Climate TRACE Inventory November, 2022

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Suggested citation format:	For assets from different sectors or global data accessed and downloaded, please cite as: Climate TRACE - Tracking Real-time Atmospheric Carbon Emissions (2022), *Climate TRACE Emissions Inventory*, https://climatetrace.org [Date Accessed]. For sector-specific citations, see below.
Disclaimer:	The emissions models provide 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 (https://climatetrace.org/tos) and the sector-specific methodology documentation (https://climatetrace.org/downloads) before using the data. If you identify an error or would like to participate in our data validation process please contact us.

Asset level Metadata Description:

Data-attribute	Definition
asset_id	The internal Climate TRACE identifier for each individual source of emissions. Every distinct asset is defined by a unique combination of facility name, country, asset type, and subsector.
iso3_country	Corresponds to the ISO 3166-1 alpha-3 code of the country where the entity is physically located except for ships. Ships codes are associated with their flag state.
original_inventory_sector	Intergovernmental Panel on Climate Change (IPCC) emissions sector to which the asset belongs.
start_time	The time using Coordinated Universal Time (UTC) of emissions, either as an instance of start time of observation.
end_time	The time using Coordinated Universal Time (UTC) of emissions, either as an instance of end time of observation.
temporal_granularity	Resolution of the data available.
gas	Greenhouse gases for which emissions are reported in metric tonnes. Climate TRACE reports emissions from Carbon Dioxide (CO2), Methane (CH4) and Nitrous oxide (N2O). Emissions in CO2-equivalents are available in the 100 year and 20 year time frame using IPCC Sixth Assessment Report (AR6) Global Warming Potentials.
emissions_quantity	Quantity of gas emitted in metric tonnes. If reported quantity is zero, it means that gas is not emitted. If reported quantity is empty/null/N-A, data is not yet available.
emissions_factor	Emissions factor of reported activity. Emissions factors vary by sector, subsector, and asset type. Emission factors data are not available for some subsectors due to licensing restrictions.
emissions_factor_units	Units of reported "emissions factor" field. Climate TRACE used SI base units and standard abbreviations when possible. https://www.nist.gov/pml/owm/metric-si/si-units
capacity	Capacity of the entity producing emissions, not including units. Because 'capacity' has different definitions in different sectors. Please see the capacity units column for detailed information.
capacity_units	Units of reported "capacity" field. Climate TRACE used SI base units and standard abbreviations when possible. https://www.nist.gov/pml/owm/metric-si/si-units There are known errors in the units for the following sectors. Please disregard the units provided in the download, and reference these: *cropland-fires capacity_units*:fire_radiative_power_MWh
capacity_factor	Corresponds to the ratio of the actual asset output (activity) by the asset capacity. When data not availble, this is not relevant for the sector. There are known errors in the units for the following sectors. Please disregard the units provided in the download, and reference these: *cropland-fires capacity_factor_units*: combustion_coefficient
activity	Activity of the entity producing the emissions, not including units. See definition of "capacity". Activity data are not available for some subsectors due to licensing restrictions.
activity_units	Units of reported "activity". There are known errors in the units for the following sectors. Please disregard the units provided in the download, and reference these: for *"cropland-fires"* and in *"activity_units"* column: total_count_of_fires
created_date	Date asset was added to the Climate TRACE database.
modified_date	Last date on which any updates were made to the dataset for the specific asset.
asset_name	Name of the entity or asset that produced the emissions. Where exact names were not available, Climate TRACE has created descriptive names based on asset location.
asset_type	Description of the asset's classification.
location	Location of the asset in well-known text representation (WKT). Representations are available to points by its (x,y) coordinate, and that translates to (long,lat). The location of the entity is not centralized. Approximate location is provided.

Country level Metadata Description:

Data-attribute	Definition
iso3_country	Corresponds to the ISO 3166-1 alpha-3 code for the country.
start_time	The time using Coordinated Universal Time (UTC) of emissions, either as an instance of start time of observation.
end_time	The time using Coordinated Universal Time (UTC) of emissions, either as an instance of end time of observation.
original_inventory_sector	Intergovernmental Panel on Climate Change (IPCC) emissions sector to which the asset belongs.
gas	Greenhouse gases for which emissions are reported in metric tonnes. Climate TRACE reports emissions from Carbon Dioxide (CO2), Methane (CH4) and Nitrous oxide (N2O). Emissions in CO2-equivalents are available in the 100 year and 20 year time frame using IPCC Sixth Assessment Report (AR6) Global Warming Potentials.
emissions_quantity	Quantity of gas emitted in metric tonnes. If reported quantity is zero, it means that gas is not emitted. If reported quantity is empty/null/N-A, data is not yet available.
emissions_quantity_units	Units of reported "emissions_quantity" field. Climate TRACE used SI base units and standard abbreviations when possible. https://www.nist.gov/pml/owm/metric-si/si-units
temporal_granularity	Resolution of the data available.
created_date	Date country emissions quantity was added to the Climate TRACE database.
modified_date	Last date on which any updates were made to the dataset for the specific country.

Ownership Metadata Description:

Data-attribute	Definition
asset_id	The internal Climate TRACE identifier for each individual source of emissions. Every distinct asset is defined by a unique combination of facility name, country, asset type, and subsector.
asset_name	Name of the entity or asset that produced the emissions. Where exact names were not available, Climate TRACE has created descriptive names based on asset location.
owner_name	The name that would be on the deed of the property, lowest level shell company that is the holding company.
owner_classification	Classification of the ownership. Climate trace provices ownership classification, when available.
percentage_of_ownership	Applies to the owner_name and owner_direct_parent.
owner_direct_parent	The next parent level of ownership. For however many owners are listed in the owner_name column, there will be a direct parent. If two different owner_names have the same owner_direct_parent, the owner_direct_parent would own the sum of the percentage_of_ownership.
owner_grouping	The ultimate parent (this is what will be listed on the website). There will only be one owner_grouping per asset. The company listed in owner_grouping does not necessarily own the company in owner_direct_parent. It is just the list of companies that have greater than 50% interest in the asset.
operator_name	The name of the operator company of the "asset_name". Climate TRACE provides this information when available.
percentage_of_operation	Applies to the "operator_name" attribute.
data_source	Data source of each column from where Climate TRACE compiled the ownership information.
url	URL from the "data_source" column.
recency	Corresponds to the last recorded date of ownership Climate TRACE recorded. This corresponds to the last time source was updated with ownership and operation information.
created_date	Date ownership and operation information was added to Climate TRACE database.

Recommended citation format for data from a specific sector:

Electricity generation:	Freeman, J., Rouzbeh Kargar, A., Söldner-Rembold, I. Ferreira, A., Couture, H., Jeyaratnam, J., O'Connor, J. Lewis, J., Hobbs, M., König, H., McCormick, C., Amuchastegui, N., Nakano, T., Dalisay, C., Davitt, A., Gans, L., Lewis, C., Volpato, G., Gray, M., and McCormick, G. (2022). *Electricity Generation Emissions Methodology.* WattTime, USA Transition Zero, UK, Pixel Scientia Labs, USA and Global Energy Monitor, USA, Climate TRACE Emissions Inventory. https://climatetrace.org [Accessed date]
Steel:	Ben m'barek, B., Phillpott, M. and De Daniloff, C. (2022). *Steel Emissions Methodology.* TransitionZero, UK, Climate TRACE Emissions Inventory. https://climatetrace.org [Accessed date]
Cement:	Ben m'barek, B., Phillpott, M. and De Daniloff, C. (2022). *Cement Emissions Methodology.* TransitionZero, UK, Climate TRACE Emissions Inventory. https://climatetrace.org [Accessed date]
Aluminum:	Ben m'barek, B., Phillpott, M. and De Daniloff, C. (2022). *Aluminum Emissions Methodology.* TransitionZero, UK, Climate TRACE Emissions Inventory. https://climatetrace.org [Accessed date]
Chemicals and Pulp and paper (country level):	Ben m'barek, B., Phillpott, M. and De Daniloff, C. (2022). *Manufacturing sector - Pulp and paper and Chemicals Emissions Methodology.* TransitionZero, UK, Climate TRACE Emissions Inventory. https://climatetrace.org [Accessed date]
Shipping:	Powell, M., Knights, D., Schofield, M., and Mackereth, T. (2022). *Shipping Emissions Methodology.* OceanMind, UK and the University of Minnesota, USA, Climate TRACE Emissions Inventory. https://climatetrace.org [Accessed date]
Domestic and international aviation:	Saraswat I. and Volpato, G. (2022). *Domestic and International Aviation Emissions.* WattTime, USA, Climate TRACE Emissions Inventory. https://climatetrace.org [Accessed date]
Road transportation:	Rollend, D., Kott, T., Foster, K., Mocharla, R., Muñoz, R., Fendley, N., Ashcraft, C., and Hughes, M. (2022). *Transportation Sector - Road Emissions Estimation Methodology.* The Johns Hopkins University Applied Physics Laboratory (JHU/APL), USA, Climate TRACE Emissions Inventory. https://climatetrace.org [Accessed date]
Oil and gas production and transport and Oil refining:	Reuland, F., Wang, R., Jenson, N., Schmeisser, L., Tecza, A., Bylsma, S., Kirk, T., Muralidharan, R., Puthuparambil, S., Kumble, S., Lu, X., Conway, T., and Gordon, D. (2022). *Oil and Gas Production, Processing, Refining, and Transport Emissions,* RMI, USA, Climate TRACE Emissions Inventory. https://climatetrace.org [Accessed date]
Coal mining (asset level):	Global Coal Mine Tracker, Global Energy Monitor, July 2022 release.
Bauxite mining, copper mining, iron mining and coal mining (country level):	Jollys, M. and Duddy, P. (2022). *Mining and Quarrying Emissions Methodology.* Hypervine, UK, Climate TRACE Emissions Inventory. https://climatetrace.org [Accessed date]
Cropland fires:	Ahmed, S., Kochhar, I., and Luong, A. (2022). *Cropland Biomass Fires Emissions Methodology.* Blue Sky Analytics, India, Climate TRACE Emissions Inventory. https://climatetrace.org [Accessed date]
Rice cultivation:	Rudiyanto and Minasny, B. (2022). *Rice Cultivation Emissions Model.* Universiti Malaysia Terengganu, Malaysia and the University of Sydney, Australia, Climate TRACE Emissions Inventory. https://climatetrace.org [Accessed date]
Enteric fermentation and Manure management:	Davitt, A., Volpato, G., Raniga, K., Gardner, A.M., Henning, L., Scheffer, M., Sutherland, A., Goodwin, B., Jaskolski, C., Powell, V., Pisard, C., and Schiller, S. (2022). *Enteric Fermentation and Manure Management Emissions from Dairy and Beef Cattle Feedlots.* WattTime, Hudson Carbon, Socially Responsible Agriculture Project, Synthetaic, Carbon Yield, USA, Climate TRACE Emissions Inventory. https://climatetrace.org [Accessed date]
Soil management:	Sharma, P and Basso, B. (2022). *Estimation of Direct Nitrous Oxide (N2O) from Synthetic Fertilizers at Country-level.* Department of Earth and environmental Sciences, Michigan State University, USA, Climate TRACE Emissions Inventory. https://climatetrace.org [Accessed date]
Solid waste disposal:	Raniga, K., Davitt, A., Gans, L., Sridhar, L., Lewis, C., McCormick, G. (2022). *Solid Waste Sector: Emissions Methodology.* WattTime, USA, Climate TRACE Emissions Inventory. https://climatetrace.org [Accessed date]
Net forest, grassland and wetland emissions:	Saatchi, S. and Yang, Y. (2022). *Forest & Mangrove, Shrub & Grassland, and Wetland Emissions Methodology.* CTrees, USA, Climate TRACE Emissions Inventory. https://climatetrace.org [Accessed date]
Metamodelling:	Lewis, C., Volpato, G., Gans, L., Reily, E., Stephens, A., Baker, M., and McCormick, G. (2022). *Implicitly Estimated National Greenhouse Gas Inventories.* WattTime and The Johns Hopkins University Applied Physics Laboratory (JHU/APL), USA, Climate TRACE Emissions Inventory. https://climatetrace.org [Accessed date]
Asset ownership:	Gans, L., Hall, B., McCormick, G., Saraswat, I., Volpato, G., Raniga, K., Lewis, C., Freeman, J., Davitt, A., Schmeisser, L., Ben m'barek, B., Phillpott, M., Jolleys, M., Powell, M. (2022). *Asset & Company-Level Ownership Methodology.* WattTime, Office of Al Gore, and RMI, USA, and TransitionZero, Hypervine, and OceanMind, UK. Climate TRACE Emissions Inventory. https://climatetrace.org [Accessed date]

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