

**INVESTIGATION OF GREENHOUSE GAS EMISSIONS FROM SELECTED
SECTORS CONTRIBUTING TO GREENHOUSE GAS EMISSIONS
IN KONYA PROVINCE IN 2022**

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Methane (CH_4)

Nitrous oxide (N_2O)

Carbon
dioxide (CO_2)

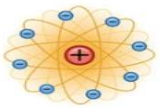
Water vapor (H_2O)

What Is Global Climate Change?

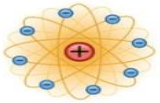
Human effects such as global climate change, increased use of fossil fuels, variations in land use, a decrease in forest areas, and an increase in industrial processes, as well as the rapid increase in greenhouse gases released into the atmosphere, cause an increase in the average temperature of the earth.



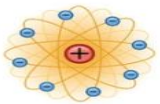
Most greenhouse gases occur naturally, but human activities increase the concentrations of some of them in the atmosphere, in particular the most important sources of greenhouse gases;



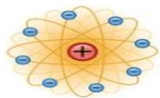
Carbon dioxide



Methane



Nitrous oxide



Fluorinated gases

- By 2020, its concentration in the atmosphere had risen to 48% above its pre-industrial level (before 1750). Methane is a more potent greenhouse gas than CO₂, but it has a shorter atmospheric life. Nitrous oxide, like CO₂, is a long-lived greenhouse gas that accumulates in the atmosphere over decades to centuries.



Conventions On Climate Change

United Nations Framework Convention on Climate Change (UNFCCC)

Signature Date:

1992

Entry into force:

1994

Objective:

To stabilise greenhouse gas concentrations in the atmosphere before they rise to dangerous levels and to combat climate change.

Turkey's Status:

Turkey became a party to the UNFCCC on 24 May 2004.

Paris Agreement

Signature Date:

2015

Entry into force:

2016

Objective:

To endeavour to keep the global temperature increase below 2°C relative to pre-industrial levels and to limit it to 1.5°C, to adapt to the impacts of climate change and to follow a low greenhouse gas emission development path.

Turkey's Status:

Turkey signed the Paris Agreement on 22 April 2016, ratified it on 7 October 2021 and officially became a party on 10 November 2021.

- **Montreal Protocol**
- **Signature Date:**
1987
- **Entry into force:**
1989
- **Objective:**

To progressively reduce and eliminate the production and use of ozone-depleting substances.

- **Turkey's Status:**
Turkey acceded to the Montreal Protocol on 19 December 1991.

- **Stockholm Convention**

- **Signature Date:**
2001
- **Entry into force :**
2004
- **Objective:**

- To control and phase out the production and use of persistent organic pollutants (POPs)

- **Turkey's Status:**
Turkey signed the Stockholm Convention on 23 May 2001 and ratified it on 14 October 2009.

- **Kigali Amendment**

- **Signature Date:**
2016
- **Entry into force:**
2019
- **Objective:**

To phase down the use of hydrofluorocarbons (HFCs) as part of the Montreal Protocol.

- **Turkey's Status:**
Turkey signed and ratified the Kigali Amendment in 2018.

Greenhouse Gas Calculation Methodology



- A GHG accounting methodology is a set of standardised methods and procedures used to calculate GHG emissions caused by a particular activity or process. These methodologies ensure that emissions are measured and reported accurately and consistently.

A graphic of a footprint where the sole is filled with chemical formulas for greenhouse gases: CO₂, CH₄, N₂O, and HFC. The footprint is superimposed on a light blue world map.

Methodology Steps

A graphic of a footprint where the sole is filled with chemical formulas for greenhouse gases: CO₂, CH₄, N₂O, and HFC. The footprint is superimposed on a light blue world map.


- **Greenhouse Gas Inventory Preparation:**

A graphic of a footprint where the sole is filled with chemical formulas for greenhouse gases: CO₂, CH₄, N₂O, and HFC. The footprint is superimposed on a light blue world map.

- **Scope Determination**

- **Boundaries:** Determination of physical, operational and organisational boundaries. These limits determine which emissions are to be included.
- **Timeframe:** Determine which periods will be considered for calculation (e.g. annual calculation)

- **Identification of Greenhouse Gas Sources**

- **Direct Emissions:** Emissions from sources owned or controlled by the company (e.g., vehicles, manufacturing facilities).
 - **Indirect Emissions:** Emissions that arise indirectly from the company's operations (e.g., electricity consumption, supply chain).
- 
- A graphic of a footprint where the sole is filled with chemical formulas for greenhouse gases: CO
- ₂
- , CH
- ₄
- , N
- ₂
- O, and HFC. The footprint is superimposed on a light blue world map.



- **Data Collection and Calculation**

- **Data Collection Activity Data:** Data on the emission source such as fuel consumption, electricity use, production quantities.
- **Emission Factors:** Coefficients indicating the amount of emissions emitted per unit of activity (e.g. CO₂ emissions per litre).
- **Calculation Methods** Emissions are usually calculated using the following basic formula; $\text{Emissions} = \text{Activity Data} \times \text{Emission Factor}$



- **Reporting**

- Calculated emissions should be reported in appropriate formats. These reports are usually prepared in accordance with greenhouse gas inventory standards.
- **Monitoring and Verification**
 - Continuous monitoring and independent verification is carried out to ensure the accuracy of the calculations.

Manual And Standards Used In Greenhouse Gas Calculation

- **GHG Protocol:** The most widely used GHG accounting standard, developed by the World Resources Institute (WRI) and the World Business Council (WBCSD).
- **ISO 14064:** An international standard for the measurement, reporting and verification of greenhouse gases.
- **IPCC Guidelines:** Guidelines for national greenhouse gas emissions accounting published by the Intergovernmental Panel on Climate Change (IPCC).

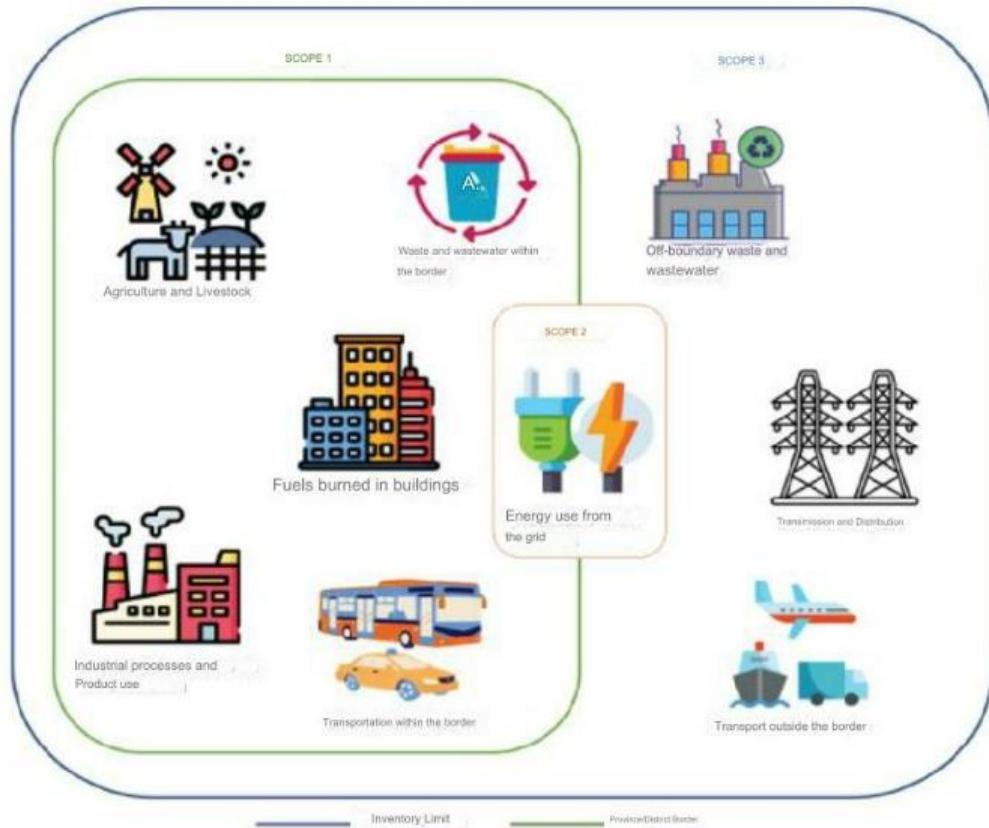




**Investigation Of Greenhouse Gas Emissions From Selected Sectors
Contributing To Greenhouse Gas Emissions In Konya Province In 2022**

- Greenhouse gas calculations have been made for residences/buildings, industry, agriculture, transportation, aviation, waste, wastewater and land use within the borders of Konya province.
- The boundaries of the inventory include Scope 1 and Scope 2 emissions within the administrative borders of Konya Province.

Scopes

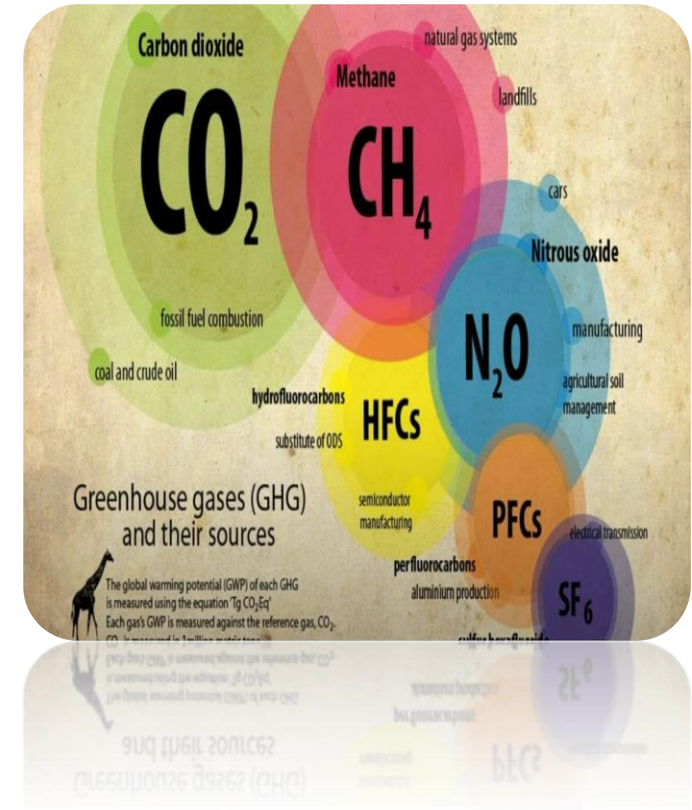


- Scope 1: Greenhouse gas emissions from sources within the provincial borders
- Scope 2: Greenhouse gas emissions occurring within the provincial borders as a result of electricity, heat, steam and/or cooling supplied from the grid. A high-level summary of the scopes and limits is presented in Figure 1 below.

Figure 1. Sources and limits of greenhouse gas emissions in cities

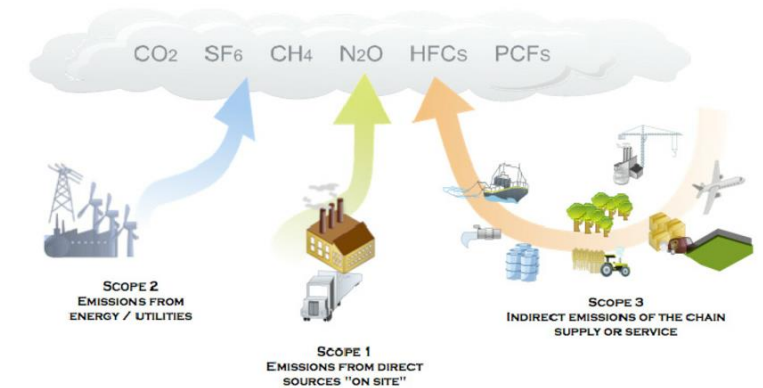


When calculating greenhouse gas emissions for city inventories, carbon dioxide (CO₂), methane (CH₄), nitrogen oxide (N₂O), perfluorinated carbons (PFC) in addition to hydrofluoride carbons (HF); Sulfur hexafluoride(SF₆); Nitrogen trifluoride (NF₃) etc. Greenhouse gases may also be involved. However, emissions largely carbon dioxide (CO₂); It originates from methane (CH₄) and nitrogen oxide (N₂O), and in this study, calculations were made for these three types of greenhouse gases.



Greenhouse Gas Source and Emission List

Greenhouse gas emissions Sources	Greenhouse Gas Emission Headlines	Scope
Buildings/Residences	Natural Gas, Coal	Scope 1
Buildings/Residences	Electric	Scope 2
Commercial / Public Buildings	Natural gas	Scope 1
Commercial / Public Buildings	Electric	Scope 2
Manufacturing Industry and Construction	Natural Gas, Fuel oil, LPG, Kerosene	Scope 1
Manufacturing Industry and Construction	Electric	Scope 2
Agriculture, Forestry and Livestock Activities	Fertilizer use in agriculture and livestock activities emissions from (calculated)	Scope 1
Transport	Highway	Scope 1
Waste and wastewater	-	Scope 1



The data presented in Turkey's national greenhouse gas inventory dated 2020 submitted to the United Nations Framework Convention on Climate Change in 2023 were used.

Ghg From Buildings

The amounts of direct emissions due to the use of fossil fuels for heating and cooking purposes in residences are presented in the inventory.



Natural gas	625,068,271.74 m ³	3,143,364 tCo2e
Electricity Consumption	1,425,591 MWH	
Electricity Loss Leakage	87,959MWH	
Coal	470,015.35 tons	

(EPDK, Doğalgaz Piyasası Yıllık Sektör Raporu, 2018-2022)

(Konya Çevre, 2018-2022)

(IPCC-<https://www.ipcc-nggip.iges.or.jp/>, tarih yok)

Ghg Emissions From Commercial And Public Buildings

- Direct emissions resulting from fossil fuel consumption in commercial buildings (natural gas consumption within Scope 1) are included in the inventory.

Natural gas	208,885,798.47 m ³	
Electricity Usage	1679101 MWH	
Electricity (loss due to use of commercial and public buildings at distribution level)MWh	103,601 MWH	
Electricity use in street lighting	168,602	1,302,968 tCo _{2e}
Electricity (loss arising from street lighting activities at the distribution level)	10,403	



Manufacturing Industry And Construction

- Direct emissions resulting from the use of fossil fuels (CH₄, N₂O and CO₂) in industrial facilities are included in the inventory.

Natural gas	237,361,018.15 m ³	
Electricity consumption (from distribution line electricity used)	2,404,832 MWH	
Electricity consumption (from transmission line electricity used)	1,130,834 MWH	
Electricity consumption (from the distribution network) caused losses)	148,378MWH	1,655,340 tCo _{2e}
Electricity consumption (from the transmission network) caused losses)	69,772MWH	
fuel oil	5,224.06 tons	
LPG	918.96 tons	
Oil	257,426 tons	



(EPDK, Doğalgaz Yıllık Sektör Raporu, 2018-2022)

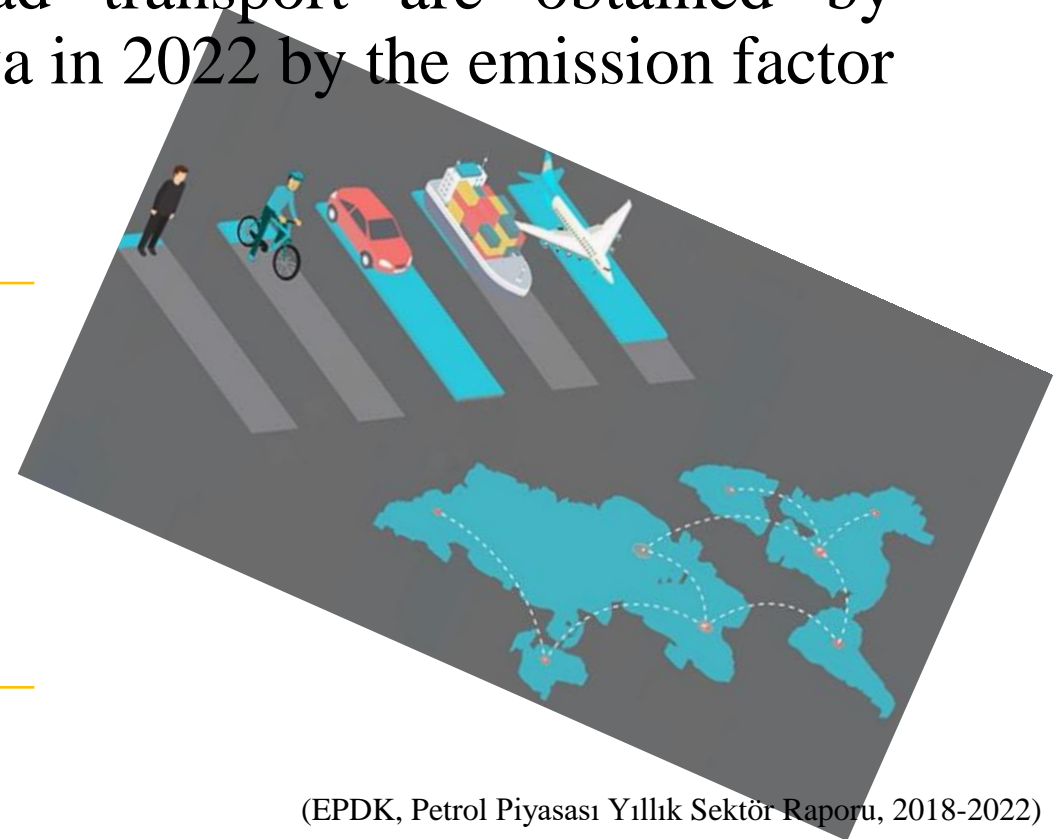
(IPCC-<https://www.ipcc-nggip.iges.or.jp/>, tarih yok)

Ghg From Transport

- It is assumed that all of the fuel sold within the borders of Konya Province is used in Konya. Emissions from road transport are obtained by multiplying the amount of fuel sold in Konya in 2022 by the emission factor depending on the fuel type.

Fuel Type	Amount
Gasoline	66,465.67 tons
Diesel	831,319.61
CNG	31,057
LPG	127,818.62

3,273,064 tCo_{2e}



(EPDK, Petrol Piyasası Yıllık Sektör Raporu, 2018-2022)

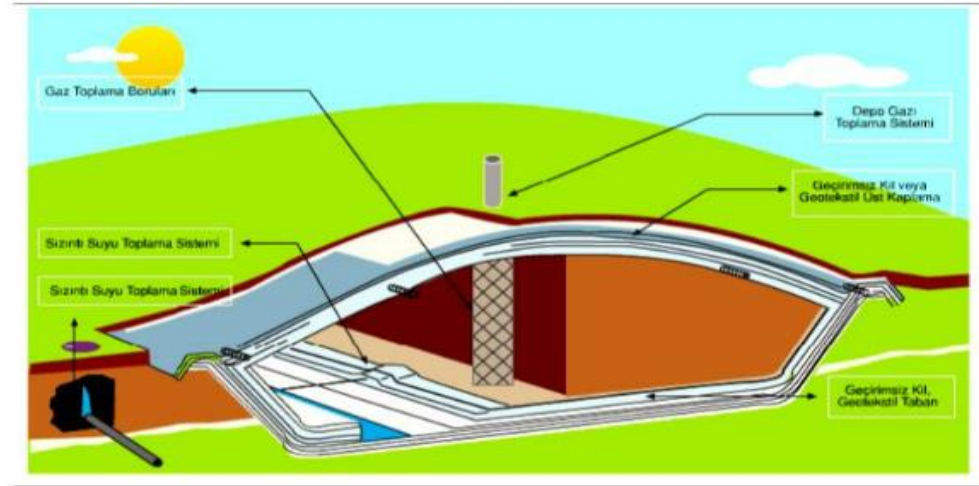
(IPCC-<https://www.ipcc-nggip.iges.or.jp/>, tarih yok)

Ghg From Waste And Wastewater

- The total tonnage of municipal solid waste sent to landfill in Konya is 598.714 tonnes for the calendar year 2022. Data on wastewater treatment was obtained from Konya Water and Sewerage Administration (KOSKI) annual report for 2022. According to Koski data, 96.831.488 m³ of wastewater was treated with advanced biological treatment.

Amount of GHG Emissions from Solid Waste + Wastewater (2022)

TOTAL AMOUNT OF CH ₄ (Ton/Year)	38,952.12
AMOUNT OF RECOVERED CH ₄ (Ton/Year)	17,000.00
Amount of CH ₄ Released (Ton/Year)	21,952.12
Result (tCO ₂ e/Year)	1,052,501 tCo2e



Ghg From Agriculture, Forestry And Land Use

- According to the data provided by Konya Provincial Directorate of Agriculture and Forestry, greenhouse gas emission was calculated with DEFRA coats based on the numbers of little and large livestock.

Number of Cattle	2022
Cattle (Culture)	717,866 units
Cattle (Hybrid)	193,144 units
Cattle (Native)	18,935 units
Mandate	800 pieces

Number of Ovine Animals	2022
Sheep (Native)	2,374,785 units
Sheep (Merino)	396,195 units
Goat (Hair)	273,595 units
Goat (Mohair)	1,894 units

2.319.484 tCo₂e SGE



Results And Discussion

- Total greenhouse gas emissions of Konya calculated for 2022 is approximately 13.000.000 tonnes CO₂ equivalent. Emissions from manufacturing industry and construction, road transport and transport and housing have a share of about 62% in the 2022 GHG emission inventory. The remaining 38% of the emissions come from solid waste, wastewater, agriculture and livestock, energy losses and leakages.

The background features abstract, layered shapes in orange, teal, and white. In the top left, there are white, irregular shapes resembling confetti or paper scraps. A teal shape with white, curved lines is in the bottom left corner. The main area is a light cream color with a faint, cursive watermark of the words 'Thank You' behind the main text.

THANK YOU