

Climate TRACE Subsector and IPCC Equivalent Sector	Model Inputs	Model(s) Employed to Estimate Emissions
<p>Steel: 1.A.2.a, 2.C.1 Cement: 1.A.2.f, 2.A.1 Aluminum: 1.A.2.b, 2.C.3 Chemical: 1.A.2.c, 2.B.1, 2.B.7, 2.B.8.a Paper and Pulp: 1.A.2.d, 2.H.1</p>	<p>Landsat-8 and -9 and Sentinel-2A/B shortwave infrared (SWIR) measurements</p> <p>Mineral Yearbook by the U.S. Geological Survey (USGS)</p> <p>International Aluminum Institute</p> <p>World Steel Association</p> <p>Global Efficiency Intelligence</p> <p>Steel data from Global Efficiency Intelligence</p> <p>GNR project by the World Business Council for Sustainable Development (WBCSD)</p> <p>Government Cement data (China, India, Taiwan, Russia, Thailand, Pakistan, Malaysia and Colombia)</p> <p>United Nations Industrial Development Organization (UNIDO)</p> <p>Industrial Production from the Economic Research - Federal Reserve Bank of St. Louis</p>	<p>Machine learning</p>
<p>Crushed Stone, Sand, Bauxite, Copper, Iron: 1.A.2.g.iii</p>	<p>Sentinel-1 synthetic aperture radar (SAR)</p> <p>Economic activity related to mining and quarrying</p> <p>tonnes of ore extracted from: US Geological Survey Minerals Yearbook</p> <p>Observatory of Economic Complexity</p> <p>Union Européenne des Producteurs de Granulats (UEPG) Mineral Publication</p> <p>Steel data from Global Efficiency Intelligence</p> <p>Global Energy Monitor Coal Mine Tracker</p>	<p>Statistical and Machine Learning</p>

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Oil and Gas Production and Refining: 1.B.2.a.i, 1.B.2.a.ii 1.B.2.a.iii, 1.B.2.b.i 1.B.2.b.ii, 1.B.2.b.iii 1.B.2.c, 1.B.2.a.iv 1.B.2.a.v, 1.B.2.b.v	<p>Upstream Oil and Gas Field and Refining datasets from service provider; oil and gas data from technical references, academic publications, government and news websites, direct emissions estimates, verified datasets on field depth, age, production, gravity, oil, gas and water ratios technical references, journal articles, and fundamental data sources</p> <p>Suomi National Polar Partnership (NPP) Visible Infrared Imaging Radiometer Suite (VIIRS) Flaring data</p>	<p>Oil Production Greenhouse Gas Emissions Estimator (OPGEE) and The Petroleum Refinery Life-Cycle Inventory Model (PRELIM) processed-based models from the Oil Climate Index + Gas (OCI+) tool</p>
Electricity Generation: 1.A.1.a.i, 1.A.1.a.ii	<p>PlanetScope, Landsat-8 and Sentinel-2A/B satellite visible imagery</p> <p>Australia National and Wholesale Electricity Market</p> <p>EU Joint Research Center (JRC) Open Power Plants Database (PPDB)</p> <p>European Network of Transmission System Operators for Electricity (ENTSO-E)</p> <p>Global Energy Monitor (GEM) Global Coal Plant Tracker (GCPT) and Global Gas Plant Tracker (GGPT)</p> <p>International Energy Agency (IEA) Electricity Generation Data</p> <p>S&P Global/Platts World Electric Power Plant (WEPP) database</p> <p>Taiwan Electric Power Corporation</p> <p>US EPA Air Markets Program Data (AMPD)</p> <p>US Energy Information Administration EIA-860 and EIA-860m</p> <p>World Resources Institute (WRI) Global Power Plant Database (GPPD)</p> <p>Government utility and power company data (Argentina, Bangladesh, Brazil, Canada, China, Croatia, Indonesia, South Korea, Lithuania, New Zealand, Panama, Peru, Singapore, South Africa, Thailand, Turkey, Vietnam)</p>	<p>Machine learning</p>

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Shipping: 1.A.3.d International navigation	Automatic ship identification data (AIS) EU's shipping emissions Monitoring Reporting, and Verification (MRV) IHS Markit (commercial provider) Third and Fourth GHG Studies from the International Maritime Organization (IMO) International Council on Clean Transportation (ICCT) Global Shipping GHG emissions study	Statistical and Machine Learning
On road: 1.A.3.b	Sentinel-2A/B visual imagery Planet Labs Global Buildings and Roads Map Database of Road Transportation Emissions (DARTE) LandScan Population, Motorization Rate 2015 - Worldwide Average Annual Daily Traffic (AADT) data from the US Highway Performance Monitoring System OpenStreetMap road network data vehicle emissions factors-related data from the World Bank Group Climate Action for Urban Sustainability (CURB) tool	Machine learning
Aviation: 1.A.3.a International aviation	Official Aviation Guide (OAG) proprietary historical flight status data International Civil Aviation Organisation's (ICAO) fuel consumption tables for specific aircraft types	ICAO model

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Synthetic Fertilizer Application: 3.D.1.a	FAOSTAT Direct N ₂ O emission at the country scale Crop-specific Yield, and Crop-specific Harvest area Crop-specific nitrogen content (Lassaletta et al., 2014) International Fertilizer Association Total N fertilizer at country scale (IFASTAT) United Nations Framework Convention on Climate Change (UNFCCC) Direct N ₂ O emission at country scale	Statistical
Rice Cultivation: 3.C	Aqua and Terra Moderate Resolution Imaging Spectroradiometer (MODIS) derived vegetation and snow indices Sentinel-1A synthetic aperture radar (SAR) and Sentinel-2A/B and land cover map	Empirical
Crop: 3.F Forest: 4.A Savanna and Shrubland: 4.C	Suomi National Polar-orbiting Partnership (NPP) Visible Infrared Imaging Radiometer Suite Visible Infrared Imaging Radiometer Suite (VIIRS) Aqua and Terra Moderate Resolution Imaging Spectroradiometer (MODIS) Copernicus Global Land Cover (CGLS) LC100 collection Blue Sky Analytics generated combustion coefficients from remote sensing data	Empirical
Forest Clearing: 4.A	Landsat-derived tree cover loss, Ice, Cloud, and Elevation Satellite (ICESat) Geoscience Laser Altimetry System (GLAS)/Landsat-derived aboveground live woody biomass density Suomi National Polar-orbiting Partnership (NPP) Visible Infrared Imaging Radiometer Suite (VIIRS) Fire Mask	Empirical