

TRAINING MATERIALS

The Revised ECE Environmental Indicators



Greenhouse Gas Emissions



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programme

Greenhouse gases

Climate change is one of the greatest environmental, social and economic threats according to the Intergovernmental Panel on Climate Change (IPCC).

In order to prevent the most severe impacts of climate change, countries that have signed up to the United Nations Framework Convention on Climate Change (UNFCCC) agreed to cooperate with a view to limiting the increase in global average temperature and the resulting climate change.



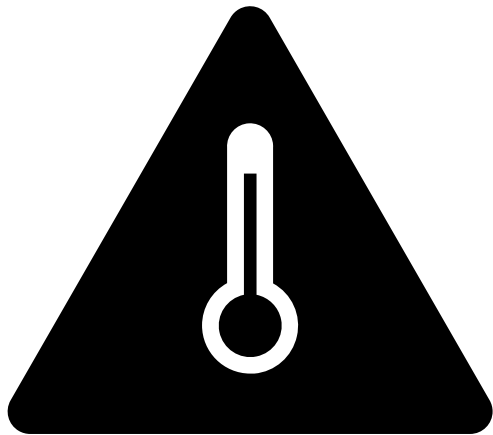
Greenhouse gases



In this context industrialised countries need to prepare and submit regularly updated annual inventories of greenhouse gas (GHG) emissions.

Up until 2020, the main international instrument to limit GHG emissions was the Kyoto Protocol, which was adopted in 1997 and set binding emission reduction targets for its signatories.

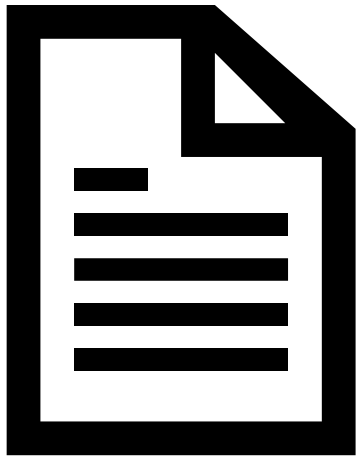
Greenhouse gases



It was followed by the Paris Agreement that aims at 'keeping a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius'.

According to the IPCC Special Report: Global Warming of 1,5° C, no or limited overshoot of 1.5 degrees Celsius requires reaching net zero emissions around 2050.

Greenhouse gases



At regular intervals, the Intergovernmental Panel on Climate Change (IPCC) prepares comprehensive Assessment Reports of scientific, technical and socio-economic information relevant to the understanding of human-induced climate change, potential impacts of climate change and options for mitigation and adaptation.

Five Assessment Reports have been completed in 1990, 1995, 2001, 2007 and 2014.

Greenhouse gases

The IPCC is now in its sixth assessment cycle producing the Sixth Assessment Report (AR6) with contributions by its three Working Groups and a Synthesis Report, three Special Reports, and a refinement to its latest Methodology Report

The Synthesis Report was released on 20 March 2023.

The image shows the cover of the AR6 Synthesis Report, 'Climate Change 2023'. It features a dark, atmospheric landscape with a road curving through a misty or foggy environment. Light trails from a vehicle are visible on the road. The text 'AR6 Synthesis Report' and 'Climate Change 2023' is overlaid in the bottom left corner.

AR6 Synthesis Report
Climate Change 2023

Greenhouse gases

Some of the conclusions of the IPCC Assessment Reports:

Warming of the climate system is unequivocal.

There is high agreement and much evidence that with current climate change mitigation policies and related sustainable development practices, global GHG emissions will continue to grow over the next few decades.

Continued GHG emissions at or above current rates would cause further warming and induce many changes in the global climate system during the 21st century that would very likely be larger than those observed during the 20th century.

Anthropogenic warming could lead to some impacts that are abrupt or irreversible, depending upon the rate and magnitude of the climate change.

Greenhouse gases



The UNFCCC sets an ultimate objective of stabilising GHG concentrations 'at a level that would prevent dangerous anthropogenic (human induced) interference with the climate system.'

Greenhouse gases

The 2006 IPCC Guidelines for National Greenhouse Gas Inventories are the latest step in the IPCC development of inventory guidelines for national estimates of GHGs.

These 2006 Guidelines build on the previous Revised 1996 IPCC Guidelines and the subsequent Good Practice reports.



Greenhouse gases

They include new sources and gases as well as updates to the previously published methods whenever scientific and technical knowledge have improved since the previous guidelines were issued.

Since 2015, UNFCCC Parties are using the 2006 IPCC Guidelines' methodologies and reporting formats when preparing their inventories, in line with the UNFCCC reporting guidelines (Decision 24/CP.19).



Greenhouse gases

National Inventories



They cover emissions and removals of the following GHGs:

Carbon dioxide (CO₂), including indirect CO₂;

Methane (CH₄)

Nitrous oxide (N₂O)

Hydrofluorocarbons (HFCs)

Perfluorocarbons (PFCs);

Sulfur hexafluoride (SF₆);

Nitrogen trifluoride (NF₃)

Greenhouse gases

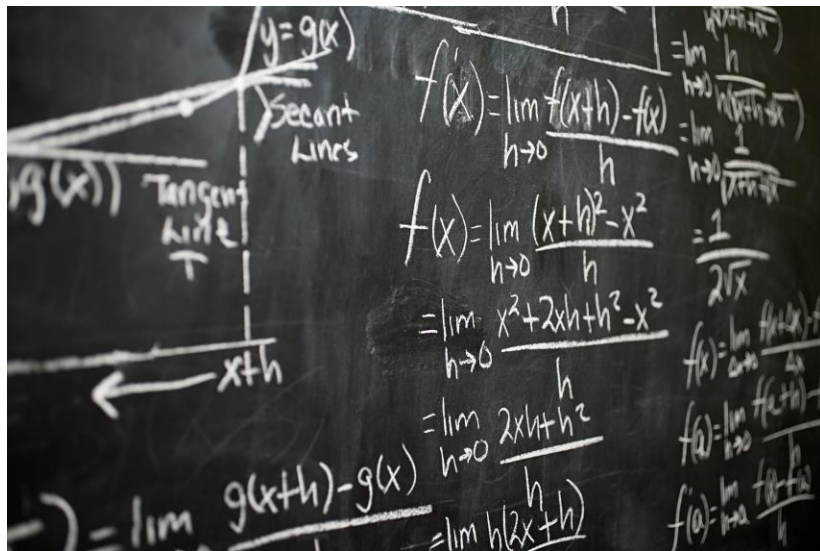
Gases from six sectors are reported (Energy, Industrial processes and product use, Agriculture, LULUCF, Waste and Other).

The gases do not include the GHG emissions that are also ozone-depleting substances, which are controlled by the Montreal Protocol.



Greenhouse gases

In order to be aggregated, non-CO₂ gases are weighted by their respective global warming potential (GWP) and presented in CO₂-equivalent units. Global warming potential (GWP) is a measure of how much a given mass of a GHG is estimated to contribute to global warming on a 100-year horizon.



In accordance with the UNFCCC rules, the GWP values used for this conversion are the ones from IPCC AR4:

Gas	Global warming potential values from IPCC AR2 [before 2015]	Global warming potential values from IPCC AR4 [after 2015]
Carbon dioxide (CO ₂)	1	1
Methane (CH ₄)	21	25
Nitrous oxide (N ₂ O)	310	298
Sulphur hexafluoride (SF ₆)	23 900	22 800
Nitrogen trifluoride (NF ₃)	–	17 200

Greenhouse gases

Data sets

The 2006 IPCC Guidelines provide approaches on how Parties should estimate uncertainties, suggesting different values for the uncertainty of activity data and emission factors for most of the emission source categories.

Based on this guidance, countries should perform their own assessment of the uncertainty of reported data and provide an uncertainty analysis in the National Inventory Report to account for uncertainty per source category, as well as the total uncertainty of their national inventory



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The Environmental indicators at the following slides cover Greenhouse gas emissions

statswiki.unece.org/display/JTFE/Revised+Guidelines+for+the+Application+of+Environmental+Indicators

UNECE Statswiki Spaces

Joint Task Force on Environmental Statistics and Indicators

Pages

Blog

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Component	Sub-component	Topic	ID	Indicator (English)
Residuals	Emissions to air	Emissions of greenhouse gases (GHGs)	B-3.1	Aggregated GHG emissions per capita
			B-3.2	Aggregated GHG emissions per square kilometre
			B-3.3	Aggregated GHG emissions per unit of GDP
			B-3.4	Aggregated GHG emissions by sectors (Energy, Industrial Processes, Solvent and Other Product use, Agriculture, Land use and forestry, Waste)
			B-3.5	Aggregated GHG emissions (CO ₂ equivalents)
			B-3.6	Aggregated GHG emissions including emissions/removals from LULUCF (CO ₂ equivalents)
			B-3.7	CO ₂ emission per unit of value added (SDG indicator 9.4.1)
			B-3.8	Total greenhouse gas emissions from the national economy
			B-3.9	Total greenhouse gas emissions from the national territory
			B-3.10	Greenhouse gas emissions from land use change (LULUCF)
			B-3.11	CO ₂ emissions from fuel combustion within the national territory
			B-3.12	Total greenhouse gas emissions from production activities

Code	Indicator	Priority
B-3.1	Total GHG emissions per capita	Yes
B-3.2	Total GHG emissions per square kilometre	Yes
B-3.3	Total GHG emissions per unit of GDP	Yes
B-3.4	Total GHG emissions by sectors (energy, transport, industrial processes, solvent and other product use, agriculture, land use and forestry, waste)	Yes
B-3.5	Total GHG emissions (excluding land use, land-use change and forestry (LULUCF)) from the national territory*	Yes
B-3.16	Greenhouse gas emissions (without LULUCF) per capita*	
B-3.7	CO2 emission per unit of value added (SDG indicator 9.4.1)	Yes
B-3.8	Total greenhouse gas emissions from the national economy	
B-3.10	Greenhouse gas emissions from land use, land use change and forestry (LULUCF)	Yes

Code	Indicator	Priority
B-3.11	CO2 emissions from fuel combustion within the national territory*	Yes
B-3.12	Total greenhouse gas emissions from production activities	Yes
B-3.13	Greenhouse gas emission intensity of production activities	Yes
B-3.14	Direct greenhouse gas emissions from households	
B-3.15	Net emissions/removals of carbon dioxide by forest land	
A-1.14	Share of carbon monoxide emissions from stationary or mobile sources	
A-1.15	Share of hydrocarbons emissions from stationary or mobile sources	Yes
A-3.2	Hydrofluorocarbon phase-down	
B-3.17	Average CO2 emissions from newly registered motor vehicles	

Air emissions

System design

Definition of possible sources

Definition of the pollutants to be reported

Definition of the parameters that must be reported for each pollutant.

Definition of the methods for entering data into the system.

Definition of the processing methods

Air emissions

Data entry

Air emissions from industrial facilities (ePRTR)

Length of natural gas pipelines

Landing and Take-off cycles.

Data for Transport.

Livestock units: animal population, emissions

Landfills: Waste composition, waste quantities, recovered biogas.

Facilities Registry

Types of data



Operating license of the facility (protocol no., date of issue and expiry date, issuing Authority),

Land use of the area where the facility is located (if such exist)

Geographical location of the facility

Operational characteristics (duration of operation, capacity and thermal power installed)

Information regarding the installation's potential compliance with international agreements (e.g. IPPC)

Contact information for the facility's environmental compliance officer

Facilities Registry

Types of data



Capacity data of the facility (products produced or raw materials used)

Data on water consumption by use (production process, cooling, personnel, irrigation, etc.) and origin (water supply network, drilling, sea, etc.).

Energy and fuel consumption data by type (electricity, natural gas, fuel oil, diesel, etc.)

Annual energy and fuel consumption. Unit of measurement: KWh (electricity), or Mcal (fuel).

The total consumption data of the solvents used by the facility.

Facilities Registry

Wastewater data



Quantities by type of wastewater (wastewater from the production process, cooling water, municipal sewage, etc.)

Wastewater treatment method (physico-chemical, biological, etc.)

Method of disposal (into a receiving water body, surface waters disposal, underground waters disposal, etc.)

Initial and final water recipient.

Facilities Registry

Types of data

Type of fuel

Quantity per fuel used for combustion to produce heat, electricity, steam, etc

Combustion technology used

Anti-pollution technology used to reduce gaseous pollutants



Facilities Registry

Types of data



Type of fuel

Quantity per fuel used for non-energy uses, as process feedstocks

Type of process used for non-energy uses, as process feedstocks

Gas quantities by fuel and technology or process

Consumption of limestone used for flue gas desulfurisation

Facilities Registry

Types of data



Industrial production

Incineration of waste

Quantities of industrial waste produced (liquid basis)

Quantities of industrial waste produced (dry basis)

Biochemically and Chemically required oxygen

Rate of aerobic treatment

Weighted MCFs methane conversion factor according to the waste management method

Methane recovery

Livestock (by animal species)

Types of data



Population in plain communities

Population in semi-mountainous communities

Population in mountain communities

Domestic animals

Herd animals

Nomadic animals

Livestock (by animal species)

Types of data



Animals born

Animals that gave birth

Milked animals

Milk production

Number of animals for fattening

Estimated amount of animal waste

Animal waste management system

Livestock (data for sheep)

Types of data



Non-lactating females > 1 year old.

Males > 1 year old

Female lambs

Male lambs

Domestic / milked herds

Nomads that were milked

Production of Mali

Crops of agricultural products (by type of production)

Types of data



Production

Total cultivated areas

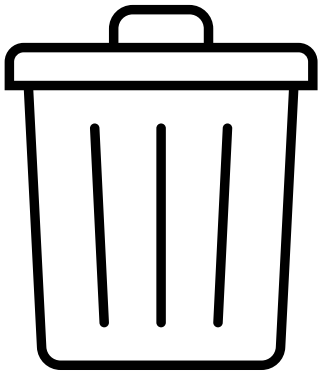
Use of synthetic fertilizers

Fertilizer type/ fertilizer composition

Emissions from fertilizers and residue burning.

Landfills

Types of data



Quantities of household waste

Quantities of waste incinerated

Composition of combustible waste (fuel, medical waste, plastics, etc.)

Quantities of household waste that are recycled

Quality composition of household waste deposited in the landfill

Landfills

Types of data



Amount of sewage sludge that ends up in the landfill for soiling

Solids content of sewage sludge that ends up for landfilling

Recoverable biogas

Methane (CH₄) (Main Pollutant)

Carbon dioxide (CO₂) from burning waste

Municipal sewage treatment plants

Types of data



Quantities of industrial waste produced (liquid basis)

Quantities of industrial waste produced (dry basis)

Quantity of sewage sludge that ends up for landfilling

Biochemically and Chemically required oxygen

Rate of aerobic treatment

Municipal sewage treatment plants

Types of data



Weighted MCFs methane conversion factor according to the waste management method

Methane recovery

Estimated protein consumption

Methane (CH₄) (Main Pollutant)

Nitric oxide (N₂O) from protein consumption

Wastewater treatment facilities

General data



Code

Name

Geographic coordinates

Peak population

Sampling station

Method of calculating peak population

Organic loading rate

Input and output loads

Category (Urban, Industrial)

Wastewater treatment facilities

Discharge point parameters



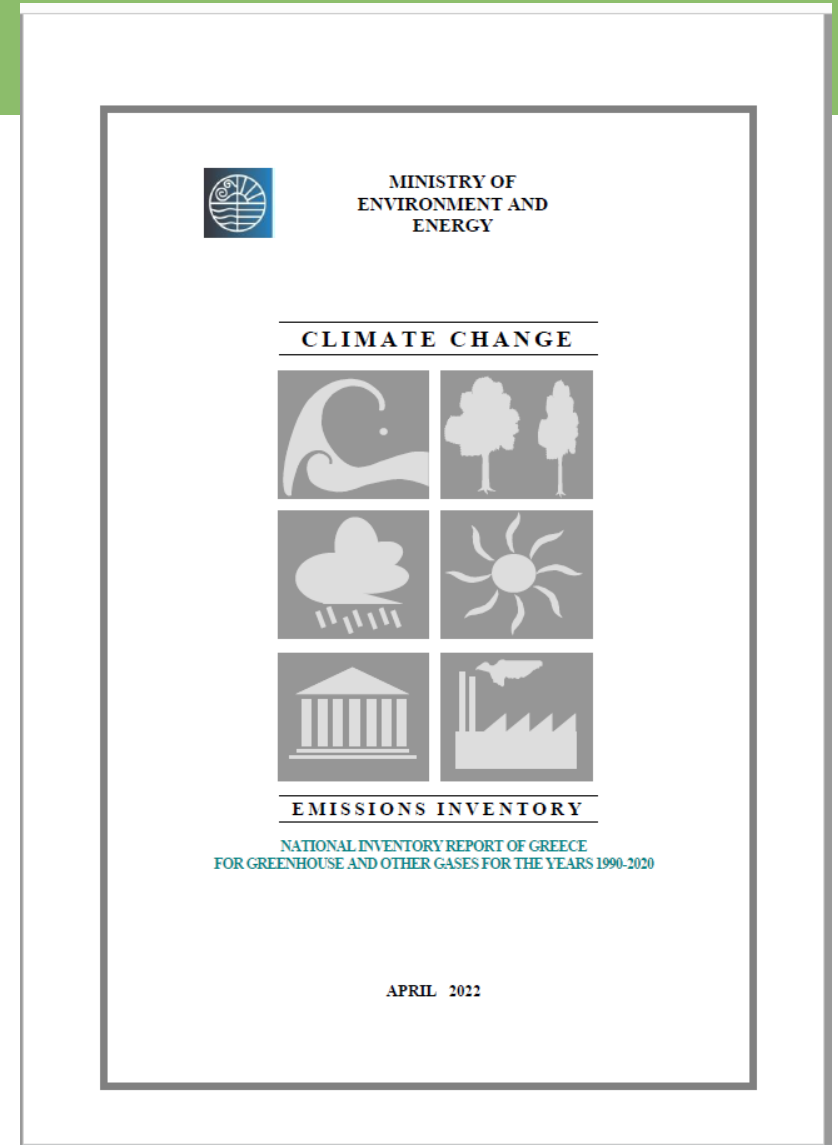
Basin Code

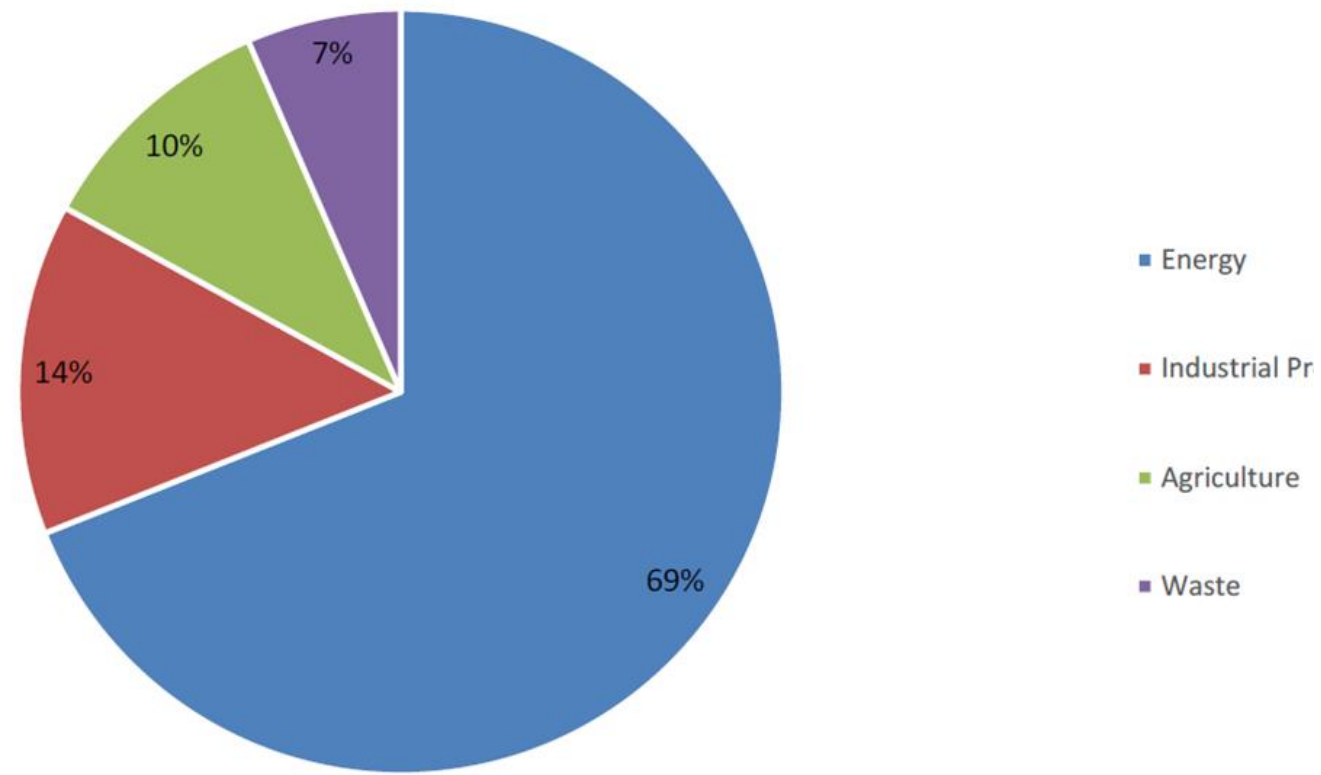
Water recipient code

Disposal point name

Geographic coordinates

GHG Emission Reports





! *Relative contribution of activity sectors to total GHG emissions (with LULUCF) in 2020*

Greece - National Inventory Report 2022

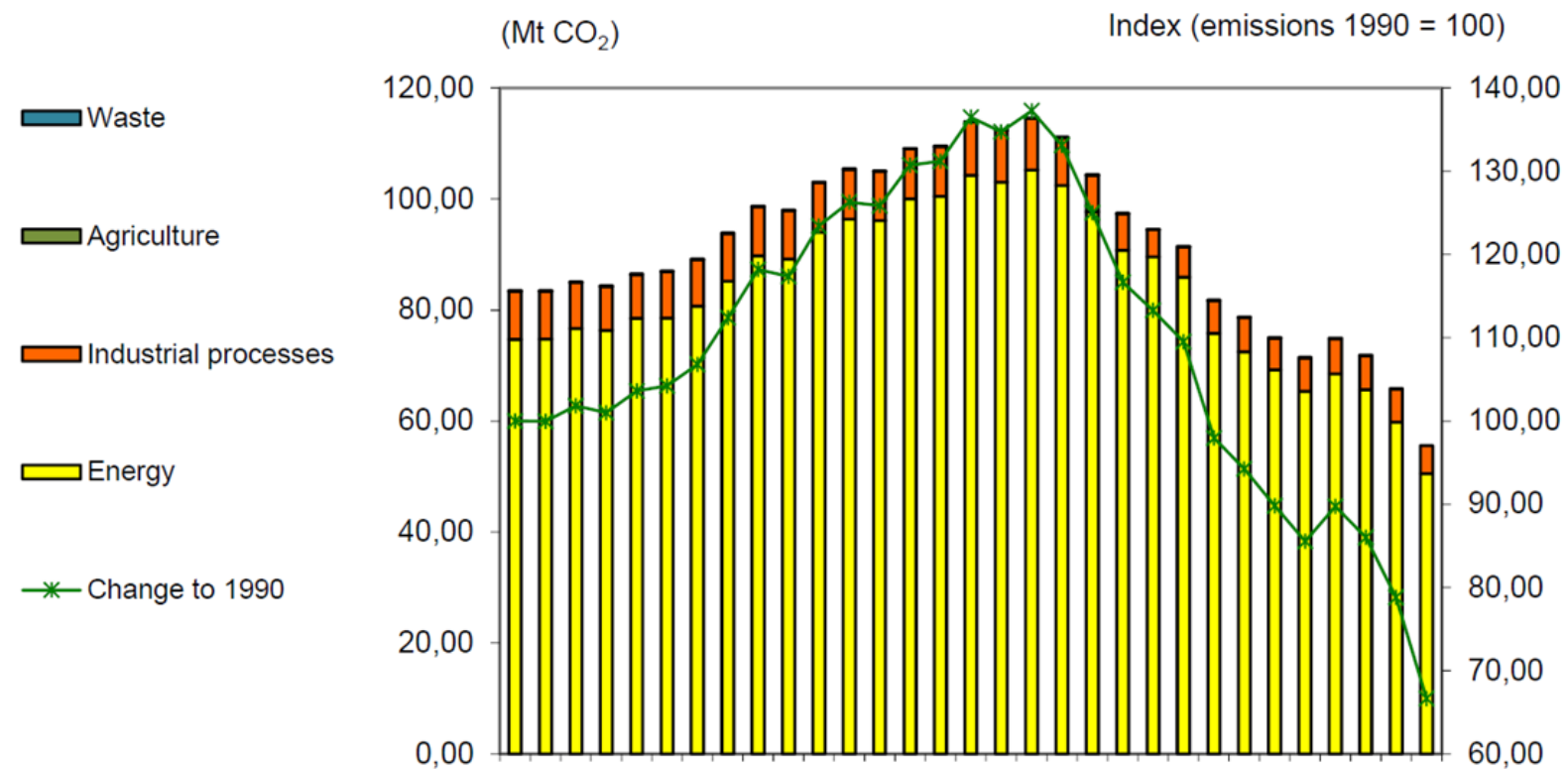


Figure 2.2 *CO₂ emissions by sector (in Mt) for the years 1990 – 2020 (without LULUCF)*

References

- [European Environment Agency Indicators](#)
- [Hellenic Ministry of Environment](#)
- [United Nations Climate Change](#)

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Thank you for your attention!