Carbon Dioxide Information and Analysis Center (CDIAC)

The EmissionsCarbonCDIAC data comes from the Carbon Dioxide Information Analysis Center (CDIAC) and is available here. (This was updated 8/22/2024 as the original site was no longer be accessible past September 30, 2017).

The organization publishes a number of datasets, including data on climate, atmospheric gases, and vegetation. The only data from the CDIAC used in IFs is total fossil-fuel CO_2 emissions, which is available from 1751 to 2013, but has been imported to IFs beginning in the year 1800.

Therre is a consistent time series of data on CO2 emissions from fossil fuel use and cement manufacture was for many years generated and updated annually by the Carbon Dioxide Information and Analysis Center (CDIAC) at the U.S. Department of Energy's (DOE) Oak Ridge National Laboratory (ORNL). The CDIAC annual inventories began in 1984 and were continued through 2017. The CDIAC emissions data set extended from the beginning of the industrial era (1751) to essentially the present. There is a data lag of 2 to 3 years due to the time needed for collecting and processing the primary data. The DOE ceased support for CDIAC in 2017. The last release supported by the DOE included emission estimates for the year 2014.

CDIAC Calculations

The CO_2 emissions prior to 1950 were calculated using historical energy statistics found in academic publications. Post-1950 emissions data has mostly come from energy statistics published by the United Nations. See more detail on the CDIAC methods and sources here.

Two main equations, derived from the work of Marland and Rotty (1984) and Boden et. al (1995), were used in calculating carbon emissions for this data. In order to calculate the CO_2 emissions from fossil fuels, three variables were used, including the amount of fuel produced and consumed (P), the fraction of the fuel that becomes oxidized (FO), and a factor for carbon content of the fuel (C). The following equation was used:

where is the group of fuel being calculated, chosen from gases, liquids, or solids. This equation was used to calculate global CO_2 estimates for each fuel group. A total of the caclulations for each group was then used to calculate the total CO_2 emissions for each country, used in IFs. In order to estimate the amount of fuel consumed (P), another equation was used:

Failed to parse (syntax error): {\displaystyle Consumption = production + imports - exports - bunkers - changes in stocks }

where "bunkers" refers to fuel used by ships and aircraft used in international trade.

Negative Emissions

There are negative emissions for a number of countries in this dataset, for Australia in the 1950s, Venezuela in 1930, and Iran in 1950, among others. A possible explanation has been provided by the CDIAC in their discussion of the CO_2 trends for the Islamic Republic of Iran:

Energy statistics for the Islamic Republic of Iran in the early 1950s and the corresponding CO_2 emissions estimates should be used with caution. Domestic fuel consumption is calculated as the difference between production plus imports and exports plus changes in stocks. When both production and exports are very large and very similar, a small error in either estimate can make it appear that domestic consumption was negative.

This is a plausible explanation for other countries with negative emissions, as they were all for years in the late 1800s or early to mid 1900s, or had poor data availability during the years their emissions appear negative.

Pulling CDIAC Fossil Fuel CO_2 Emissions Data

For general instructions on how to import data into IFs, visit the data import page.

To get the data, download the National CO2 emissions from fossil fuels and cement manufacture excel sheet.

Data Product	Data Description	Download
Global CO_2 emissions from fossil fuels and cement manufacture	Global CO_2 emissions from 1751 to 2020. Total CO_2 emissions including emissions from the consumption of solid fuels, liquid fuels, gas fuels, the production of cement, and gas flaring shown in million metric tons of carbon, or megatons of carbon (MtC). Per capita CO_2 emissions (1950-2020) are in metric tons of carbon	global.1751_2020.xlsx (21 KB)
National CO_2 emissions from fossil fuels and cement manufacture	CO_2 emissions for each individual nation from 1751 to 2020. Total CO_2 emissions including emissions from the consumption of solid fuels, liquid fuels, gas fuels, the production of cement, and gas flaring shown in thousand metric tons of carbon, or kilotons of carbon (ktC). Per capita CO_2 emissions (1950-2020) are in metric tons of carbon	nation.1751_2020.xlsx (922 KB)
Total CO_2 emissions in 2020 by country	Ranking of each country by total CO_2 emissions in 2019 shown in thousand metric tons of carbon, or kilotons of carbon (ktC)	total.2020.xlsx (14 KB)
Per capita CO_2 emissions in 2020 by country	Ranking of each country by per capita CO_2 emissions in 2019 shown in thousand metric tons of carbon, or kilotons of carbon (ktC)	per.capita.2020.xlsx (15 KB)

The data is in the coloumn: Total CO2 emissions from fossil-fuels and cement production (thousand metric tons of C).

Notes on the CDIAC dataset,

1. The country concordance table to be used for this dataset is the CDIAC table. Every year, the CDIAC adds and deletes some countries out of these tables. Therefore the table must be updated along with the dataset.

2. Data is available from the year 1700 onwards. However, only data from the year 1800 onwards is used in IFs.

3. The user must update the formula column when importing the dataset through IFs so that the data is recorded in billions and not millions.

4. The user or vetter should also check the earliest and most recent data columns in the access file. In case of datasets with a large number of nulls, IFs does not update the earliest and most recent columns accurately in the case of some countries.