sets

Industrial Info Resources (IIR) provided asset level information including location and technology type (IIR, 2023). For the chemicals sector - ammonia, methanol and soda ash were covered. Facility level characteristic data was available for ammonia (278 sources) and methanol (172 sources). Soda ash was handled at the country-level (34 countries) where source level data was not available during the scope of this work. Characteristic data for pulp and paper were available for a total of 378 sources. An overview of the country coverage for chemicals and pulp and paper can be found in Figure 1 and Figure 2, respectively.

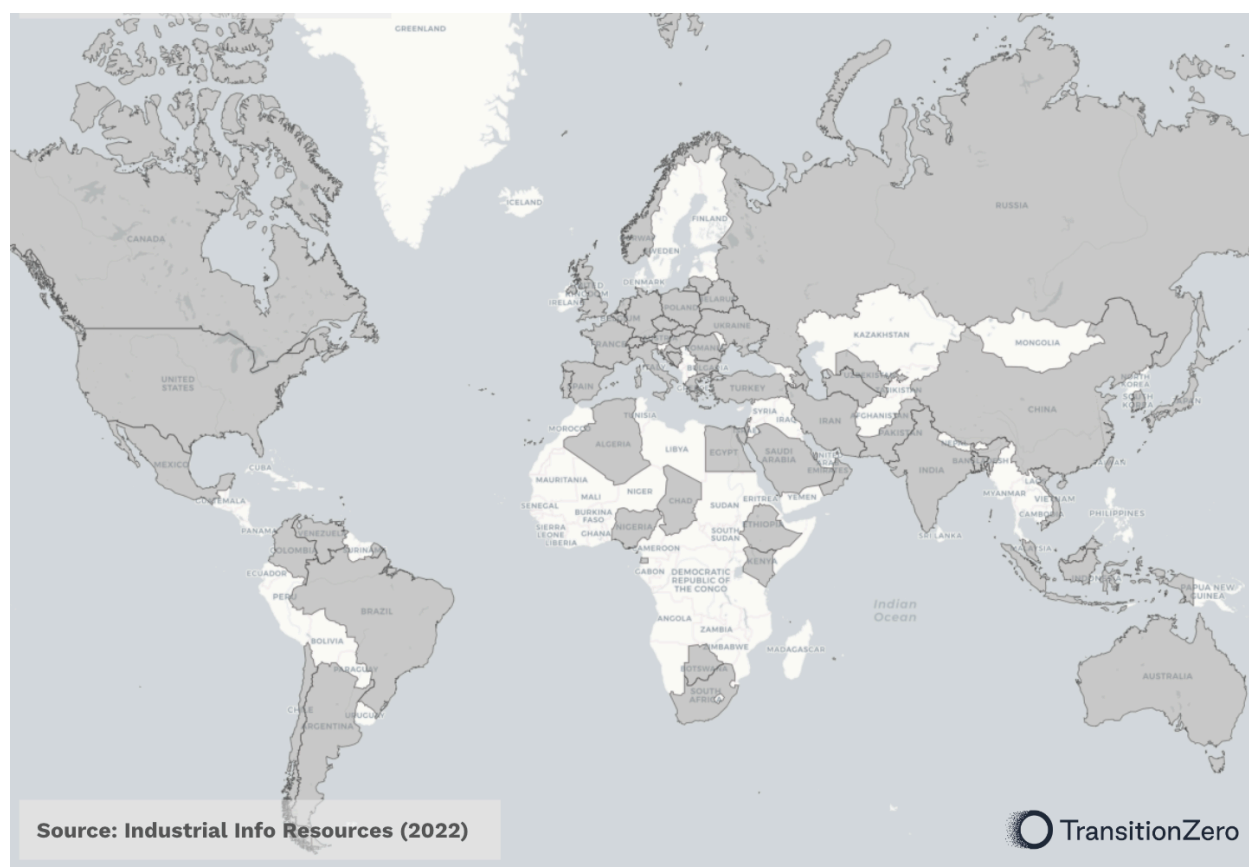


Figure 1 Country coverage for the chemical's subsector (ammonia, methanol and soda ash), represented in gray.

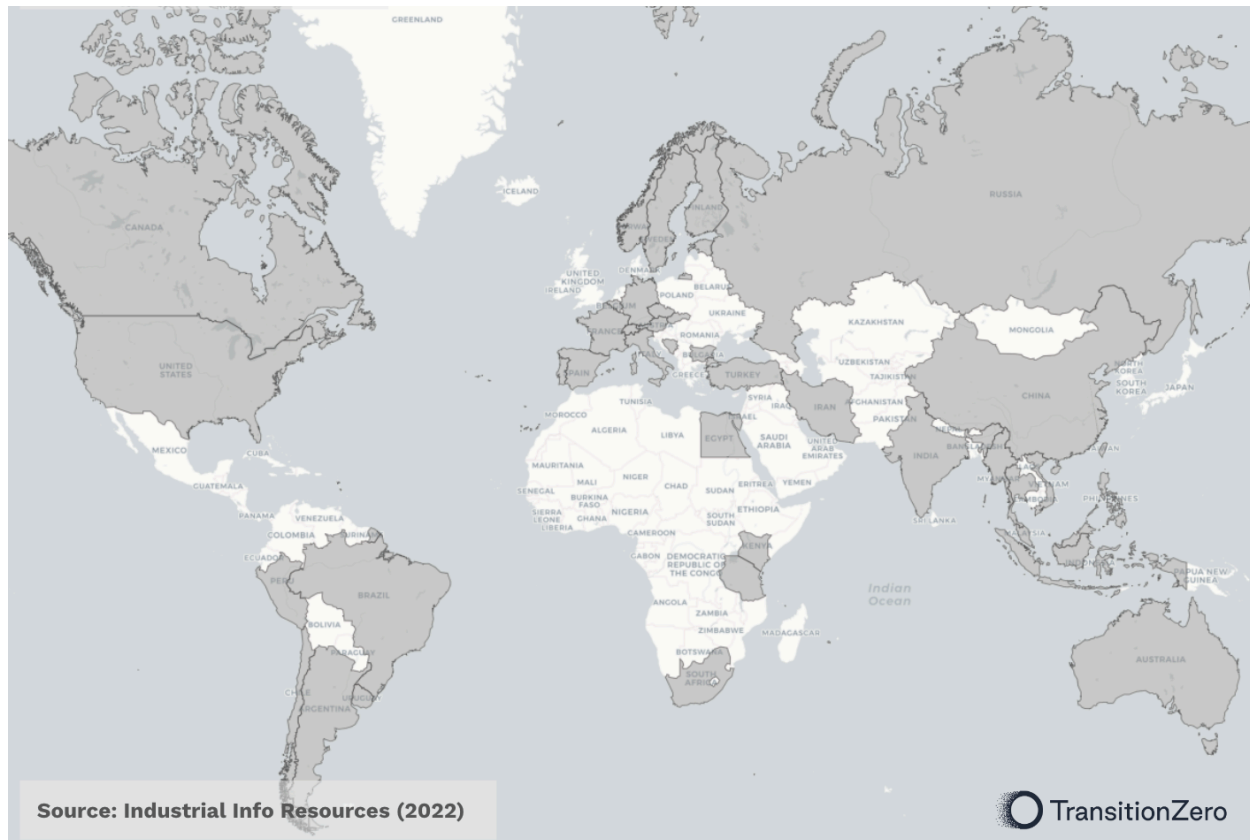


Figure 2 Country coverage for pulp and paper, represented in gray.

2.1.2 Production data sets

Aggregated production was utilized in all our models. For pulp and paper, it was sourced from the Food and Agriculture Organization of the United Nations (FAO) (FAOSTAT, 2022) at the national level. For chemicals, historical data was sourced from the United States Geological Survey (USGS) (USGS, 2022). More recent production data was inferred using the ISIC 20 Chemicals and Chemical products index sourced from the United Nations Industrial Development Organization (UNIDO) (UNIDO, 2022).

2.1.3 Emissions factor dataset

Emissions factors were sourced separately for each material with: ammonia from the International Fertiliser Society (IFS) (Hoxha and Christensen, 2019), methanol from Intergovernmental Panel on Climate Change (IPCC) (IPCC, 2022), soda ash from the Environmental Protection Agency (EPA) (EPA, 2022), and pulp and paper from Tomberlin et. al (2020). Methanol and ammonia emissions were listed based upon fuel type. Ammonia was also further dependent upon geographical location.

2.2 Methods

2.2.1. Production methodology

The first step in quantifying emissions for each emitting source was estimating the associated activity, expressed in tons of product in a given time period. To do this, a disaggregation method was applied: for each facility, its share of national capacity was computed before multiplying this number by the national production to derive the facility's contribution for the given timeframe. An illustrative example of a country with two plants A and B (of capacities C_A and C_B respectively) and a total production P_m for a country/region and a given month m , the capacity-based estimates for these two plants are (respectively $P_{A,m}$ and $P_{B,m}$):

- $P_{A,m} = \frac{C_A}{C_A + C_B} \times P_m$
- $P_{B,m} = \frac{C_B}{C_A + C_B} \times P_m$

2.2.3. Emissions methodology

With the production estimates generated for each emitting source, the emission estimates were derived by multiplying the production by the relevant emission factors. Electricity-related emissions were excluded from these emission factors (when applicable) as these emissions are already accounted for in other parts of the Climate TRACE Electricity generation sector. The overall methodology is summarized in Figure 3.

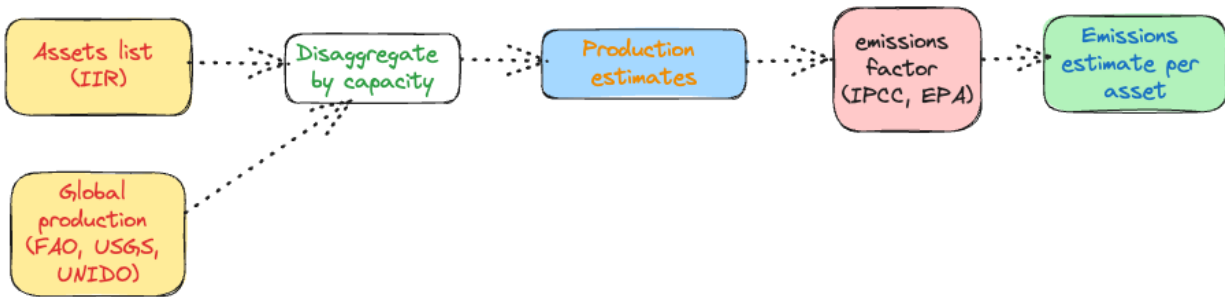


Figure 3 Flowchart of the methodology to calculate plant level emissions for emitting sources.

3. Results

Figure 4 shows the global annual CO₂ emission estimates for the chemicals and pulp and paper industries. Of the four sub sectors, ammonia emissions are the largest above 300 tCO₂ per year. Methanol, the second largest, with emissions steadily rising during the time period. Soda ash and pulp and paper have relatively lower emissions below 100 tCO₂.

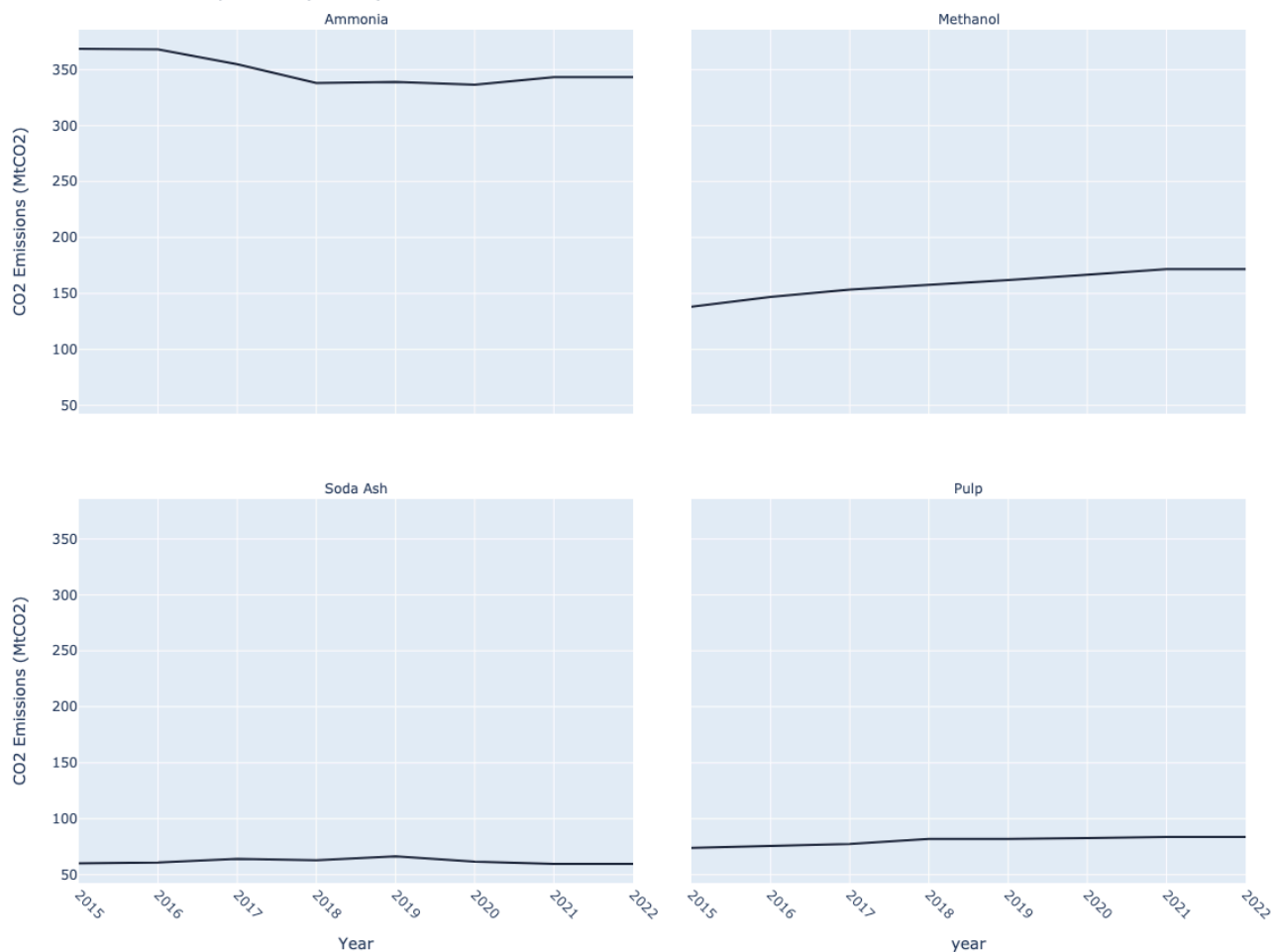


Figure 4 Global annual Climate TRACE estimated CO₂ emissions for Ammonia (top left), Methanol (top right), Soda Ash (bottom left), and Pulp and Paper (bottom right) for years 2015 to 2022.

Tables 1 to 4 show the biggest producers and emitters in the ammonia, methanol, soda-ash and pulp and paper industry, respectively.

Table 1 Top producers and emitters in the ammonia sector.

| Country | CO ₂ Emissions (MtCO ₂) | Production (Mt) |
|----------|--|-----------------|
| China | 125.2 | 35.2 |
| Russia | 50.4 | 17.6 |
| India | 37.5 | 12.5 |
| USA | 24.1 | 8.1 |
| Canada | 11.5 | 3.9 |
| Pakistan | 11 | 3.7 |
| Poland | 9.3 | 2.8 |
| Ukraine | 8.4 | 2.9 |
| Egypt | 7.4 | 2.8 |
| Germany | 7.2 | 2.6 |

Table 2 Top producers and emitters in the methanol industry.

| Country | CO ₂ emissions (MtCO ₂) | Production (Mt) |
|-------------------|--|-----------------|
| China | 138.9 | 31.4 |
| Iran | 6 | 8.9 |
| Russia | 3.9 | 5.7 |
| USA | 3.7 | 5.6 |
| Saudi Arabia | 2.7 | 4 |
| Egypt | 2 | 3 |
| Trinidad & Tobago | 1.5 | 2.3 |
| Malaysia | 1.4 | 2.1 |
| Canada | 1.2 | 1.8 |
| New Zealand | 1.2 | 1.8 |

Table 3 Top producers and emitters in the soda ash industry.

| Country | CO ₂ Emissions (MtCO ₂) | Production (Mt) |
|----------|--|-----------------|
| China | 25.7 | 24.5 |
| USA | 11.8 | 11.3 |
| Turkey | 3.6 | 3.4 |
| Russia | 3.1 | 3 |
| Germany | 2.7 | 2.6 |
| India | 2.2 | 2.1 |
| Poland | 1.2 | 1.2 |
| France | 1.1 | 1 |
| Bulgaria | 0.9 | 0.8 |
| Ukraine | 0.8 | 0.7 |

Table 4 Top producers and emitters in the pulp and paper industry.

| Country | CO ₂ emissions (MtCO ₂) | Production (Mt) |
|-----------|--|-----------------|
| USA | 25.6 | 44 |
| Brazil | 12.7 | 21.9 |
| China | 12 | 20.6 |
| Indonesia | 5 | 8.6 |
| Canada | 4 | 7.6 |
| Sweden | 4 | 7.3 |
| Finland | 4 | 6.9 |
| Russia | 3.5 | 6 |
| Chile | 2.8 | 4.8 |
| Uruguay | 1.6 | 2.8 |

4. Discussion & Conclusions

CO₂ emissions estimates were provided for the chemicals and pulp and paper industries. Emissions estimates are at the source level for pulp and paper, ammonia, and methanol, and at the country-level for soda ash with all estimates provided on an annual basis.

To estimate emissions at the source level, our methodology takes known facility capacities as a fraction of the national share and uses this information to allocate a proportional share of the known national production. The approach itself does make several assumptions about each emitting source, such as the production of a given at a facility relative to that of national production. Additionally, it assumes that all operational facilities were functioning within a nation, or that all emitting sources were documented within our database to assign the correct proportion of national production. As a consequence, the accuracy of these estimates was considered to be limited and edge cases may be present which can impact these assumptions. Nevertheless, this work serves as a strong foundational piece for the estimation of CO₂ emissions in the pulp and paper and chemical industries which may be utilized to develop more detailed estimates in the future.

5. Supplementary metadata section

5.1 Chemicals

The chemicals sector CO₂ emissions were reported for individual source-level for the years 2015 to 2022. The emissions described here represent a subset of specific country-level emissions estimates from the Climate TRACE manufacturing sector. All data is freely available on the Climate TRACE website (<https://climatetrace.org/>). A detailed description of what is available is described in Tables 5 and 6.

Table 5 Metadata for Emissions for chemicals sector.

| General Description | Definition |
|--------------------------|--|
| Sector definition | <i>Emissions from chemicals production</i> |
| UNFCCC sector equivalent | <i>2.B.1 (Ammonia), 2.B.8.a. (Methanol), 2.B.7. (Soda ash)</i> |
| Temporal Coverage | <i>2015 – 2022</i> |
| Temporal Resolution | <i>Monthly</i> |
| Data format | <i>CSV</i> |

| | |
|--|--|
| Coordinate Reference System | <i>None. ISO3 country code provided</i> |
| Number of emitters available for download | <i>278 ammonia sources, 172 methanol sources, soda ash (34 countries)</i> |
| What emission factors were used? | <i>Global emission factors</i> |
| What is the difference between a “0” versus “NULL/none/nan” data field? | <i>“0” values are for true non-existent emissions. If we know that the sector has emissions for that specific gas, but the gas was not modelled, this is represented by “NULL/none/nan”</i> |
| total_CO2e_100yrGWP and total_CO2e_20yrGWP conversions | <i>Climate TRACE uses IPCC AR6 CO₂e GWPs. CO₂e conversion guidelines are here: https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_FullReport_small.pdf</i> |

Table 6 Chemicals sector description for confidence and uncertainty in emissions.

| Data attribute | Confidence Definition | Uncertainty Definition |
|------------------------------------|---|-------------------------------|
| type | <ul style="list-style-type: none"> <i>Very low:</i> Based on highly speculative or obsolete information. Very low level of confidence in the accuracy of classification. <i>Low:</i> Limited or somewhat outdated data. Low level of confidence in the classification's correctness. <i>Medium:</i> A mix of historical and more recent data. A medium level of confidence in its accuracy. <i>High:</i> Grounded in comprehensive and recent data. A high level of confidence in the precise classification of the source. <i>Very high:</i> Extensive, up-to-date, and verified data. A very high level of confidence in the accurate and detailed identification of the source. | Not used; N/A |
| capacity_description | <ul style="list-style-type: none"> <i>Very low:</i> Limited or outdated data, and significant uncertainties exist. <i>Low:</i> Outdated and/or incomplete data. <i>Medium:</i> A mix of historical and recent data. <i>High:</i> <i>Comprehensive</i> and recent data updates. High level of certainty. <i>Very high:</i> Extensive, up-to-date, and verified data. Very high level of certainty. | Not used; N/A |
| capacity_factor_description | <ul style="list-style-type: none"> <i>Very low:</i> Data is sparse or highly unreliable. Considerable uncertainty in capacity factor estimations. <i>Low:</i> Moderate uncertainty in capacity factor calculations. | Not used; N/A |

| | | |
|-----------------------------------|---|---|
| | <ul style="list-style-type: none"> • <i>Medium</i>: Data is sufficiently available, though not comprehensive. No absolute accuracy in capacity factor estimations. • <i>High</i>: High confidence in the accuracy of capacity factor calculations. • <i>Very high</i>: Derived from thorough and validated data sources. Very high precision of capacity factor estimations. | |
| activity_description | <ul style="list-style-type: none"> • <i>Very low</i>: Largely speculative or based on outdated information. A very low level of confidence in activity assessments. • <i>Low</i>: Limited or somewhat outdated sources. A low level of confidence in the activity assessments. • <i>Medium</i>: A mix of historical and more recent data. Medium level of confidence in activity insights. • <i>High</i>: Detailed and current operational data ensures a high level of confidence in the accuracy of activity assessments. • <i>Very high</i>: Extensive, verified, and up-to-date data. A very high level of confidence in their accuracy. | 10% of emitting source level production (based on IPCC) |
| CO2_emissions_factor | <ul style="list-style-type: none"> • <i>Very low</i>: Highly uncertain due to insufficient or unreliable data. • <i>Low</i>: Estimated from incomplete data. Low confidence level in its precision. • <i>Medium</i>: A mix of historical and more recent data. Medium level of confidence in their accuracy. • <i>High</i>: Derived from comprehensive and recent data. A high level of confidence in their precision. • <i>Very high</i>: Based on extensive and validated data, providing a very high level of confidence in their precision. | 25% of source level emission factor (based on IPCC) |
| CH4_emissions_factor | Not used; N/A | Not used; N/A |
| N2O_emissions_factor | Not used; N/A | Not used; N/A |
| other_gas_emissions_factor | Not used; N/A | Not used; N/A |
| CO2_emissions | <ul style="list-style-type: none"> • <i>Very low</i>: Based on very rough estimations or outdated information. A very low level of confidence in its accuracy. | 35% of source level emissions |

| | | |
|----------------------------|--|-------------------------------|
| | <ul style="list-style-type: none"> • <i>Low</i>: Estimated from incomplete data. Low confidence level in its precision. • <i>Medium</i>: A mix of historical and more recent data. Medium level of confidence in their accuracy. • <i>High</i>: Derived from comprehensive and recent data. A high level of confidence in their precision. • <i>Very high</i>: Based on extensive and validated data, providing a very high level of confidence in their precision. | |
| CH4_emissions | Not used; N/A | Not used; N/A |
| N2O_emissions | Not used; N/A | Not used; N/A |
| other_gas_emissions | Not used; N/A | Not used; N/A |
| total_CO2e_100yrGWP | <ul style="list-style-type: none"> • <i>Very low</i>: Based on very rough estimations or outdated information. A very low level of confidence in its accuracy. • <i>Low</i>: Estimated from incomplete data. Low confidence level in its precision. • <i>Medium</i>: A mix of historical and more recent data. Medium level of confidence in their accuracy. • <i>High</i>: Derived from comprehensive and recent data. A high level of confidence in their precision. • <i>Very high</i>: Based on extensive and validated data, providing a very high level of confidence in their precision. | 35% of source level emissions |
| total_CO2e_20yrGWP | <ul style="list-style-type: none"> • <i>Very low</i>: Based on very rough estimations or outdated information. A very low level of confidence in its accuracy. • <i>Low</i>: Estimated from incomplete data. Low confidence level in its precision. • <i>Medium</i>: A mix of historical and more recent data. Medium level of confidence in their accuracy. • <i>High</i>: Derived from comprehensive and recent data. A high level of confidence in their precision. • <i>Very high</i>: Based on extensive and validated data, providing a very high level of confidence in their precision. | 35% of source level emissions |

5.2 Pulp and paper

The pulp and paper sector CO₂ emissions were reported for individual emitting sources for the years 2015 to 2022. The emissions described here represent a subset of specific country-level emissions estimates from the Climate TRACE manufacturing sector. All data is freely available on the Climate TRACE website (<https://climatetrace.org/>). A detailed description of what is available is described in Tables 7 and 8.

Table 7 Metadata for Emissions for pulp and paper sector.

| General Description | Definition |
|--|--|
| Sector definition | <i>Emissions from pulp and paper production</i> |
| UNFCCC sector equivalent | <i>2.H.1 Pulp and paper</i> |
| Temporal Coverage | <i>2015 – 2022</i> |
| Temporal Resolution | <i>Annual</i> |
| Data format | <i>CSV</i> |
| Coordinate Reference System | <i>None. ISO3 country code provided</i> |
| Number of emitters available for download | <i>378 pulp and paper sources</i> |
| What emission factors were used? | <i>Global emission factors</i> |
| What is the difference between a “0” versus “NULL/none/nan” data field? | <i>“0” values are for true non-existent emissions. If we know that the sector has emissions for that specific gas, but the gas was not modelled, this is represented by “NULL/none/nan”</i> |
| total_CO2e_100yrGWP and total_CO2e_20yrGWP conversions | <i>Climate TRACE uses IPCC AR6 CO₂e GWPs. CO₂e conversion guidelines are here: https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_FullReport_small.pdf</i> |

Table 8 Pulp and paper sector description for confidence and uncertainty in emissions.

| Data attribute | Confidence Definition | Uncertainty Definition |
|------------------------------------|--|---|
| type | <ul style="list-style-type: none"> • <i>Very low</i>: Based on highly speculative or obsolete information. Very low level of confidence in the accuracy of source classification. • <i>Low</i>: Limited or somewhat outdated data. Low level of confidence in the classification's correctness. • <i>Medium</i>: A mix of historical and more recent data. A medium level of confidence in its accuracy. • <i>High</i>: Grounded in comprehensive and recent data. A high level of confidence in the precise classification of the source. • <i>Very high</i>: Extensive, up-to-date, and verified data. A very high level of confidence in the accurate and detailed identification of the source. | Not used; N/A |
| capacity_description | <ul style="list-style-type: none"> • <i>Very low</i>: Limited or outdated data, and significant uncertainties exist. • <i>Low</i>: Outdated and/or incomplete data. • <i>Medium</i>: A mix of historical and recent data. • <i>High</i>: Comprehensive and recent data updates. High level of certainty. • <i>Very high</i>: Extensive, up-to-date, and verified data. Very high level of certainty. | Not used; N/A |
| capacity_factor_description | <ul style="list-style-type: none"> • <i>Very low</i>: Data is sparse or highly unreliable. Considerable uncertainty in capacity factor estimations. • <i>Low</i>: Moderate uncertainty in capacity factor calculations. • <i>Medium</i>: Data is sufficiently available, though not comprehensive. No absolute accuracy in capacity factor estimations. • <i>High</i>: High confidence in the accuracy of capacity factor calculations. • <i>Very high</i>: Derived from thorough and validated data sources. Very high precision of capacity factor estimations. | Not used; N/A |
| activity_description | <ul style="list-style-type: none"> • <i>Very low</i>: Largely speculative or based on outdated information. A very low level of confidence in activity assessments. | 10% of emitting source production (based on IPCC) |

| | | |
|-----------------------------------|--|--|
| | <ul style="list-style-type: none"> • <i>Low</i>: Limited or somewhat outdated sources. A low level of confidence in the activity assessments. • <i>Medium</i>: A mix of historical and more recent data. Medium level of confidence in activity insights. • <i>High</i>: Detailed and current operational data ensures a high level of confidence in the accuracy of activity assessments. • <i>Very high</i>: Extensive, verified, and up-to-date data. A very high level of confidence in their accuracy. | |
| CO2_emissions_factor | <ul style="list-style-type: none"> • <i>Very low</i>: Highly uncertain due to insufficient or unreliable data. • <i>Low</i>: Estimated from incomplete data. Low confidence level in its precision. • <i>Medium</i>: A mix of historical and more recent data. Medium level of confidence in their accuracy. • <i>High</i>: Derived from comprehensive and recent data. A high level of confidence in their precision. • <i>Very high</i>: Based on extensive and validated data, providing a very high level of confidence in their precision. | 25% of emitting source emission factor (based on IPCC) |
| CH4_emissions_factor | Not used; N/A | Not used; N/A |
| N2O_emissions_factor | Not used; N/A | Not used; N/A |
| other_gas_emissions_factor | Not used; N/A | Not used; N/A |
| CO2_emissions | <ul style="list-style-type: none"> • <i>Very low</i>: Based on very rough estimations or outdated information. A very low level of confidence in its accuracy. • <i>Low</i>: Estimated from incomplete data. Low confidence level in its precision. • <i>Medium</i>: A mix of historical and more recent data. Medium level of confidence in their accuracy. • <i>High</i>: Derived from comprehensive and recent data. A high level of confidence in their precision. • <i>Very high</i>: Based on extensive and validated data, providing a very high level of confidence in their precision. | 35% of emitting source emissions |
| CH4_emissions | Not used; N/A | Not used; N/A |

| | | |
|----------------------------|--|----------------------------------|
| N2O_emissions | Not used; N/A | Not used; N/A |
| other_gas_emissions | Not used; N/A | Not used; N/A |
| total_CO2e_100yrGWP | <ul style="list-style-type: none"> • <i>Very low</i>: Based on very rough estimations or outdated information. A very low level of confidence in its accuracy. • <i>Low</i>: Estimated from incomplete data. Low confidence level in its precision. • <i>Medium</i>: A mix of historical and more recent data. Medium level of confidence in their accuracy. • <i>High</i>: Derived from comprehensive and recent data. A high level of confidence in their precision. • <i>Very high</i>: Based on extensive and validated data, providing a very high level of confidence in their precision. | 35% of emitting source emissions |
| total_CO2e_20yrGWP | <ul style="list-style-type: none"> • <i>Very low</i>: Based on very rough estimations or outdated information. A very low level of confidence in its accuracy. • <i>Low</i>: Estimated from incomplete data. Low confidence level in its precision. • <i>Medium</i>: A mix of historical and more recent data. Medium level of confidence in their accuracy. • <i>High</i>: Derived from comprehensive and recent data. A high level of confidence in their precision. • <i>Very high</i>: Based on extensive and validated data, providing a very high level of confidence in their precision. | 35% of emitting source emissions |

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Disclaimer: The emissions provided for this sector are our current best estimates of emissions, and we are committed to continually increasing the accuracy of the models on all levels. Please review our terms of use and the sector-specific methodology documentation before using the data. If you identify an error or would like to participate in our data validation process, please [contact us](#).

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7. Appendices

Appendix 7.1: Industry emissions factors

Pulp and paper:

The emissions factors given for pulp and paper are dependent upon the manufacturing process. For this study, we have used emission factors for the chemical wood pulping process (Tomberlin et. al, 2020).

Methanol:

Methanol emissions factors are dependent on the fuel type and technology at the facility. Their respective values are listed below in Table 9.

Table 9 Methanol emissions factors (IPCC, 2022).

| Technologies / Practices | Value | Unit | Source fuel |
|---|--------------|-------------------------------------|--|
| Conventional Steam Reforming, without primary reformer; Process Feedstock: Natural Gas (Default process technology and default feedstock) | 670 | kg CO ₂ / tonne methanol | Natural Gas (Default process technology and default feedstock) |
| Conventional Steam Reforming Process with Primary Reformer; Process Feedstock: Natural Gas | 497 | kg CO ₂ / tonne methanol | Natural Gas |
| Conventional Steam Reforming Process with Integrated Ammonia Production; Process Feedstock: Natural Gas | 1020 | kg CO ₂ / tonne methanol | Natural Gas |
| LURGI Conventional Steam Reforming Process; Process Feedstock: Natural Gas | 385 | kg CO ₂ / tonne methanol | Natural Gas |
| LURGI Conventional Steam Reforming Process; Process Feedstock: Natural Gas plus Feedstock CO ₂ | 267 | kg CO ₂ / tonne methanol | Natural Gas plus Feedstock CO ₂ |
| LURGI Low Pressure Steam Reforming Process; Process Feedstock: Natural Gas | 267 | kg CO ₂ / tonne methanol | Natural Gas |
| LURGI Combined Steam Reforming Process; Process Feedstock: Natural Gas | 396 | kg CO ₂ / tonne methanol | Natural Gas |
| LURGI Mega Methanol Steam Reforming Process; Process Feedstock: Natural Gas | 310 | kg CO ₂ / tonne methanol | Natural Gas |
| Partial Oxidation; Process Feedstock: Oil | 1376 | kg CO ₂ / tonne methanol | Oil |
| Partial Oxidation; Process Feedstock: Coal | 5285 | kg CO ₂ / tonne methanol | Coal |
| Partial Oxidation; Process Feedstock: Lignite | 5020 | kg CO ₂ / tonne methanol | Lignite |

Soda ash:

Soda ash emissions factors are sourced from the EPA (EPA, 2022) and dependent upon the technology type at the facility. There are four main types of technology which yield: solution mining (450kg), trona mining (750kg), Solvay process mining (1050kg) and Hou process mining (1,100kg) of CO₂ per ton of soda ash respectively.

Ammonia:

Ammonia emissions factors are categorized depending upon fuel type and geography. Their respective values are listed below in Table 10.

Table 10 Ammonia emissions factors (Hoxha and Christensen, 2019).

| Geography | Fuel type | Value (kg CO₂ per tonne) |
|------------------|-------------------------|--|
| China | Natural Gas | 2741 |
| China | Coal peat and oil shale | 4160 |
| Europe | Natural Gas | 2656 |
| Europe | Coal peat and oil shale | 4147 |
| CIS | Natural Gas | 2667 |
| Africa | Natural Gas | 2552 |
| North America | Natural Gas | 2810 |
| Latin America | Natural Gas | 2434 |
| Middle East | Natural Gas | 2417 |
| Southeast Asia | Natural Gas | 2501 |
| South Asia | Natural Gas | 2688 |
| Oceania | Natural Gas | 2520 |