

Dataset Information:

Title	Emissions shares
Abstract	<p>The FAOSTAT Emissions shares domain of FAOSTAT Agri-Environmental Indicators disseminates data on the greenhouse gas (GHG) emissions shares of agriculture and related land use to the total emissions from all economic sectors, by gas, country and year, for the period 1990–2017. Emissions data are also disseminated, for transparency. The economic sectors considered as emission sources are those defined by the Intergovernmental Panel on Climate Change (IPCC) in the 2006 guidelines (Vol.1, ch.8): Energy, Industrial Processes and Product Use, Waste, and Agriculture. Agriculture-related land use emissions are also considered and used to compute emissions shares. Emissions from agriculture and associated land use are taken from the relevant FAOSTAT GHG emissions domains of Emissions-Agriculture and Emissions-Land Use (2019). Agriculture-related land use emissions include emissions from cropland, grassland, net forest conversion, and fires from burning of organic soils and humid tropical forests. Emissions from the other sectors are taken from the third-party PRIMAP-hist dataset v2.1 (Gütschow et al., 2016; Gütschow et al., 2019).</p>
Supplemental	<p>Shares are computed and disseminated with respect to total CO₂eq as well as single gas emissions. The domain 'Emissions shares' contains the following data categories available for download by sector, country and year: <i>a</i>) shares of total CO₂eq emissions; <i>b</i>) shares of total CO₂, CH₄, N₂O and Fluorinated gases (F-gases, including Hydrofluorocarbons (HFCs), Perfluorinated compounds (PFCs), SF₆ and NF₃ gases; <i>c</i>) emissions in Gg CO₂eq; <i>d</i>) emissions in Gg of the single gases.</p> <p>Total emissions are computed by summing emissions in CO₂ gas with emissions of the other trace gases, the latter converted in CO₂eq via Global Warming Potentials (GWP) coefficients. Results are disseminated separately for GWPs corresponding to three different options used in various IPCC reporting processes, namely GWPs from: <i>a</i>) the IPCC Second Assessment Report (SAR)(IPCC, 1996); <i>b</i>) the IPCC Fourth Assessment Report (AR4) (IPCC, 2007); and <i>c</i>) the IPCC Fifth Assessment Report (AR5)(IPCC, 2014).</p> <p>Data are available by country, by FAOSTAT regional aggregation and special group, including the Annex I and Non-Annex I Parties to the United Nations Framework Convention on Climate Change (UNFCCC).</p> <p>The aim of this domain is to provide a global database of reference data to support countries in addressing statistical data gaps and exploring policy-relevant emissions indicators.</p>
Creation Date	2016
Last Update	2020
Data Type	Climate Change - Greenhouse Gases
Category	Agriculture, Environment
Time Period	1990–2017
Periodicity	Annual
Geographical Coverage	World
Spatial Unit	Country (198 countries; 45 areas/territories incl. former territorial entities)
Language	Multilingual (EN, FR, ES)

Methodology and Quality Information:

Methods and processing

Overview

Data sources

Emissions estimates from the FAOSTAT dataset 'Agriculture Total' (<http://www.fao.org/faostat/en/#data/GT>) are the source of data for 'Agriculture total'. Data for the sector **Agriculture total** combines the CH₄ and N₂O emissions from crop and livestock and other agricultural management activities.

Emissions estimates for **Agricultural land use** are taken from the FAOSTAT Emissions-Land Use domain, and specifically:

a) The emissions associated with carbon losses due to forest converted to other land uses as in the FAOSTAT dataset <http://www.fao.org/faostat/en/#data/GF>. The Net forest conversion is taken here as a proxy for deforestation (Federici et al., 2016) and assumed to be entirely associated with conversion of forests for agricultural purposes.

b) The CO₂ emissions due to the degradation of organic soils under cultivation and grazing (Tubiello et al., 2016) as per FAOSTAT datasets <http://www.fao.org/faostat/en/#data/GC> and <http://www.fao.org/faostat/en/#data/GG>.

c) The non-CO₂ emissions from the burning of biomass in the humid tropical forests as well as the CO₂, N₂O and CH₄ emissions from fires on peat soils all from <http://www.fao.org/faostat/en/#data/GI>. Burning of biomass in tropical rainforests and tropical moist forests, as well as emissions from peat fires (Rossi et al., 2016), are assumed to be associated with deforestation events for agricultural purposes.

The PRIMAP-hist national historical emissions time series v2.1 is the source of CO₂, CH₄, N₂O and F-gases emissions for the sectors **Energy, Industrial Processes and Product Use, Waste and Other, nec**. PRIMAP-hist is developed and maintained by the Potsdam Institute for Climate Impact Research (Gütschow et al., 2016; Gütschow et al., 2019) (<https://www.pik-potsdam.de/paris-reality-check/primap-hist/>). In preparation of this domain, the **third party data scenario** of PRIMAP-hist v2.1 was used (Gütschow et al., 2019), covering the years 1990–2017.

Emissions from "**International Bunkers**" is derived from data on 'International aviation' and 'International navigation/shipping' of the **EDGAR dataset** (JRC/PBL, 2016), covering the period 1990–2010 and extrapolated linearly to 2017 by using the average growth rate of the 2008–2010 period. Emissions for this category and corresponding shares are only available for the world aggregate.

Items (sectors) and items aggregated

Emissions and shares are available for all sectors and aggregates. Sectors in the domain are: Agriculture total; Agricultural land use; Energy; Industrial processes and product use; Waste; International Bunkers; and Other, nec. The latter category includes sources of emissions not elsewhere classified such as indirect N₂O emissions from non-agricultural NO_x and indirect N₂O from non-agricultural NH₃.

Available sector aggregates are: Total emissions with agricultural land use; Total emissions without land use; and Agriculture and related land use.

Shares

Two types of shares are estimated, by country and year, as follows:

i) Share of each sector in total CO₂eq emissions

These shares represent the contribution of each sector to total emissions (in CO₂ equivalent) from all gases and sectors in the scope of this domain. Total emissions with agricultural land use were used at the denominator to calculate the shares. As discussed later in more detail, emissions in CO₂ equivalents are computed applying three different sets of Global Warming Potentials (GWPs).

$$\text{Share of sector}_{(A,I,Y)} = \left(\text{Emiss. CO}_2\text{eq}_{(A,I,Y)} / \text{Emiss. CO}_2\text{eq}_{(A,\Sigma I,Y)} \right) \cdot 100$$

where:

<i>Share of sector</i> $_{(A,I,Y)}$	Share of sector <i>I</i> (%) in total CO ₂ eq emissions, for country <i>A</i> and year <i>Y</i>
<i>Emiss. CO₂eq</i> $_{(A,I,Y)}$	Emissions (Gg CO ₂ eq) from sector <i>I</i> , for country <i>A</i> and year <i>Y</i>
<i>Emiss. CO₂eq</i> $_{(A,\Sigma I,Y)}$	Emissions (Gg CO ₂ eq) from all sectors ΣI , for country <i>A</i> and year <i>Y</i>
<i>A, I, Y</i>	Country, sector, and year, respectively

ii) Share of each sector in the emissions from each gas

This share represents the contribution of each sector to total emissions from each gas (N₂O, CH₄, CO₂ or F-gases).

$$\text{Share of sector}_{(A,I,G,Y)} = \left(\text{Emiss. Gas}_{(A,I,G,Y)} / \text{Emiss. Gas}_{(A,G,\Sigma I,Y)} \right) \cdot 100$$

where:

<i>Share of sector</i> $_{(A,I,G,Y)}$	Share of sector (%) in total emissions of gas <i>G</i> from all sectors, for country <i>A</i> and year <i>Y</i>
<i>Emiss. Gas</i> $_{(A,I,G,Y)}$	Emissions of gas <i>G</i> (Gg) from sector <i>I</i> , for country <i>A</i> and year <i>Y</i>
<i>Emiss. CO₂eq</i> $_{(A,G,\Sigma I,Y)}$	Total emissions (Gg) of gas <i>G</i> from all sectors ΣI , for country <i>A</i> and year <i>Y</i>
<i>A, I, G, Y</i>	Country, sector, gas and year, respectively
<i>G</i>	Gases in the scope of the domain are CO ₂ , CH ₄ , N ₂ O and F-gases

Global Warming Potential (GWP)

Emissions in Gg from the single gases N₂O, CH₄ and the aggregate F-gases are converted to CO₂eq by applying three different sets of GWP coefficients (100-year time horizon) from the IPCC assessment reports: *a*) IPCC SAR (1996); *b*) IPCC AR4 (2007); and *c*) IPCC AR5 (2014) (see Tab. 1).

The PRIMAP-hist v2.1 includes values of CO₂eq from F-gases based on the SAR and AR4 GWPs but the detailed gas composition of F-gases in each country and year is not available in the dataset (Gütschow et al., 2016). The missing emissions in Gg from F-gases and corresponding CO₂eq using AR5 GWP coefficients are estimated as follows:

- a) *Emissions in Gg from F-gases* – By country and year, PRIMAP SAR emissions in CO₂eq were divided by the simple average of AR4 (μGWP AR4) coefficients in Table

1. The corresponding value (5,346) is applied as a constant, hypothetical F-gases composition to derive the Gg of F-gases emissions for all countries and years.
- b) *Emissions in CO₂eq AR5 from F-gases*– By country and year, the emissions in Gg from F-gases are then multiplied by the mean average value μ GWP AR5 in Table 1 (5,195) to compute AR5 CO₂eq emissions from F-gases.

Table 1. Global Warming Potentials (GWP) relative to CO₂ (dimensionless)

	Greenhouse gas	GWP SAR (IPCC 1996)	GWP AR4 (IPCC, 2007)	GWP AR5 (IPCC, 2014)
<i>Single gases</i>	N ₂ O	310	298	265
	CO ₂	1		
	CH ₄	21	25	28
<i>F-gases</i>	HFC-23	11,700	14,800	12,400
	HFC-32	650	675	677
	HFC-41	150		116
	HFC-125	2,800	3,500	3,170
	HFC-134	1000		1,120
	HFC-134a	1,300	1,430	1,300
	HFC-143	300		328
	HFC-143a	3,800	4,470	4,800
	HFC-152			16
	HFC-152a	140	124	138
	HFC-161			4
	HFC-227ea	2,900	3,220	3,350
	HFC-236cb			1,210
	HFC-236ea			1,330
	HFC-236fa	6,300	9,810	8,060
	HFC-245ca	560		716
	HFC-245fa		1,030	858
	HFC-365mfc		794	804
	HFC-43-10mee	1,300	1,640	1,650
	Sulfur hexafluoride (SF ₆)	23900	22800	23500
	Nitrogen trifluoride (NF ₃)		17,200	16,100
	PFC-14	6,500	7,390	6,630
	PFC-116	9,200	12,200	11,100
	PFC-218	7,000	8,830	8,900
	PFC-318	8,700	10,300	9,540
	PFC-31-10	7,000	8,860	9,200
PFC-41-12	7,500	9,160	8,550	
PFC-51-14	7,400	9,300	7,910	
PCF-91-18		7,500	7,190	
	μ GWP	3,797	5,346	5,195

Territorial definitions

The territorial definitions of the PRIMAP-hist dataset are based on the list of countries reporting their emissions to the UNFCCC (Gütschow et al., 2016). These definitions differ from the FAOSTAT list of countries and territories. For instance, PRIMAP emissions data for the United Kingdom include Bermuda as well as other countries/territories, for which FAOSTAT disseminates separate data instead. Shares are not computed when data is only available for Agriculture total and/or Agriculture related land use. Annex I summarizes the differences in territorial definitions between PRIMAP-hist v2.1 and FAOSTAT.

Preparation of the time series

In line with UNFCCC standards (Gütschow et al., 2016), PRIMAP data attributes the emissions originating from a certain territory at any point in time to the state that territory currently belongs to. Thus, for the entire time series (1850–2017), emissions are attributed

to the country/territory now present, including back in time if it was part of a different country or territory. Conversely, FAOSTAT data follows the actual country and territory composition and its changes over time. For instance, FAOSTAT emissions estimates for the former Soviet Union (USSR) are available until 1991. From 1992 onward, statistics are disseminated for the 15 countries originated from the split. To maintain consistency along the entire time series (1990–2017), PRIMAP data are thus aggregated backward in time as appropriate following the FAOSTAT approach.

References

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Data Collection Method	Computed
Completeness	100%
Useful links	https://www.pik-potsdam.de/pik-frontpage https://www.pik-potsdam.de/paris-reality-check/primap-hist/ http://www.fao.org/economic/ess/environment/en/ http://www.ipcc-nggip.iges.or.jp/public/

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ANNEX I

Areas / Territories	
<i>available with separate data in FAOSTAT</i>	<i>included in other countries in PRIMAP</i>
Norfolk Island	Australia
Heard and Mc-Donald Islands	
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Faroe Islands	Denmark
Greenland	
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Palestinian Territory	Israel
<hr/>	
Western Sahara	Morocco
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Svalbard and Jan Mayen Islands	Norway
<hr/>	
Bermuda	UK
Cayman Islands	
Channel Islands	
Falkland Islands (Malvinas);	
Gibraltar	
Isle Of Man	
Montserrat	
Guernsey	
Jersey	
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Guam	USA
Northern Mariana Islands	
Puerto Rico	
American Samoa	
United States Virgin Islands	

Coverage of specific territories by FAOSTAT and PRIMAP.