Documentation for the Global Fire Emissions Indicators, Country-Level Tabular Data: 1997-2015

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Center for International Earth Science Information Network (CIESIN),
Columbia University

Abstract

This document outlines the basic methodology and data sets used to construct the Global Fire Emissions Indicators, Country-Level Tabular Data, v1 (1997-2015), along with use cases, limitations, and use constraints.

Data set citation: Center for International Earth Science Information Network (CIESIN), Columbia University. 2017. Global Fire Emissions Indicators, Country-Level Tabular Data: 1997-2015. Palisades, NY: NASA Socioeconomic Data and Applications Center (SEDAC). https://doi.org/10.7927/H4V69GJ5. Accessed DAY MONTH YEAR.

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We appreciate feedback regarding this data set, such as suggestions, discovery of errors, difficulties in using the data, and format preferences. Please contact:

NASA Socioeconomic Data and Applications Center (SEDAC)
Center for International Earth Science Information Network (CIESIN)
Columbia University
Phone: 1 (845) 365-8920
Email: ciesin.info@ciesin.columbia.edu

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I. Introduction

The Global Fire Emissions Indicators, Country-Level Tabular Data: 1997-2015 contains country tabulations from 1997 to 2015 for the total area burned (hectares) and total carbon content (metric tons). The annual total area burned is for all fire types per country. There are two groups of total carbon content (TCC), annual totals for all six fire types per country and annual totals for each of six fire types per country which include Agricultural, Boreal, Tropical Deforestation, Peat, Savanna, and Temperate forest fires.

II. Data and Methodology

This data set is based on the fourth-generation global fire emissions database version 4.0 (GFED4), Giglio et al., (2013), available at http://www.globalfiredata.org.

Input data

The input data are taken from the fourth-generation global fire emissions database version 4.0 (GFED4) time series data consisting of annual data bundles from 1997 to 2015. The downloaded files are in Hierarchical Data Format (HDF) 5 containing 245 variables. There are three input data sets used in the calculation of the country level indicators:

1. The burned area files consist of two data sets for each month of the year: burned fraction and burned area source. The burned fraction is the proportion of each grid cell that burned in that month according to GFED4s burned area data. The burned area source indicates what data was used to construct the burned area maps, excluding small fires. The Along-Track Scanning Radiometer (ATSR) and the Tropical Rainfall Measuring Mission (TRMM) Visible and Infrared Scanner (VIRS) data were used before 2001 and Moderate-Resolution Imaging Spectroradiometer (MODIS) data after 2001.

2. The emissions files consist of 5 data sets for each month of the year: emissions (Carbon with units of *g C* m^{-2} $month^{-1}$ and Dry Matter (DM) with units of *kg DM* m^{-2} $month^{-1}$); small fire fraction; daily fraction; diurnal cycle; and partitions for both C and DM data sets: AGRI (Agricultural waste burning), BORF (Boreal forest fires), DEFO (Tropical forest fires [deforestation and degradation]), PEAT (Peat fires), SAVA (Savanna [grassland, and shrubland fires]), and TEMF (Temperate forest fires).

3. National boundary raster data from the Gridded Population of the World, Version 4 (GPWv4): National Identifier Grid (https://doi.org/10.7927/H41V5BX1) data set aggregated to 0.25 degree resolution.

Methods

Carbon Content (CC) was estimated from Carbon Dioxide (CO_2), Carbon Monoxide (CO), and Methane (CH_4) Emission Factors (EFs), for each of the biomes with conversion factors assuming that these species represent the main bulk of carbon emissions during a fire.

Biome	Tropical Forest	Temperate Forest	Boreal Forest	Savanna	Peat	Agricultural Waste
CC	0.4917505	0.4894161	0.4649894	0.4882731	0.522823	0.4803520

By converting DM emissions to trace gas or aerosol emissions, CC can be estimated. In order to perform this conversion, DM values (kg DM/m^2/month) are multiplied with emission factors.

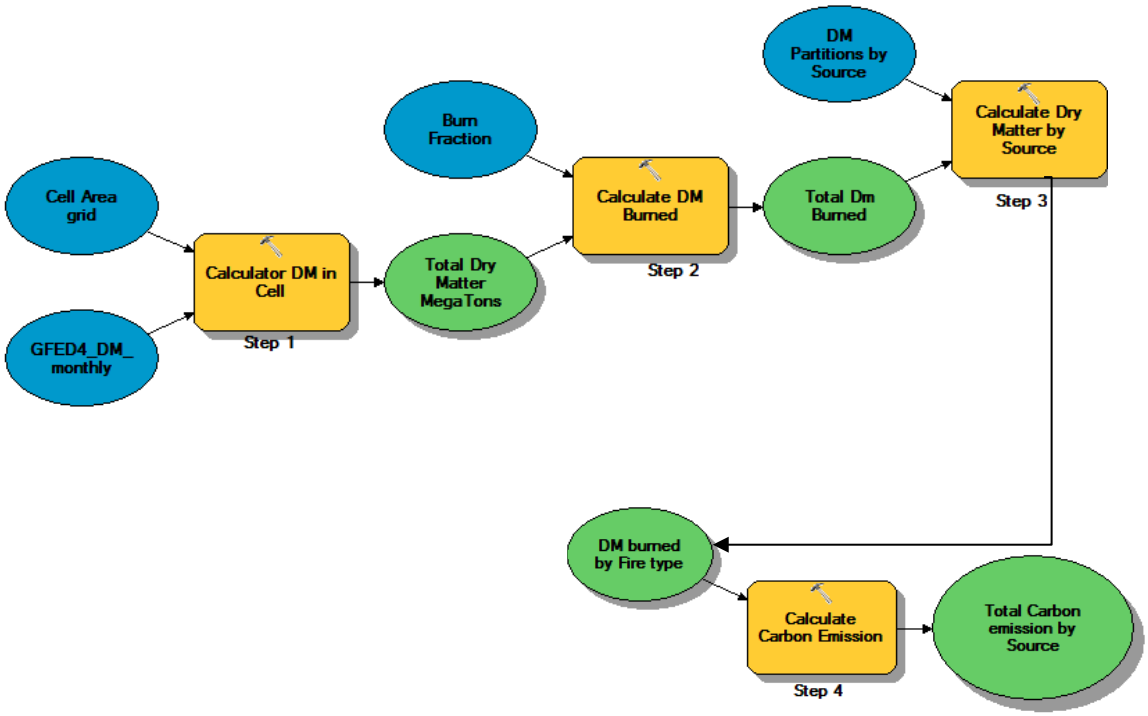
$$E_{CO}(x, y, time) = \sum^{sources} EF_{CO_{source}} \times DM(x, y, time) \times contr_{source}(x, y, time)$$

Where:

E is emissions
EF is the emission factor

Contr is the contribution of the various sources (SAVA, DEFO, etc.)

Monthly grid files were aggregated into yearly rasters. Zonal statistics were then generated at a national level for total area burned and total carbon content using GPWv4 National Identifier Grid data. The processing model (in Arc Model Builder) is as follows:



III. Data Set Description(s)

Data set description:
The global fire emissions tabular data consists of total carbon content and total area burned yearly from 1997 to 2015. The annual total carbon content (TCC) represents carbon burned (metric tons) for all fire types, and for each of the six fire types per country. The annual total area burned is for all fire types (hectares) per country.

Data set web page:
http://sedac.ciesin.columbia.edu/data/set/sdei-global-fire-emissions-indicators-country-level-1997-2015

Data set format:
The data are available in Microsoft Excel format as a downloadable zip files. The downloadable is a compressed zip file, containing: 1) Workbook, and 2) PDF documentation. The Worksheets include:

1. Annual total area burned for all fire types (hectares)
2. Annual total carbon content for all fire types (metric tons)
3. Annual total carbon content (metric tons) for AGRI fires (Agricultural waste burning)
4. Annual total carbon content (metric tons) for BORF fires (Boreal forests)
5. Annual total carbon content (metric tons) for DEFO fires (Tropical Deforestation and Degradation)
6. Annual total carbon content (metric tons) for PEAT fires
7. Annual total carbon content (metric tons) for SAVA fires (Savanna, grassland and shrubland)
8. Annual total carbon content (metric tons) for TEMF fires (Temperate forests)

Data set downloads:
sdei-global-fire-emissions-indicators-country-level-1997-2015-gfed4-total-carbon-content-area-burned-xlsx.zip

IV. How to Use the Data

The tabular data with aggregates of area burned and total carbon emissions for each year can be used directly for statistical analysis.

V. Potential Use Cases

Uses of the tabular data include monitoring of fire emissions by type, since they are an important component of land-based emissions globally. The data may also enable countries to monitor the effect of fire suppression policies. Other uses include integrating these data with other natural and socioeconomic data sets for environmental monitoring or decision support.

VI. Limitations

Any limitations to the underlying data are detailed in Giglio et al., (2013).

VII. Acknowledgments

The gridded data were created by Louis Giglio, James T. Randerson, and Guido R. van der Werf. The country level statistics were calculated by CIESIN staff member Malanding Jaiteh.

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VIII. Disclaimer

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IX. Use Constraints

X. Recommended Citation(s)

Data set(s):

Center for International Earth Science Information Network (CIESIN), Columbia University. 2017. Global Fire Emissions Indicators, Country-Level Tabular Data: 1997-2015. Palisades, NY: NASA Socioeconomic Data and Applications Center (SEDAC). https://doi.org/10.7927/H4V69GJ5. Accessed DAY MONTH YEAR.

Scientific publication:

Giglio, L., J. T. Randerson and G. R. van der Werf. 2013. Analysis of Daily, Monthly, and Annual Burned Area Using the Fourth-Generation Global Fire Emissions Database (GFED4). *Journal of Geophysical Research* 118 (1): 317-328. https://doi.org/10.1002/jgrg.20042.

XI. Source Code

No source code is provided.

XII. References

Giglio, L., J. T. Randerson and G. R. van der Werf. 2013. Analysis of Daily, Monthly, and Annual Burned Area Using the Fourth-Generation Global Fire Emissions Database (GFED4). *Journal of Geophysical Research* 118 (1): 317-328. https://doi.org/10.1002/jgrg.20042.

Additional information on the data set may be obtained from:
http://www.globalfiredata.org/

XIII. Documentation Copyright and License

Appendix 1. Data Revision History

No revisions have been made to this data set.

Appendix 2. Contributing Authors & Documentation Revision History

Revision Date	Contributors	Revisions
February 21, 2018	Malanding Jaiteh	This document is the 1st instance of documentation