



**CoCo2**

Prototype system for a  
Copernicus CO<sub>2</sub> service

# Factsheets with national observation-based carbon budgets



Co-ordinated by  
 **ECMWF**





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Prototype system for a  
Copernicus CO<sub>2</sub> service

## D6.1 Factsheets with national observation-based carbon budgets

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# CoCO2: Prototype system for a Copernicus CO<sub>2</sub> service

Coordination and Support Action (CSA)  
H2020-IBA-SPACE-CHE2-2019 Copernicus evolution –  
Research activities in support of a European operational  
monitoring support capacity for fossil CO<sub>2</sub> emissions

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# 1. Introduction

The European Commission is establishing an operational observation-based anthropogenic CO<sub>2</sub> emissions monitoring and verification support capacity (CO2MVS) as part of its Copernicus Earth Observation programme. A key component of this CO2MVS system, that is developed in the Prototype System for a Copernicus CO<sub>2</sub> service (CoCO2) project, includes the provision of policy-relevant information based on the data produced by the future service. This deliverable presents the results of one such data visualisation framework, i.e., the production and promotion of GHG flux syntheses in the form of synthetic factsheets. These factsheets correspond to updates of initial factsheets developed within the VERIFY project and first described in the following document:

<https://verify.lsce.ipsl.fr/index.php/repository/public-deliverables/wp5-wp6-synthesis-and-products-policy-relevant-ghg-monitoring-and-verification-system-design/d5-6-first-factsheets-with-national-observation-based-ghg-budgets>

The factsheets represent a synthesis of the GHG budgets derived from observation-based flux estimates as well as the estimates reported by each country to the UNFCCC. They are mainly targeting national and regional technical experts as well as policy makers. These factsheets are based on the data and model runs realised in several WPs of the CoCO2 project as well as in the last year of the VERIFY project. They rely on a selection of synthetic plots from a larger ensemble of plots that can be accessed from the same VERIFY webpage (<https://webportals.ipsl.fr/VERIFY/FactSheets/>).

This deliverable presents the factsheets for the countries of the EU27 to illustrate the potential content of the summary factsheets themselves and will be used in upcoming discussion meetings with specific policy user communities. A detailed analysis and comparison of the bottom-up and top-down flux estimates will be made in a later deliverable, in the form of a scientific article (D6.2: **Scientific review article on carbon budgets for year 2021**). These factsheets are key summaries of GHG budget synthesis, that were regularly published within the VERIFY project: i) for CO<sub>2</sub>: Petrescu et al., (2021) and McGrath et al. (2023) and ii) for CH<sub>4</sub> and N<sub>2</sub>O: Petrescu et al. (2021, 2022).

Separate factsheets summarising the GHG budget synthesis for individual or groups of countries are made for:

- CO<sub>2</sub> from fossil sources,
- CO<sub>2</sub> from land-use and land-use change,
- CH<sub>4</sub> from all sources.

Given that the initial factsheets were developed within the VERIFY project, we kept the VERIFY web portal (<http://webportals.ipsl.jussieu.fr/VERIFY/>) to host and display all the datasets which are then processed into synthetic figures with a few of them assemble into summary factsheets (<http://webportals.ipsl.jussieu.fr/VERIFY/FactSheets/>).

The updates of the factsheets were made at the end of each calendar year in order to include flux estimates from the previous year (y-1), following the same cycle as done for the global carbon budget of the Global Carbon Project (GCP):

1. Collection and preparation of all data needed to run bottom-up and top-down model up to “year - 1” during the first 6 months;
2. Run of both bottom-up and top-down models during the June - September period;
3. Final completion of the synthesis GHG budget and associated factsheets.

The factsheets were initially designed for all individual countries of Europe (and groups of countries within Europe) in order to valorise regional model simulations over Europe (high-resolution process-based models and high-resolution atmospheric inversions). They can, however, be extended to cover most of the world's countries using global data sets (this has been partly done).

This deliverable recalls briefly below the products and methodology that are used to produce the different factsheets, including the updates that were made compared to the initial factsheets produced in the VERIFY project. It then provides examples of factsheets and a short description on how to access them from a website.

## 2. Flux products and methodological updates

The main objective of the activity reported in this deliverable was to prolong the VERIFY synthesis by primarily extending datasets used in the previous version to include the year 2021 where possible. This version of the factsheets is thus referred to as V2022, continuing the VERIFY nomenclature of naming a version V(final\_year+1). Table 1 below displays the list of products that have been used to produce all GHG synthesis plots. Only some of these plots are used in the summary factsheets and thus not all these data are formerly part viewed in the factsheets.

The primary datasets updated were the official UNFCCC inventories for CO<sub>2</sub> and CH<sub>4</sub>, extending them to year 2020 (as such inventories are produced only to year-2).

For CO<sub>2</sub> emissions from fossil sources, updated estimates from numerous datasets have been used in making identical synthesis plots as those produced in VERIFY: EIA, EDGAR, CDIAC, CEDS, PRIMAP-HIst, BP, IEA, and the GCP. These were all updated by persons external to the project, though collecting the datasets and producing plots were done under the auspices of CoCO<sub>2</sub>.

For CO<sub>2</sub> emissions from terrestrial ecosystems, several global ensembles (GCP inversions and the TRENDY dynamic global vegetation models) were downloaded, processed, and updated. Two dynamic global vegetation models (ORCHIDEE and LPX-Bern) used high-resolution forcing data across Europe provided by the project (CRUERA) to update their estimates of CO<sub>2</sub> sources and sinks from terrestrial ecosystems. The FLUXCOM upscaled fluxes from eddy-covariance sites have been updated. FLUXCOM and ORCHIDEE were additionally used as prior estimates to special regional inversions with the CarboScopeRegional system to constrain estimates by observed atmospheric CO<sub>2</sub> concentrations. Emissions from lateral fluxes (crop trade, wood trade, rivers) have been updated in order to permit a more apples-to-apples comparison with bottom-up inventories and models. FAOSTAT emissions from organic soils, forests, and loss of forest have been updated. Updated cropland and grassland emissions are now available from the EPIC-IIASA model, also at high resolution.

For CH<sub>4</sub>, several datasets have been updated: FLEXPART, using the Community Inversion Framework (CIF); CTE inversions over Europe, as well as the global inversions submitted to the GCP. Inversions from CAMS are available and currently undergoing processing to be used. Similarly, updated bottom-up estimates of emissions from peatlands, mineral soils, and inundated areas have all been received and made available. FAOSTAT fluxes have also been updated.

Table 1: List of the products used for the production of the observation-based GHG flux synthesis plots. Factsheets only use a subset of these plots.

CO <sub>2</sub> natural			
Type	Product Type / file name	Contact / lab	Period / variables
TD	GCP-2022-Inversions	PEYLIN	2000-2021; NBP
TD	EUROCOM drought inversions	THOMPSON and KARSTENS	2009-2018; NBP
TD	CarboScope-Reg inversions 2022	GERBIG	2006-2021; NBP
TD	LUMIA	MONTEIL	2006-2020; NBP
TD	CIF-CHIMERE	FORTEMS	2005-2021; NBP
BU	TRENDY-V11; global	SITCH	1901 - 2021; S3 scenario; NBP
BU	CABLE-POP, EU high resolution	KNAUER	1901-2020; NBP
BU	LPX-Bern; EU high resolution	SUN	1901-2021; NBP
BU	ORCHIDEE 3.0; EU high resolution	McGrath	1981-2021; NBP
BU	FLUXCOM 2022 (V2)	WALTHER	2003-2021; NEE
BU	ECOSSE agricultural (maize, wheat)	KUHNERT	0.25 degrees, 1981-2020, only for croplands; NBP
BU	EFISCEN-SPACE NEP from forests (5 years periods)	SCHELHAAS	Countries: Belgium, France, Germany, Hungary, part of Ireland, Italy, Luxembourg, Netherlands, Poland, Romania, Slovakia, Spain, Sweden, Switzerland, Czech Republic; NBP, NEP, harvest, stock
BU	CBM NEP from forests	VIZZARRI	NBP, NPP, up to 2020 but JRC requests to be careful about distinguishing between historical (2000-2015) and simulated (2016-2020) results.

BU	H&N bookkeeping	Gathered by PONGRATZ	Net flux from land use change 1980 - 2020
BU	EPIC model for croplands	IIASA - BALKOVIC	1981-2021 NBP, RH, harvest, NPP,
BU	EPIC model for grasslands	IIASA - BALKOVIC	1981-2021 NBP, RH, harvest, NPP,
BU	BLUE model for land use change (using Hilda+)	PONGRATZ	1960 - 2019; CO2 flux from land-uses and land cover changes, does not include natural emissions)
BU	BLUE model for land use change	PONGRATZ	1960 - 2020; Net flux (results from GCB2021)
BU	UNFCCC sector 1-5 emissions	MATTHEWS (downloaded from website)	1990-2020, Sectors 1-5 (no breakdown into 1A and 1B)EU countries and others from around the world
BU	UNFCCC land emissions broken down by type (e.g., Forest remaining Forest) 2021	MATTHEWS (downloaded from website)	1990-2020 All land cover remain and convert, HWP Eu countries and others from around the world
BU	UNFCCC uncertainties	MATTHEWS	Uncertainties for sectors 1-5 for EU27, 1990-2020 Uncertainties for LULUCF and total subsectors (remain+convert) for EU27 member states, 1990-2020
BU	FAOSTAT	<a href="http://www.fao.org/faostat/en/#data/GF">http://www.fao.org/faostat/en/#data/GF</a>	1992-2020 emissions from forests, cropland/grassland soils, and loss of carbon from converting forests to other ecosystems 2020
BU	Coastal ocean fluxes	BECKER	Sept 1997-Dec 2019; Net CO2 air-sea flux
BU	Lateral fluxes	CIAIS and Chevallier	8km resolution, from rivers, harvest, annual Upt to 2021
<b>CO2 anthropogenic</b>			
	<b>CO2 anthropogenic / Type</b>	<b>Contact / lab</b>	<b>Period / variables</b>
TD	Fossil fuel inversions	BROQUET / LSCE	2005-2019 ; fossil fuel emissions



BU	Fossil fuel emissions	TNO	2005-2017 & predicted 2018-2019
BU	Biofuel combustion emissions	TNO	2005-2017 & predicted 2018-2019
BU	BP, Fossil fuel emissions	ANDREW	1990 - 2021; fossil fuel emissions
BU	EIA, Fossil fuel emissions	ANDREW	1990 - 2021; fossil fuel emissions
BU	IEA, Fossil fuel emissions	ANDREW	1990 - 2021; fossil fuel emissions
BU	BPPRIMAP 2.4-CR Fossil fuel emissions	ANDREW	1990 - 2021; fossil fuel emissions
BU	CEDS, Fossil fuel emissions	ANDREW	1990 - 2021; fossil fuel emissions
BU	EDGAR 7.0_GHG, Fossil fuel emissions	ANDREW	1990 - 2021; fossil fuel emissions
BU	GCP, Fossil fuel emissions	ANDREW	1990 - 2021; fossil fuel emissions
BU	CDIAC, Fossil fuel emissions	ANDREW	1990 - 2021; fossil fuel emissions
BU	NGHGI, Fossil fuel emissions	ANDREW	1990 - 2021; fossil fuel emissions
<b>CH4</b>			
	<b>Product Type</b>	<b>Contact / lab</b>	<b>Period / variables</b>
TD	GCP-2020-Inversions	Marielle Saunois - LSCE	22 inversions, both SURF and GOSAT: Net flux and per sector
TD	FLEXPART inversion 2020	EMPA BRUNNER	2005-2019 monthly net CH4 fluxes at 0.5° x 0.5° resol.
TD	FLEXPART-CIF	Espen	Covers Europe. 0.25 degrees. 2005-2020. net flux
TD	TM5 inversion 2020	JRC BERGAMASCHI	2005 - 2018; net flux
TD	FLEXINVERT	NILU CHRISTINE GROOT ZWAAFTINK	2005 - 2018; net flux
TD	NAME	METO ALISTAIR MANNING	2006 - 2012 ; net flux

TD	CTE inversions for Europe	FMI TSURUTA	2005-2019; net flux
TD	CTE inversions for GCP	FMI TSURUTA	2000-2021; net flux
TD	CTE inversions	FMI TSURUTA	Spatially explicit country totals. 2005-2012 for GOSAT 2005-2018 for the two VERIFY runs
TD	CAMS	Arjo SEGERS	CAMS, a global inversion, 2 versions v19r and v21r each with two sets of posteriors: NOAA stations and NOAA + GOSAT; Total flux.
BU	Emissions from peatlands	FMI - MARKKANEN	Daily resolution, 0.1 degree over Europe, 2005-2021
BU	Emissions from mineral soils	FMI - MARKKANEN	Daily resolution, 0.1 degree over Europe, 2005-2021
BU	Emissions from inundated areas	FMI - MARKKANEN	Daily resolution, 0.1 degree over Europe, 2005-2021
BU	Emissions from lakes	ULB	Climatology
BU	Emissions from rivers	ULB	Climatology
BU	Emissions from geological sources	Etiopé, G., et al.: Global geological CH <sub>4</sub> emission grid files.	<a href="https://doi.org/10.25925/4J3F-HE27">https://doi.org/10.25925/4J3F-HE27</a> , 2018.
BU	EDGARv8	JRC	1990 - 2020; 0.1x0.1 degree, global. Monthly files, one timestep per file, for 2005-2018.
BU	CAPRI agricultural fluxes	JRC	CountryTot 1990-2018
BU	CAPRI agricultural fluxes	JRC (From A Leip)	Gridded total emissions of agricultural CH <sub>4</sub> as estimated by CAPRI - CAPDIS. 2000-2018, but only every two years.
BU	GAINS	IIASA From Roxana	CountryTot 1990-2015
BU	FAOSTAT	FAO downloaded from the website	CountryTot, 1990-2020 FCH4_AGR_FAO, FCH4_AGR_UNFCCC, FCH4_ENE, FCH4_WASTE, FCH4_IPPU, FCH4_LULUCF_FAO, FCH4_LULUCF_UNFCCC, FCH4_TOT_WITH_LULUCF,

			FCH4_TOT_WITHOUT_LULUCF
BU	UNFCCC	From Roxana	CountryTot, 1990-2020

We now briefly summarise the main CoCO<sub>2</sub> updates and improvements that were made to the last series of factsheets produced within VERIFY. These include:


1. The inclusion of flux estimates for the year 2021: this is the main update with the inclusion of the reference year for the first global stocktake (i.e., the year 2021).
2. The Fact Sheets were automated for almost 250 countries and regions around the world, due to considerable work this past year.
3. Improvement of the layout of the factsheets: changes in the layout with the inclusion of the CoCO<sub>2</sub> logo, and some shortening of the key messages associated with several figures (primarily for CO<sub>2</sub> land).

### 3. Examples of factsheets for the EU27

There are three main factsheets for CO<sub>2</sub> land, CO<sub>2</sub> fossil, and CH<sub>4</sub>. Note that initially, with VERIFY a fourth factsheet was done for N<sub>2</sub>O. The creation process has been automated to permit the production of all of these factsheets for every single country and group of countries considered but this deliverable only presents the factsheets for the EU27 countries. The factsheets for each of the three components have similar layouts, while the factsheets for each region with a specific component have identical layouts and only differ in the content of the text and the data shown in the figures:

- The top-left shows a figure based on Member State submissions to the UNFCCC, where decadal trends are broken down by subsectors to identify drivers of change. This is to both provide a link to national inventory estimates and also to establish context for the dataset comparisons which follow.
- The top right shows a map with the region/country of interest shaded in grey to immediately orient the reader.
- The bottom part of the figure shows a comparison of sectoral emissions by bottom-up methods (left) and a comparison of the bottom-up and top-down methods (right). All uncertainties are shown where available.


### 3.1. Fossil fuel CO<sub>2</sub> fact sheet



**VERIFY**  
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## Fossil Carbon Dioxide Fact Sheet for EU27

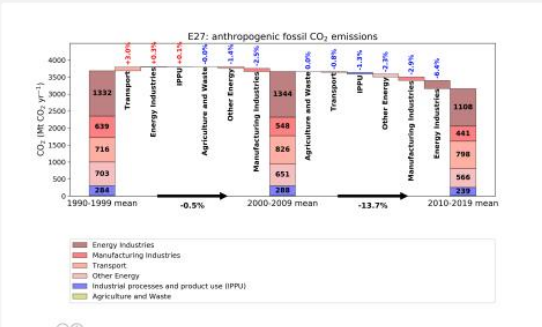
Jan 2023



**EU-27 (E27)**

*Austria; Belgium; Bulgaria; Croatia; Cyprus; Czech Republic; Denmark; Estonia; Finland; France; Germany; Greece; Hungary; Ireland; Italy; Latvia; Lithuania; Luxembourg; Malta; Netherlands; Poland; Portugal; Romania; Slovakia; Slovenia; Spain; Sweden*

**Map highlighting the target region.**

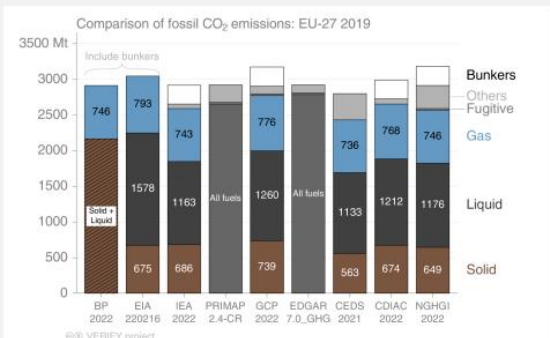


**E27: anthropogenic fossil CO<sub>2</sub> emissions**

Period	Energy Industries	Manufacturing Industries	Transport	Other Energy	Industrial processes and product use (IPPU)	Agriculture and Waste	Total	% Change
1990-1999 mean	716	703	284	1332	639	0	3674	-
2000-2009 mean	826	651	288	1344	548	0	3637	-0.5%
2010-2019 mean	566	566	239	1308	441	0	3120	-13.7%

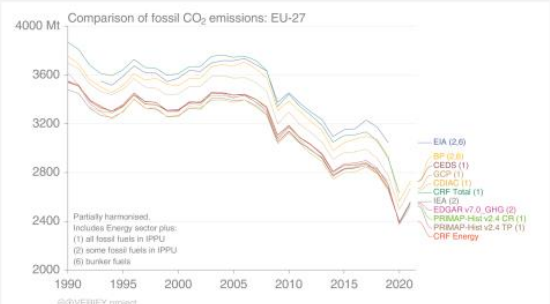
**Map highlighting the target region.**

The contribution of changes in fossil CO<sub>2</sub> emissions in the six UNFCCC sectors to the overall change in decennial mean, as reported in UNFCCC national GHG inventories. The three stacked columns represent the average fossil CO<sub>2</sub> emissions from each sector during three periods (1990–1999, 2000–2009 and 2010–2019) and percentages represent the contribution of each sector to the total reduction percentages between periods.



**Comparison of fossil CO<sub>2</sub> emissions: EU-27 2019**

Provider	Solid	Liquid	Gas	Others	Fugitive	Bunkers	Total
BP 2022	675	1163	743	746	0	0	2227
EIA 2020/16	675	1163	743	746	0	0	2227
IEA 2022	675	1163	743	746	0	0	2227
PRIMAP 2.4-CR	675	1163	743	746	0	0	2227
GCP 2022	675	1163	743	746	0	0	2227
EDGAR 7.0_GHG	675	1163	743	746	0	0	2227
CEDS 2021	675	1163	743	746	0	0	2227
CDIAC 2022	675	1163	743	746	0	0	2227
NGHGI 2022	675	1163	743	746	0	0	2227




**Comparison of fossil CO<sub>2</sub> emissions: EU-27**

Partially harmonized. Includes Energy sector plus: (1) all fossil fuels in IPPU (2) some fossil fuels in IPPU (3) bunker fuels

Legend: EIA (2.6), BP (2), CEDS (1), GCP (1), CDIAC (1), CRF Total (1), IEA (2), EDGAR v7.0\_GHG (2), PRIMAP-His v2.4 CR (1), PRIMAP-His v2.4 TP (1), CRF Energy

A comparison of fossil CO<sub>2</sub> emissions across different data providers with the UNFCCC national GHG inventories (NGHGI) for the latest year (2019) where all datasets are available. Emissions from international transport ('bunkers') are usually excluded from national totals but shown here based on bunker fuel sales for comparison. Breaking down by emission categories facilitates exploration of the reasons for differences, but not all datasets provide this breakdown (dark grey, 'all fuels').




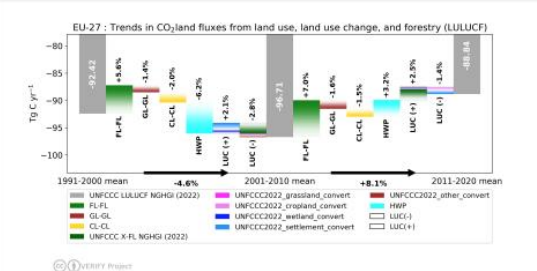
The VERIFY/CoCO<sub>2</sub> projects have received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776810/958927.

### 3.2. Land CO<sub>2</sub> fact sheet

# Land Carbon Dioxide Fact Sheet for EU27


Jan 2023





**EU-27 : Trends in CO<sub>2</sub> land fluxes from land use, land use change, and forestry (LULUCF)**

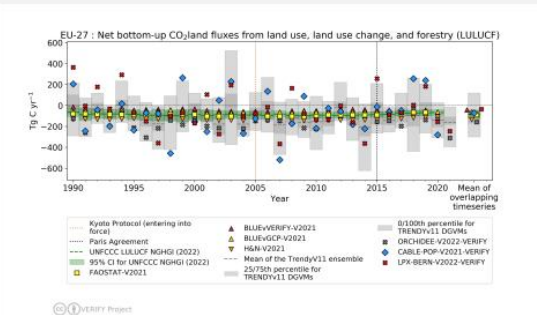
1991-2000 mean: -4.6%  
2001-2010 mean: -8.1%  
2011-2020 mean: -8.1%



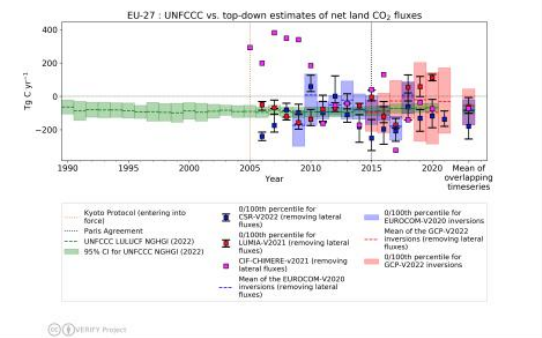
**EU-27 (E27)**

Austria; Belgium; Bulgaria; Croatia; Cyprus; Czech Republic; Denmark; Estonia; Finland; France; Germany; Greece; Hungary; Ireland; Italy; Latvia; Lithuania; Luxembourg; Malta; Netherlands; Poland; Portugal; Romania; Slovakia; Slovenia; Spain; Sweden

The contribution of changes in land-based CO<sub>2</sub> emissions in the thirteen UNFCCC subsectors to the overall change in decennial mean, as reported in UNFCCC national GHG inventories. For clarity, less commonly-used sectors are grouped into increasing (+) and decreasing (-) contributions.




**EU-27 : Net bottom-up CO<sub>2</sub> land fluxes from land use, land use change, and forestry (LULUCF)**




**EU-27 : UNFCCC vs. top-down estimates of net land CO<sub>2</sub> fluxes**

A comparison of different estimates of the CO<sub>2</sub> land fluxes from different bottom-up sources. These methods calculate emissions by estimating emissions from a certain activity or land type (e.g., grasslands, deforestation) and scaling up by the amount of that activity. The relative error on the UNFCCC value is computed with the error propagation method (95% confidence interval) independently for every year.



The VERIFY/CoCO<sub>2</sub> projects have received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776810/958927.

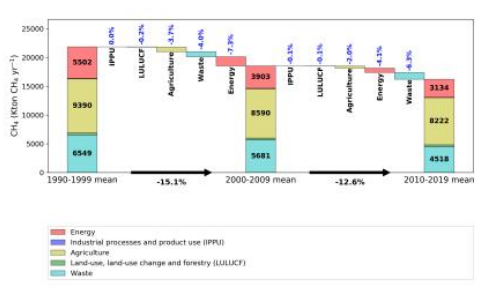
### 3.3. Methane fact sheet



## Methane Fact Sheet for EU27

Jan 2023


  



**CH<sub>4</sub> (Kton CH<sub>4</sub> yr<sup>-1</sup>)**

Period	Energy	IPPU	LULUCF	Agriculture	Waste	Total
1990-1999 mean	6549	9390	5302	1502	1217	25000
2000-2009 mean	5681	8590	1902	1102	1127	18302
2010-2019 mean	4518	8222	3134	1102	1127	13334

Reduction percentages: -15.1% (2000-2009 vs 1990-1999), -12.6% (2010-2019 vs 1990-1999)

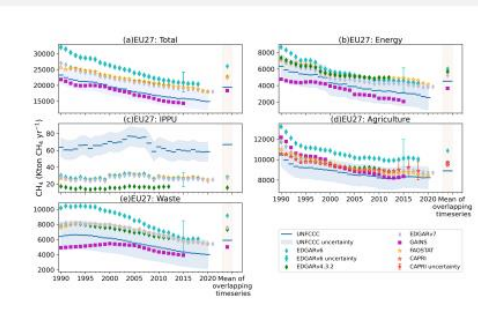


**EU-27 (E27)**

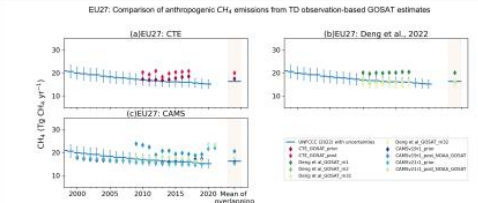
Austria; Belgium; Bulgaria; Croatia; Cyprus; Czech Republic; Denmark; Estonia; Finland; France; Germany; Greece; Hungary; Ireland; Italy; Latvia; Lithuania; Luxembourg; Malta; Netherlands; Poland; Portugal; Romania; Slovakia; Slovenia; Spain; Sweden

**Map highlighting the target region.**

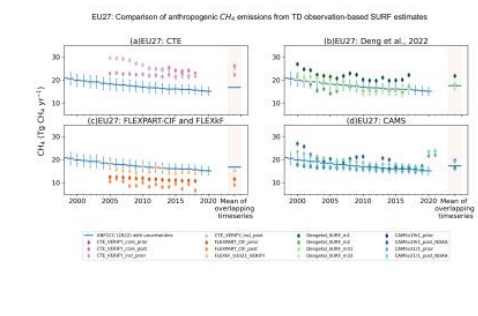
The contribution of changes (%) in anthropogenic CH<sub>4</sub> emissions in the five UNFCCC sectors to the overall change in the decennial mean, as reported in the UNFCCC national GHG inventories. The three stacked columns represent the average CH<sub>4</sub> emissions from each sector during three periods (1990–1999, 2000–2009 and 2010–2019) and percentages represent the contribution of each sector to the total reduction percentages (black arrows) between periods.



EU27: Comparison of anthropogenic CH<sub>4</sub> emissions from TD observation-based GOSAT estimates




EU27: Comparison of anthropogenic CH<sub>4</sub> emissions from TD observation-based SURF estimates



Total sectoral anthropogenic CH<sub>4</sub> emissions (excluding LULUCF) from UNFCCC national GHG inventories compared to bottom-up inventories EDGAR (v4.3.2, v6 and v7), a scenario approach (GAINS) and global statistics FAOSTAT, with specific models for agriculture only (CAPRI). The relative error on the UNFCCC value is computed with the error propagation method (95% confidence interval) independently for every year. The means represent the common overlapping period 1990–2015 (to 2014 for agriculture). CAPRI uncertainties are only available for 2014, 2016 and 2018. EDGARv6 uncertainties are only available for 2015.

Total CH<sub>4</sub> emissions from top-down global and regional observation-based SURF (top) and GOSAT (bottom) inversions from multiple datasets, compared with UNFCCC national GHG inventories (blue line). The time series mean was computed for the common period: 2005–2017 (top) and 2010–2017 (bottom). The relative error on the UNFCCC value is computed with the error propagation method (95% confidence interval) independently for every year.



The VERIFY/CoCO<sub>2</sub> projects have received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776810/958927.

## 4. Access to all countries and groups of countries factsheets

Factsheets were made for most of the world's countries and groups of countries following the initial design in the VERIFY project. These factsheets can be accessed from the "Products" page of the VERIFY website: <https://verify.lsce.ipsl.fr/index.php/products>


From this main page, one has to select the item "Country GHG Synthesis Plots & Summary Factsheets", which opens a dedicated webpage: <https://webportals.ipsl.fr/VERIFY/FactSheets/> where people can select an ensemble of countries or groups of countries to retrieve the factsheets as illustrated in figure below.


The screenshot shows the VERIFY - CoCO2 FactSheets v1.28 web interface. At the top, there are logos for VERIFY and CoCO2, and the text "VERIFY - CoCO2 FactSheets v1.28". A "How to use this site" link is visible in the top right. The main content area is divided into several sections:

- Predefined set of Countries or Groups of countries:** A dropdown menu labeled "Select a preset".
- Countries:** A dropdown menu labeled "Select a country".
- Groups of countries (not mapped):** A dropdown menu labeled "Select a group of countries".
- Map:** A world map showing selected regions: Ukraine (pink), United States of America (orange), and EU-27 (purple).
- Species Types and Plots:** A table with four rows:
 

Synthesis CO2land	None selected ▾
Synthesis CO2fossil	None selected ▾
Synthesis CH4	All selected (6) ▾
Synthesis N2O	None selected ▾
- Buttons:**
  - Display plots
  - Display all comments about plots
  - Display national inventory factsheets
  - Display observation-based summary factsheets

Once the regions are selected (three regions in the above figure), you have to select "Display observation-based summary factsheets" at the bottom right in order to display the selected factsheets. A new window is opened, as illustrated in the figure below with the factsheets that are available for the selected regions. Note that for some countries/regions and GHG, the factsheets are not yet available; it will be mentioned "No files found". From the proposed list of available factsheets, you can simply visualise it by clicking on the pdf-file link (a new window with the factsheet is opened).





**CoCO<sub>2</sub>**  
Prototype system for a  
Copernicus CO<sub>2</sub> service

Selected observation-based summary factsheets  
by country or region

**Ukraine (UKR)**

[ObsBased\\_Summary\\_UKR\\_FCO2fossil\\_FACTSHEET\\_V2022.pdf](#)  
[ObsBased\\_Summary\\_UKR\\_FCO2land\\_FACTSHEET\\_V2022.pdf](#)  
[ObsBased\\_Summary\\_UKR\\_FCH4\\_FACTSHEET\\_V2021.pdf](#)  
[ObsBased\\_Summary\\_UKR\\_FN2O\\_FACTSHEET\\_V2021.pdf](#)

**United States of America (USA)**

[ObsBased\\_Summary\\_USA\\_FCO2fossil\\_FACTSHEET\\_V2021.pdf](#)  
[ObsBased\\_Summary\\_USA\\_FCO2land\\_FACTSHEET\\_V2022.pdf](#)  
[ObsBased\\_Summary\\_USA\\_FCH4\\_FACTSHEET\\_V2021.pdf](#)  
[ObsBased\\_Summary\\_USA\\_FN2O\\_FACTSHEET\\_V2021.pdf](#)

**(E27)**

[ObsBased\\_Summary\\_E27\\_FCO2fossil\\_FACTSHEET\\_V2022.pdf](#)  
[ObsBased\\_Summary\\_E27\\_FCO2land\\_FACTSHEET\\_V2022.pdf](#)  
[ObsBased\\_Summary\\_E27\\_FCH4\\_FACTSHEET\\_V2022.pdf](#)  
[ObsBased\\_Summary\\_E27\\_FN2O\\_FACTSHEET\\_V2021.pdf](#)

## 5. Conclusion

This deliverable is primarily to present the factsheets for the GHG flux synthesis conducted within CoCO<sub>2</sub> together with the contribution of VERIFY. It is based on the most recent flux estimates from both bottom-up and top-down approaches, including flux estimates over the last decades and up to the end of year 2021 as available. There are three main factsheets for CO<sub>2</sub> land, CO<sub>2</sub> fossil, and CH<sub>4</sub>. All factsheets are available from a dedicated website (based on the VERIFY project website) and only one example for the EU27 has been provided in this deliverable report. The factsheets for each component, and each region, have a similar design.

However, this deliverable describe only a first version of these country-specific factsheets as they are currently being updated following several directions (updated versions will be accessible from the website as described above):

- Some factsheets are still not available (especially for CH<sub>4</sub>), given delays in treating the UNFCCC flux estimates (i.e., the last update);
- A few products are also being currently gathered and processed; they will be further used in the synthesis plots. Note that these late acquisitions (especially for CH<sub>4</sub>) are due to difficulties in the different groups to gather all input data and run their process-based or inversion model.
- On-going effort is also focused around improving the aesthetic design of the factsheets, trying to find more simple synthetic figures to illustrate the GHG budget of each country/region in a more policy-oriented way.



Overall, these factsheets provide convenient materials to serve as a focal-point for discussions between members of the CoCO<sub>2</sub> project and national and regional experts when searching for future development directions.

## 6. References

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## Document History

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## Internal Review History

Internal Reviewers	Date	Comments
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