

ipcc

INTERGOVERNMENTAL PANEL ON climate change



# IPCC

INTERGOVERNMENTAL  
PANEL ON  
CLIMATE CHANGE



## Greenhouse Effect and Climate Change

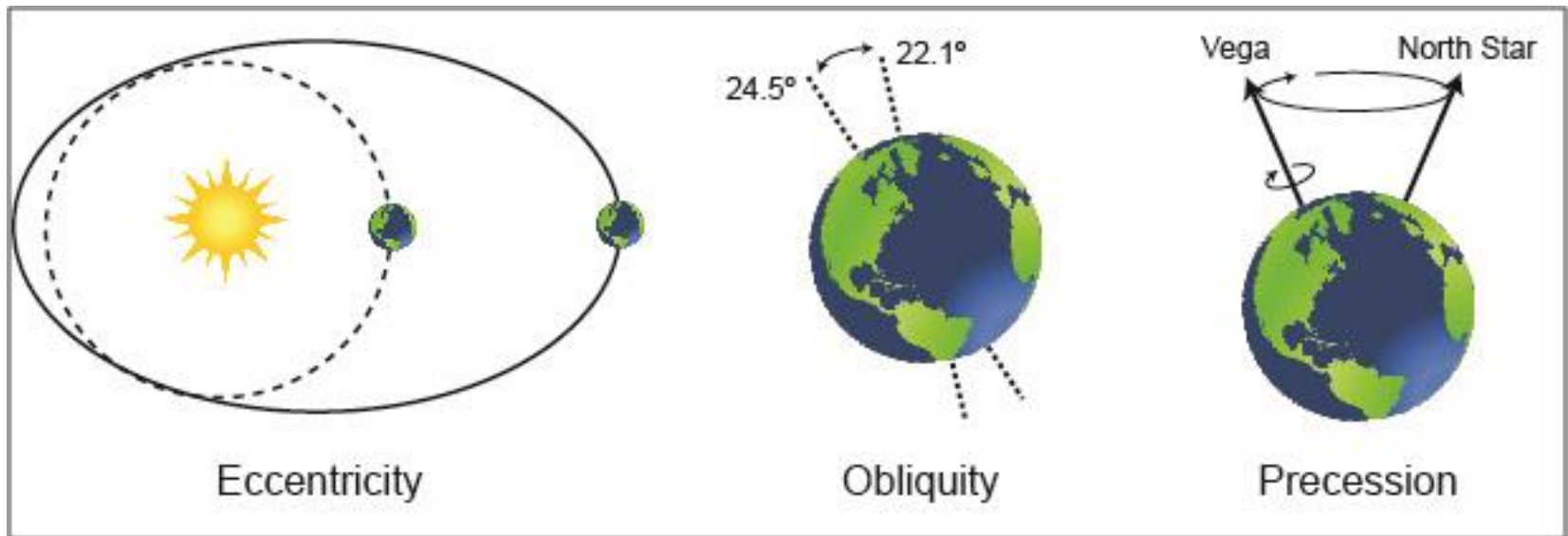
Copyright © Özgür ZEYDAN (PhD)

<http://www.ozgurzeydan.com/>

# Natural Climate Change

- Over the last 800,000 years, there have been natural cycles in the Earth's climate.
- There have been ice ages and warmer interglacial periods.
- After the last ice age 20,000 years ago, average global temperature rose by about 3°C to 8°C, over a period of about 10,000 years.

# Milankovitch Cycles



<https://timescavengers.blog/introductory-material/geologic-time/>

# Milankovitch Cycles

- Milutin Milankovich, a Serbian mathematician, astronomer, and engineer solved the mystery of what caused major ice ages over the last half-million years of Earth's history.
- Watch animation on University of Wisconsin Madison's website:
- <https://cimss.ssec.wisc.edu/wxfest/Milankovitch/earthorbit.html>

# Man Made Climate Change

- The rises in temperature over the last 200 years to rises in atmospheric CO<sub>2</sub> levels.
- Rises in temperature are now well above the natural cycle of the last 800,000 years.
- Human influence on the climate system is clear. This is evident from the increasing greenhouse gas concentrations in the atmosphere, positive radiative forcing, observed warming, and understanding of the climate system (IPCC, 2013).

# Intergovernmental Panel on Climate Change (IPCC)

- IPCC was established by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) in 1988 to provide the world with a clear scientific view on the current state of knowledge in climate change and its potential environmental and socio-economic impacts.
- It reviews and assesses the most recent scientific, technical and socio-economic information produced worldwide relevant to the understanding of climate change.
- It does not conduct any research nor does it monitor climate related data or parameters.

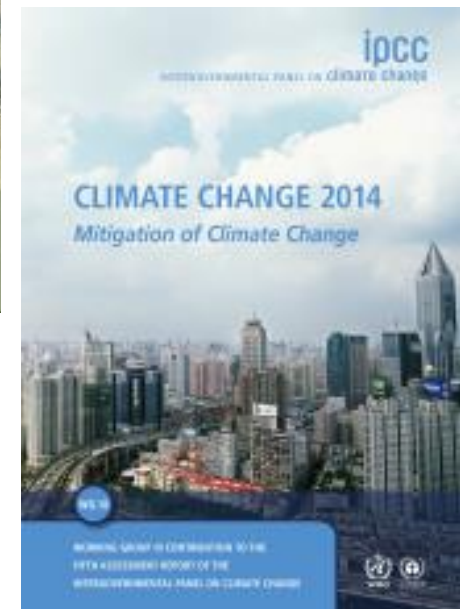
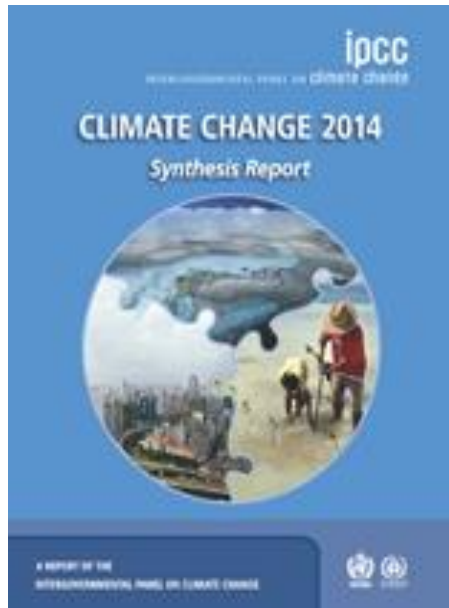
# Intergovernmental Panel on Climate Change (IPCC)

- The IPCC is an intergovernmental body. It is open to all member countries of the United Nations (UN) and WMO. Currently 195 countries are members of the IPCC. Governments participate in the review process and the plenary Sessions, where main decisions about the IPCC work programme are taken and reports are accepted, adopted and approved.
- The IPCC is honored with the **Nobel Peace Prize** (Oslo, 10 December 2007)





# Fifth Assessment Report (AR5)

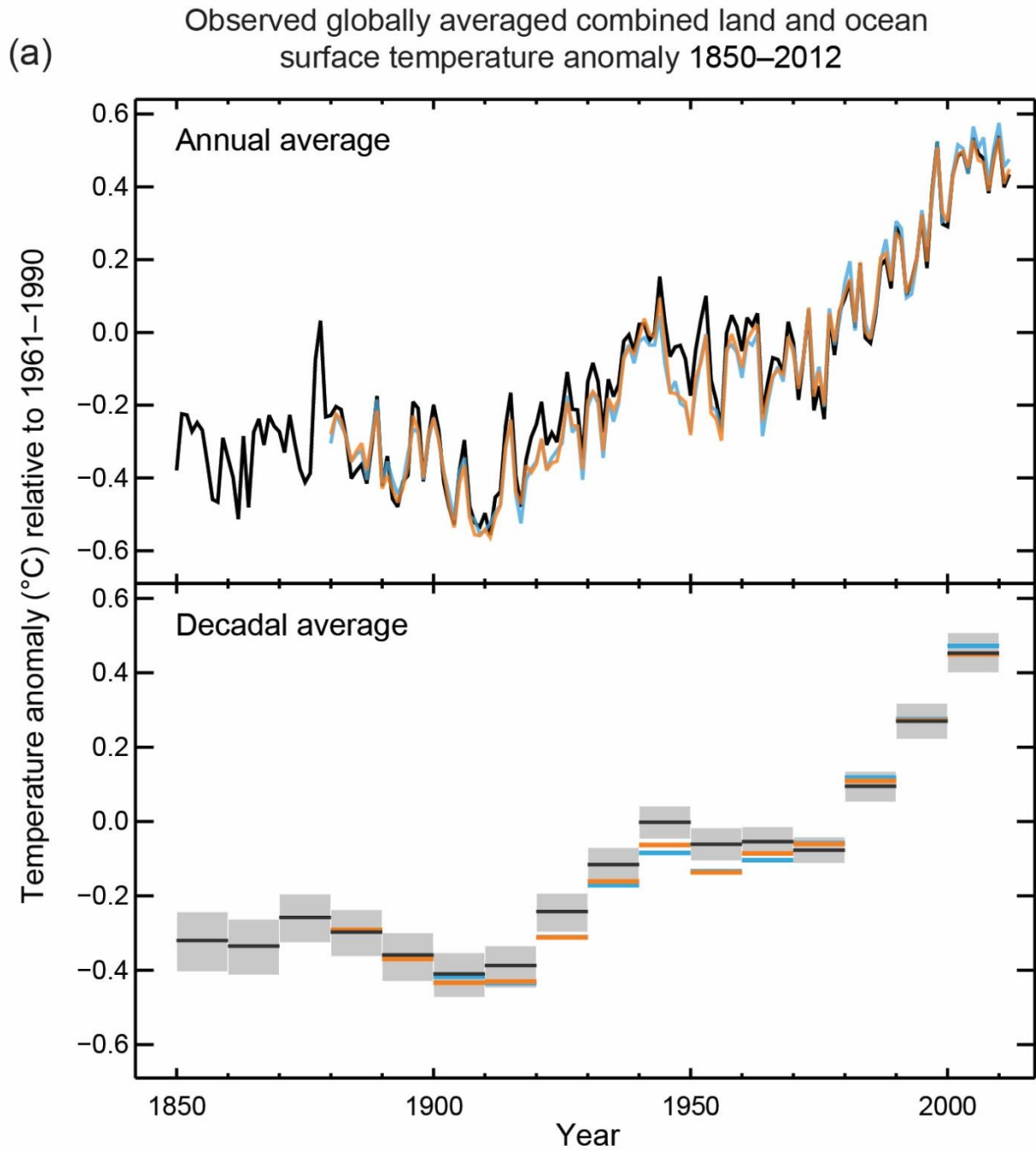


Note: Unless otherwise stated, all graphs and tables are taken from these reports in this presentation. (<http://www.ipcc.ch/>)

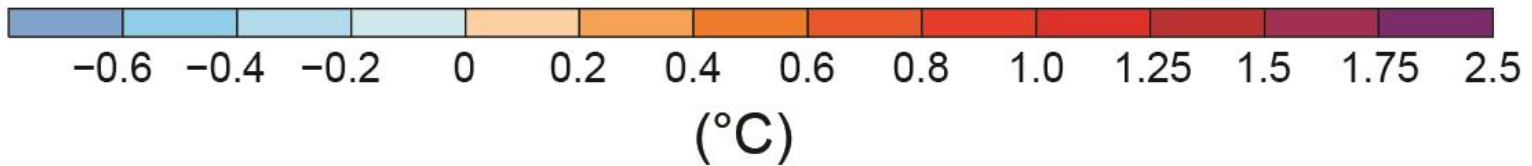
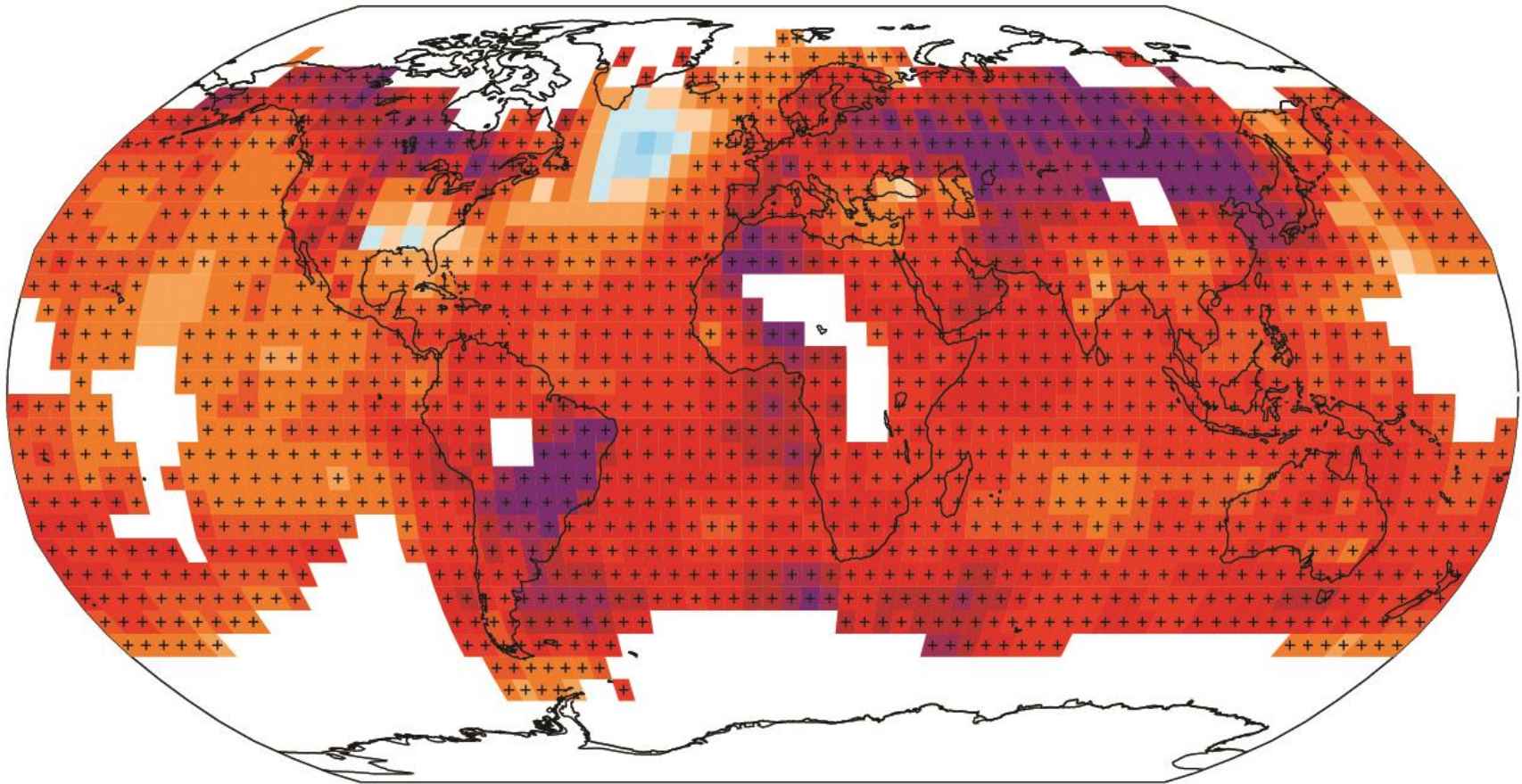


# Global Temperature Change

- Averaged over all land and ocean surfaces, temperatures warmed roughly **0.85 °C** from 1880 to 2012, according to the IPCC's Climate Change 2013: The Physical Science Basis Report.
- 1983–2012 was likely the warmest 30-year period of the last 1400 years.
- Reason of Climate Change: increasing amounts of greenhouse gases.

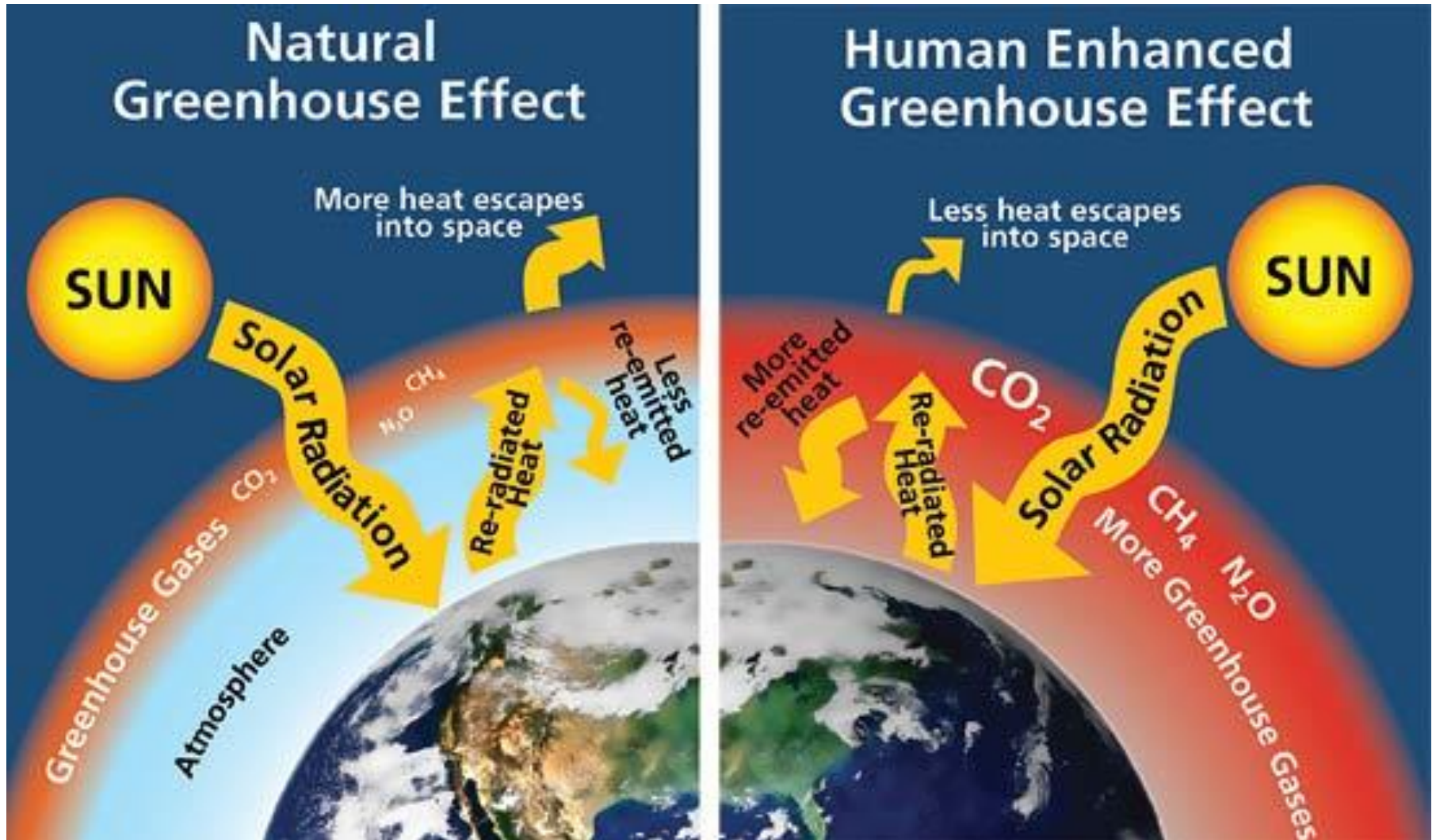


# Observed change in surface temperature 1901–2012

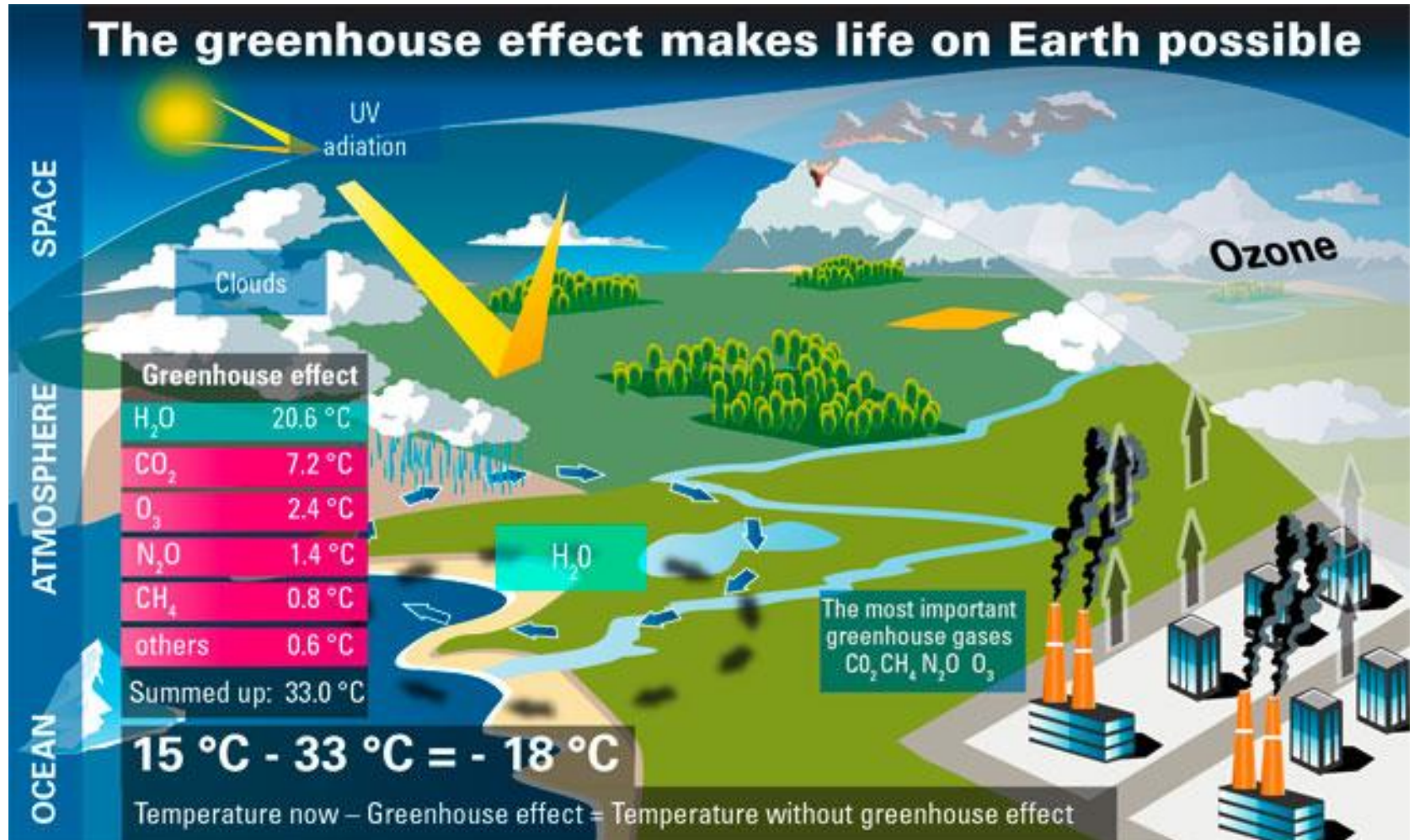




# Greenhouse Effect



# Human Life Depends on the Greenhouse Effect

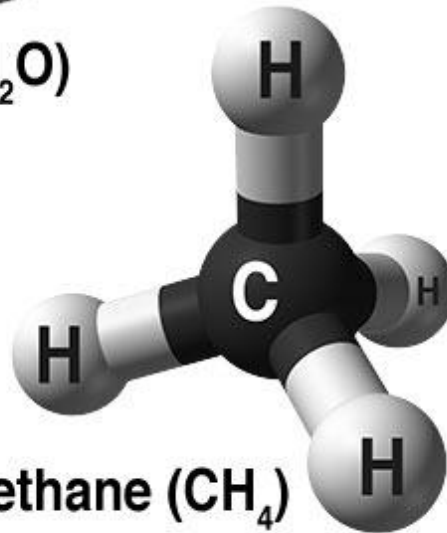
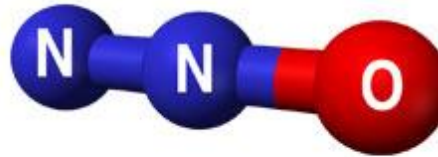


# Greenhouse Gases

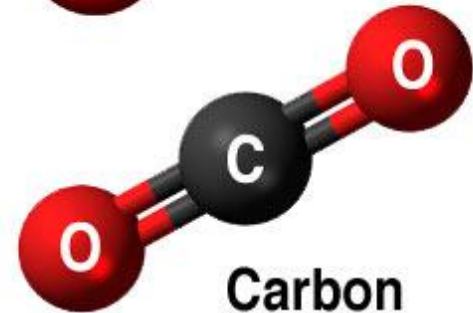


Water vapor ( $\text{H}_2\text{O}$ )

Nitrous oxide ( $\text{N}_2\text{O}$ )



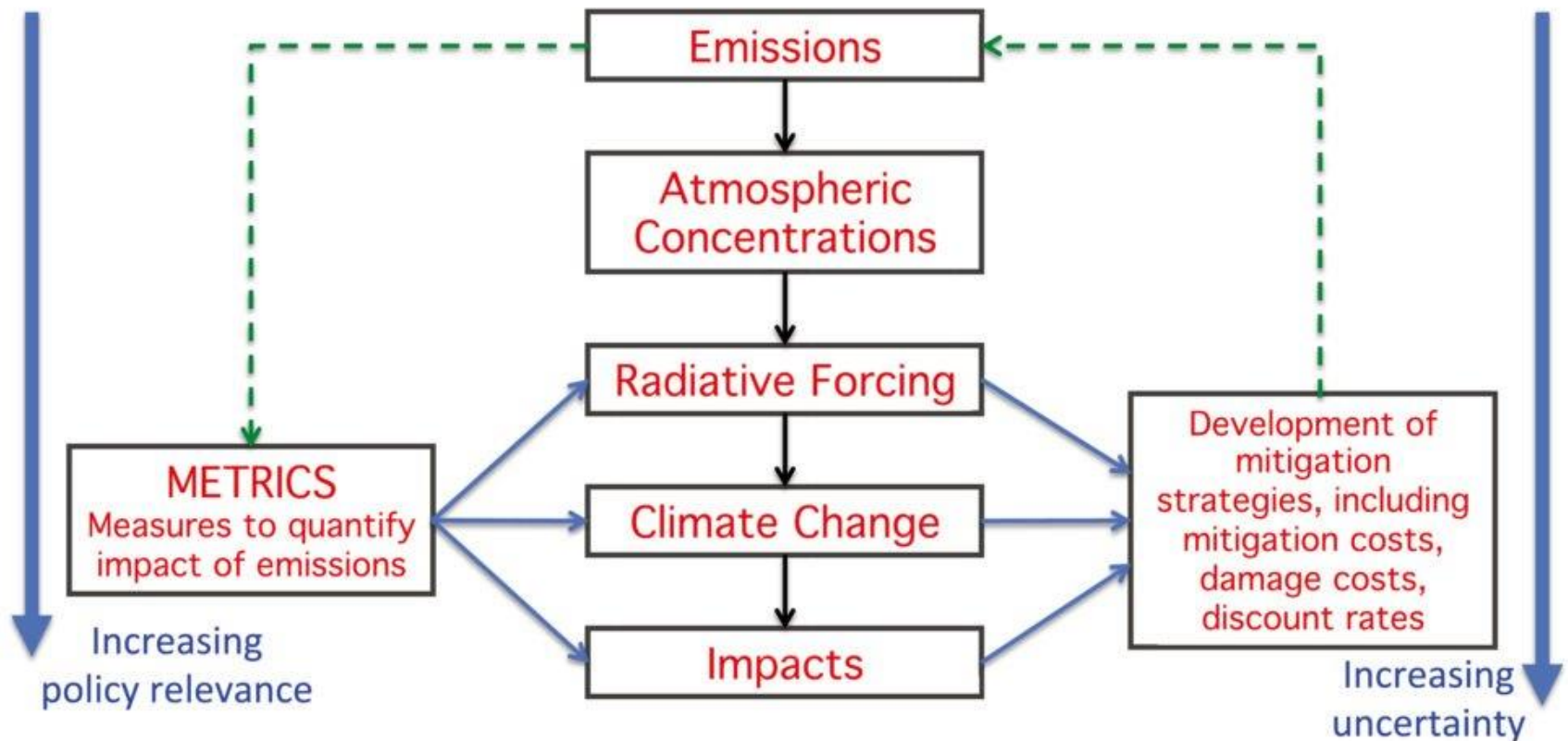
Methane ( $\text{CH}_4$ )



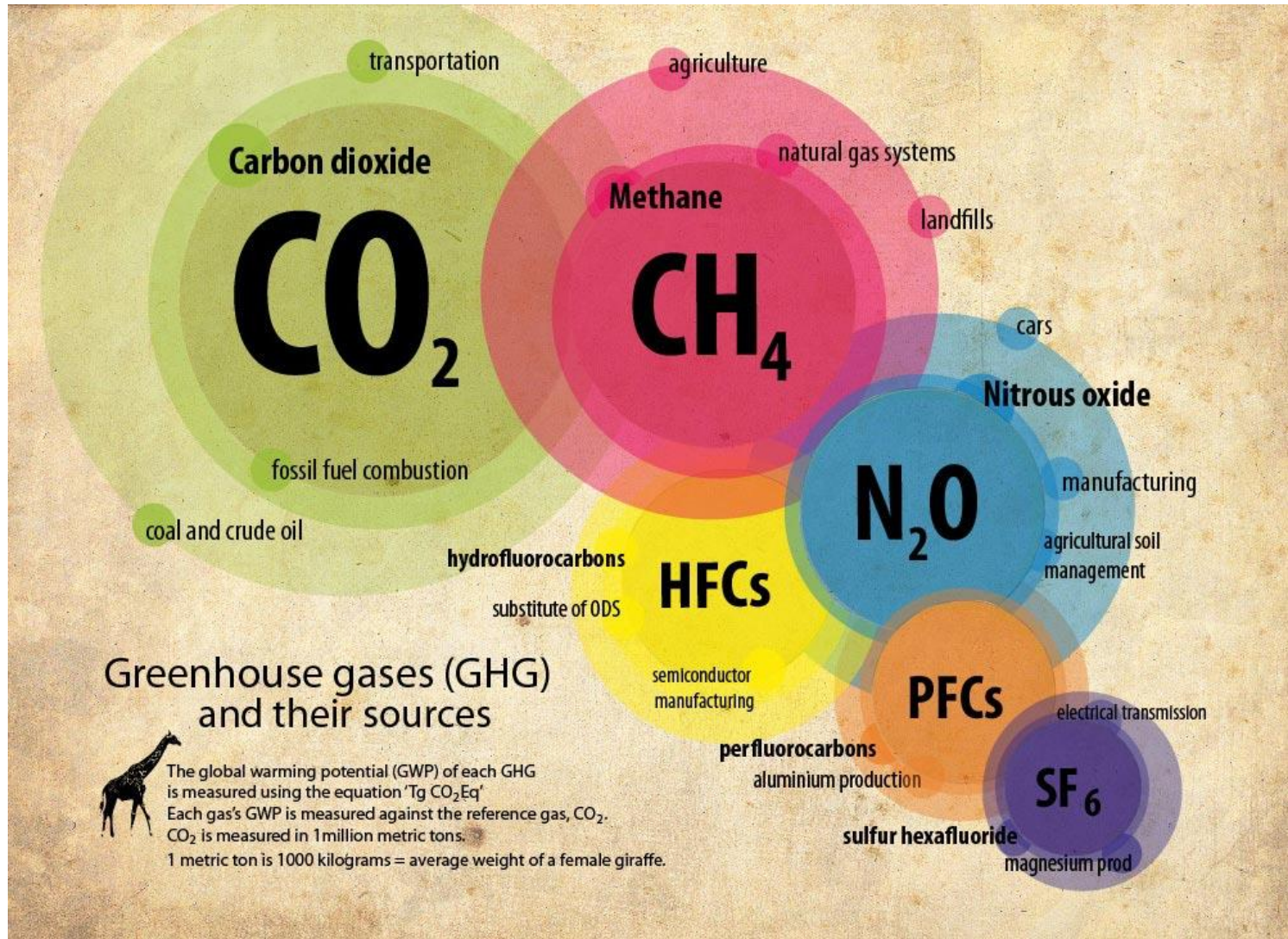
Carbon dioxide ( $\text{CO}_2$ )



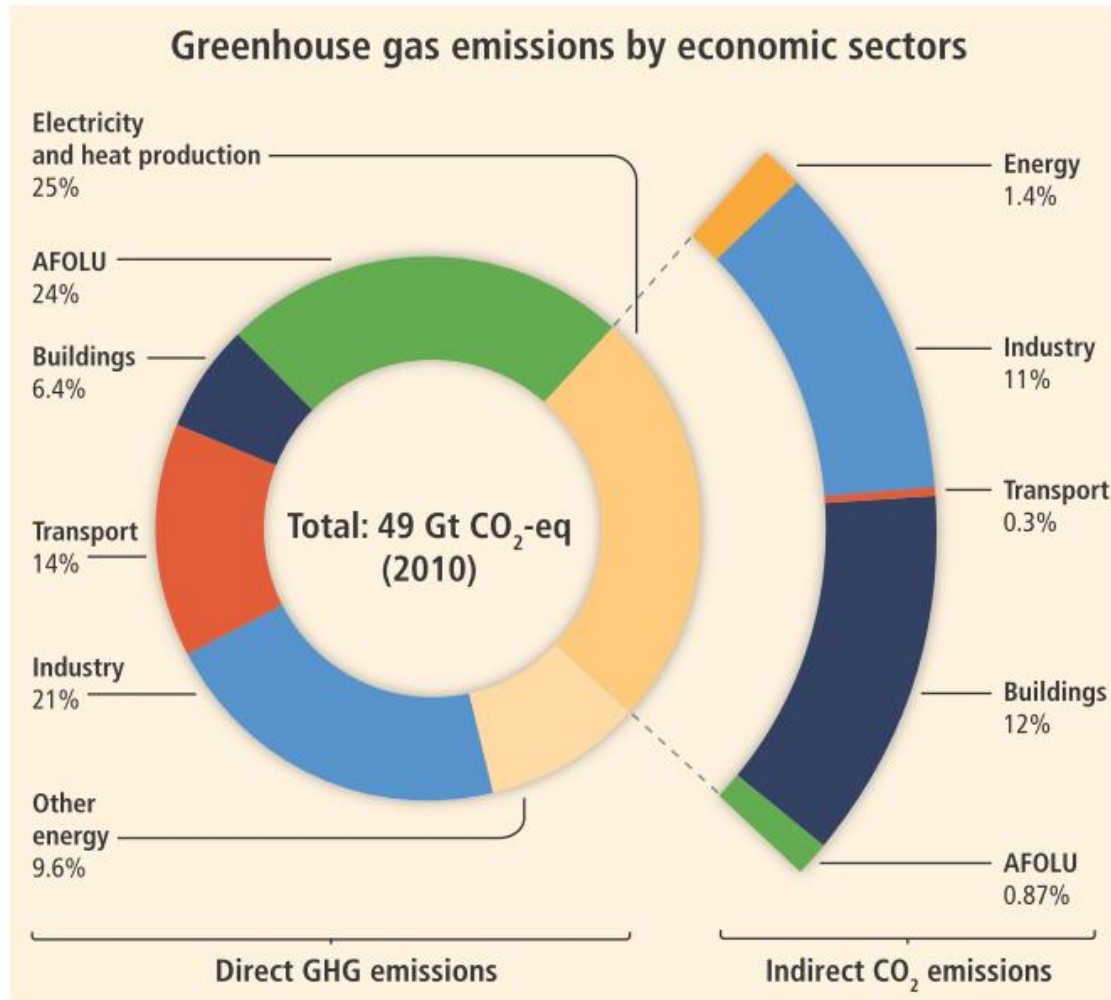
# The cause–effect chain from emissions to climate change and impacts



# Greenhouse Gases and Sources



# Total anthropogenic greenhouse gas (GHG) emissions (Gt CO<sub>2</sub>-eq/yr) from economic sectors in 2010





# Global Warming Potentials

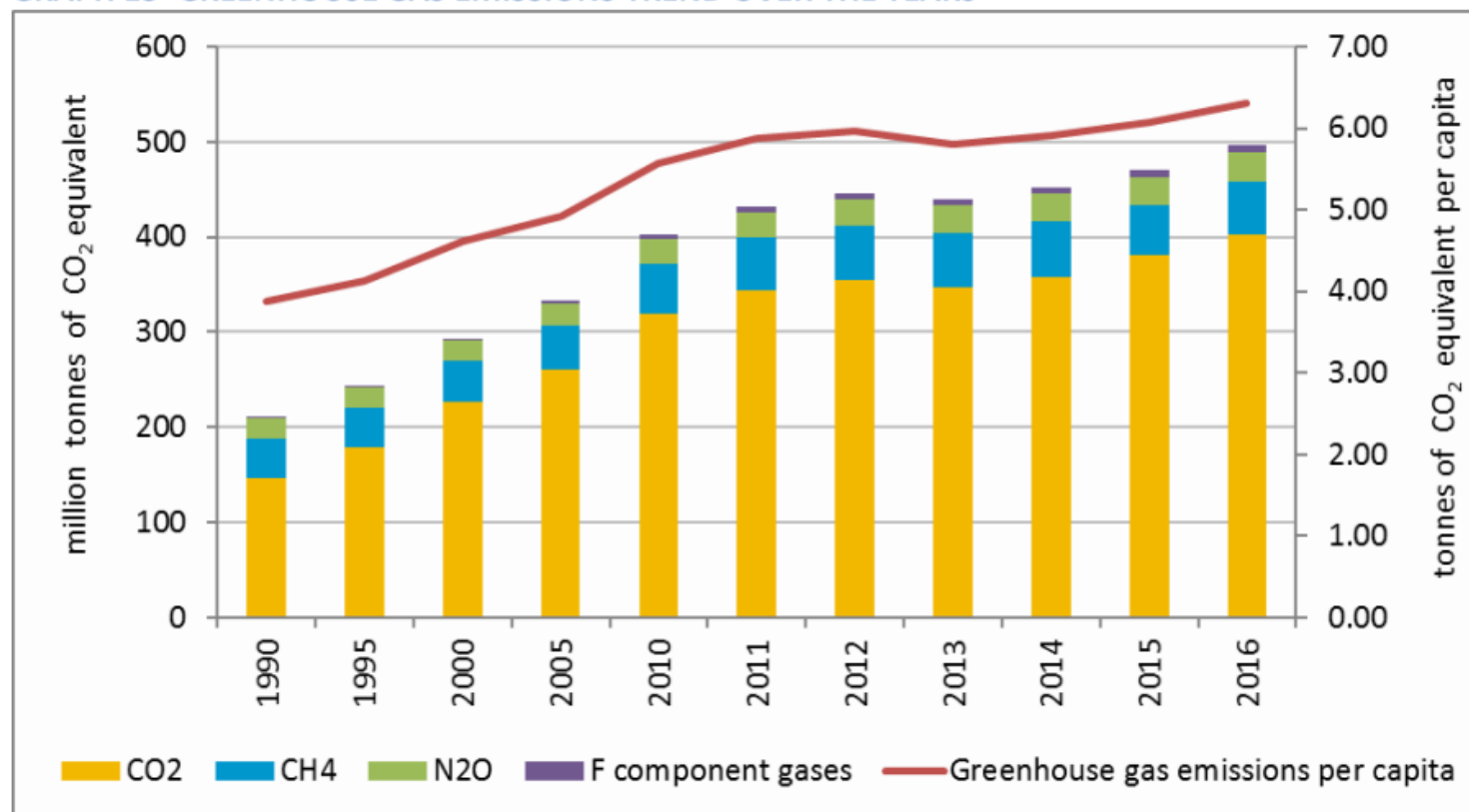
**Global warming potential (GWP) values relative to CO<sub>2</sub>**

Industrial designation or common name	Chemical formula	GWP values for 100-year time horizon		
		Second Assessment Report (SAR)	Fourth Assessment Report (AR4)	Fifth Assessment Report (AR5)
Carbon dioxide	CO <sub>2</sub>	1	1	1
Methane	CH <sub>4</sub>	21	25	28
Nitrous oxide	N <sub>2</sub> O	310	298	265

For detailed list:

[https://www.ghgprotocol.org/sites/default/files/ghgp/Global-Warming-Potential-Values%20%28Feb%2016%202016%29\\_1.pdf](https://www.ghgprotocol.org/sites/default/files/ghgp/Global-Warming-Potential-Values%20%28Feb%2016%202016%29_1.pdf)

**GRAPH 13- GREENHOUSE GAS EMISSIONS TREND OVER THE YEARS**



**TABLE 6- GREENHOUSE GAS EMISSIONS TREND OVER THE YEARS (million tonnes of CO<sub>2</sub> equivalent)**

Year	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	2016
CO <sub>2</sub>	146.5	178.3	226.0	260.9	319.5	344.7	354.1	346.8	357.6	380.9	402.8
CH <sub>4</sub>	42.2	42.4	43.5	45.5	52.5	54.7	58.0	56.8	58.1	52.4	54.7
N <sub>2</sub> O	21.4	20.9	22.6	23.7	25.9	26.8	27.6	29.3	29.3	29.8	32.0
F Component Gases	0.6	0.6	1.4	2.6	4.7	5.2	5.9	6.1	6.8	6.9	6.6
<b>Total</b>	<b>210.7</b>	<b>242.2</b>	<b>293.5</b>	<b>332.7</b>	<b>402.6</b>	<b>431.4</b>	<b>445.6</b>	<b>439.0</b>	<b>451.8</b>	<b>469.9</b>	<b>496.1</b>

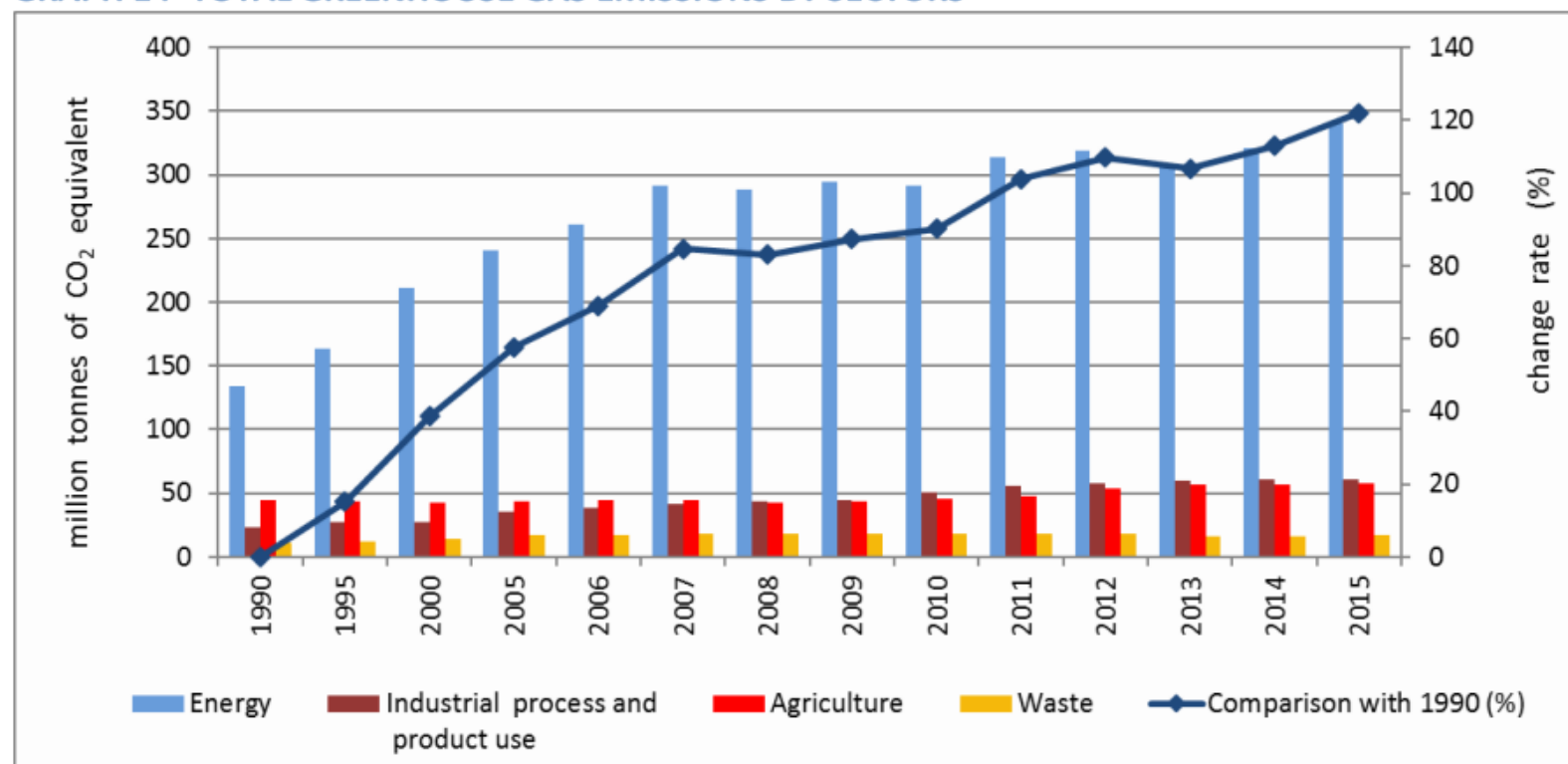
Source: TURKSTAT, Greenhouse Gas Emissions Statistics, 1990-2016

Notes:

(1) Data for 1990-2015 are revised.

(2) Land use, land use change and forestry emissions and sinks are not included.

**GRAPH 14- TOTAL GREENHOUSE GAS EMISSIONS BY SECTORS**



**TABLE 7- TOTAL GREENHOUSE GAS EMISSIONS BY SECTORS (million tonnes of CO<sub>2</sub> equivalent)**

YEARS	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	2016
Energy	134.3	162.7	212.3	240.3	292.3	313.4	320.1	308.8	321.3	339.7	361.0
Industrial process and product use	22.9	26.1	26.6	34.6	49.2	54.4	56.8	59.8	60.2	59.6	62.4
Agriculture	42.4	41.0	40.0	40.8	42.8	45.1	50.6	53.6	53.7	53.7	56.5
Waste	11.1	12.4	14.5	16.9	18.2	18.5	18.1	16.8	16.6	17.0	16.2
Comparison with 1990 (%)	-	14.9	39.3	57.9	91.0	104.7	111.5	108.3	114.4	123.0	135.4

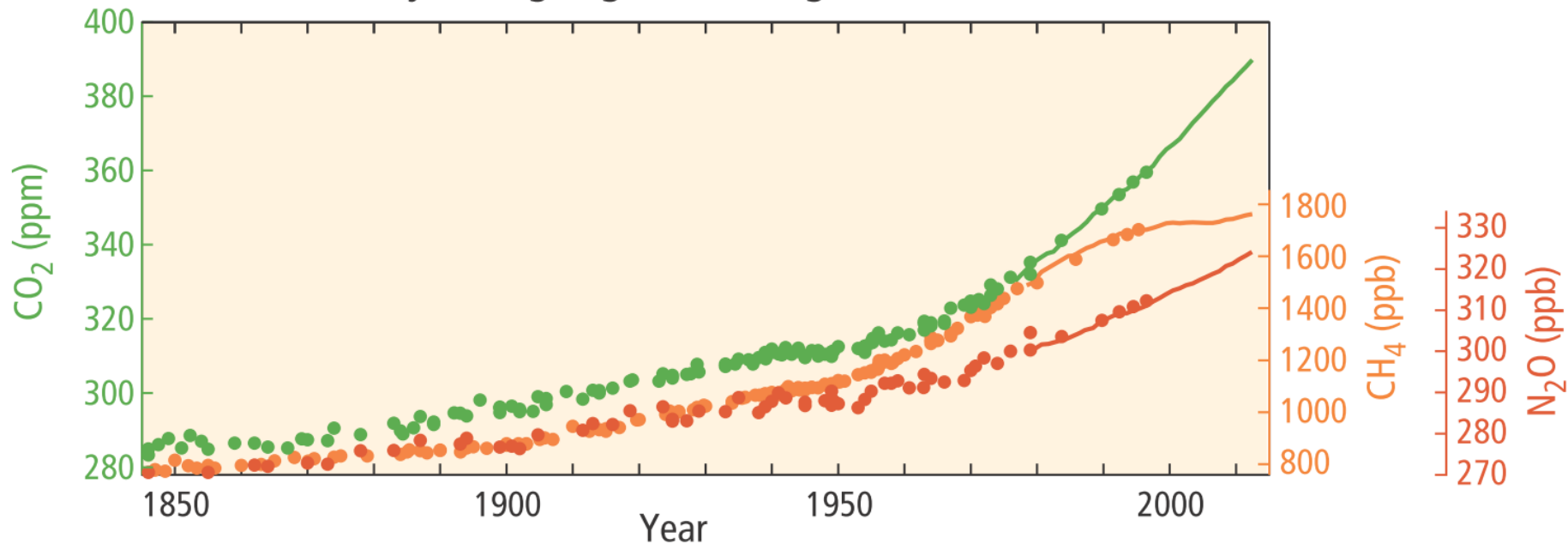
Source: TURKSTAT, Greenhouse Gas Emissions Statistics, 1990-2016

Notes: (1) Data for 1990-2015 are revised.

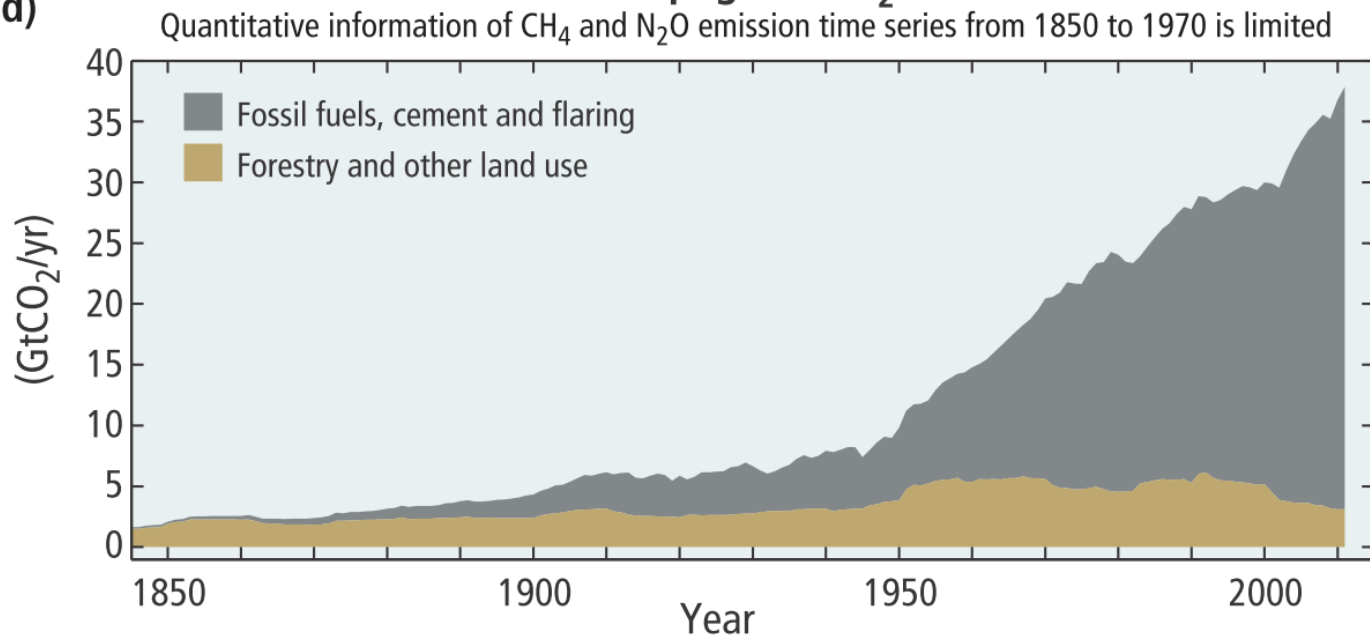
(2) Land use, land use change and forestry emissions and sinks are not included.



(c) Globally averaged greenhouse gas concentrations



(d) Global anthropogenic CO<sub>2</sub> emissions



Cumulative CO<sub>2</sub> emissions

