Energy & Pollution

Consequences

March 20th, 2019

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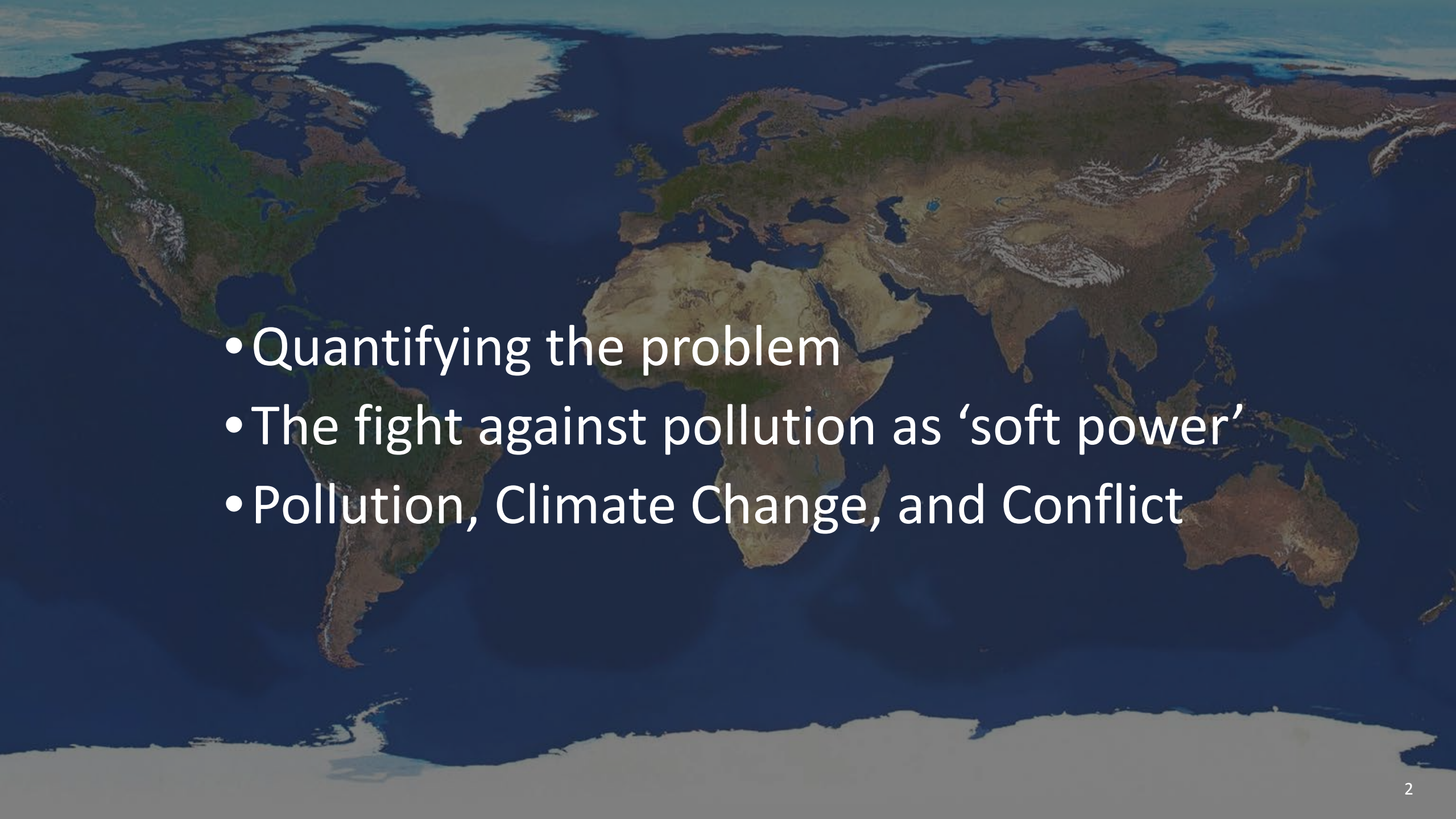


- Quantifying the problem
- The fight against pollution as ‘soft power’
- Pollution, Climate Change, and Conflict

Pollution: quantifying the problem

- IPCC*:
  - It is *extremely likely* that human influence has been the dominant cause of observed warning since the mid-20th century.
  - It is *extremely likely* that anthropogenic greenhouse-gas (GHG) emissions are the main cause of a global mean surface warming of 0,7°C over the period 1951 to today.
- Pollution – GHG: ENERGY will be at the core of the discussion
  - The energy chain accounts for two-thirds of the world's GHG emissions.
  - The energy chain = the single most important man-made source of air pollutant emissions.

*IPCC = Intergovernmental Panel on Climate Change

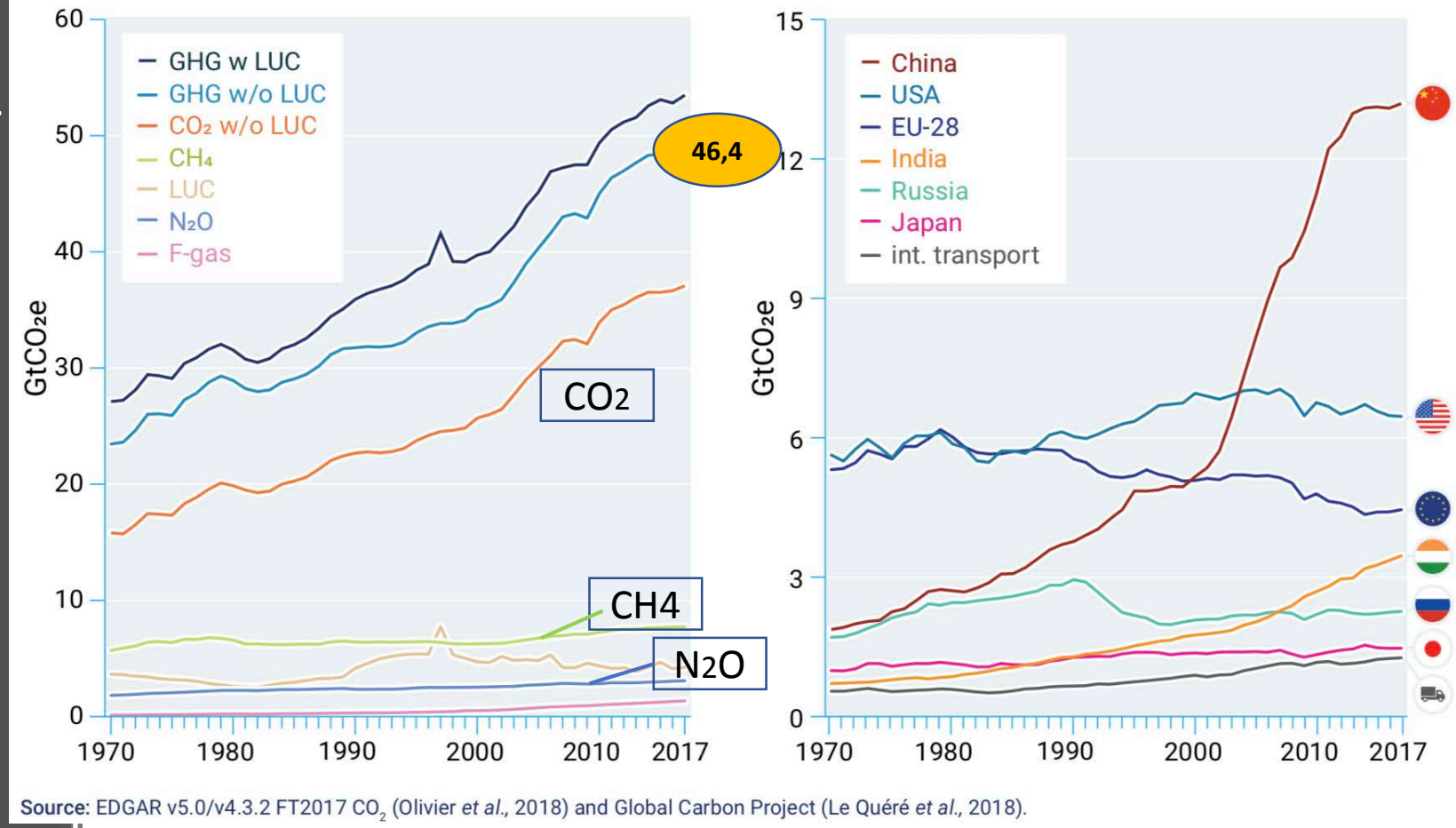
Global GHG emissions increased steadily to 46,4 GigaT CO_{2eq}/year

Increase since 1970 = 91%

China: (±) USA+EU+India

GHG emissions:

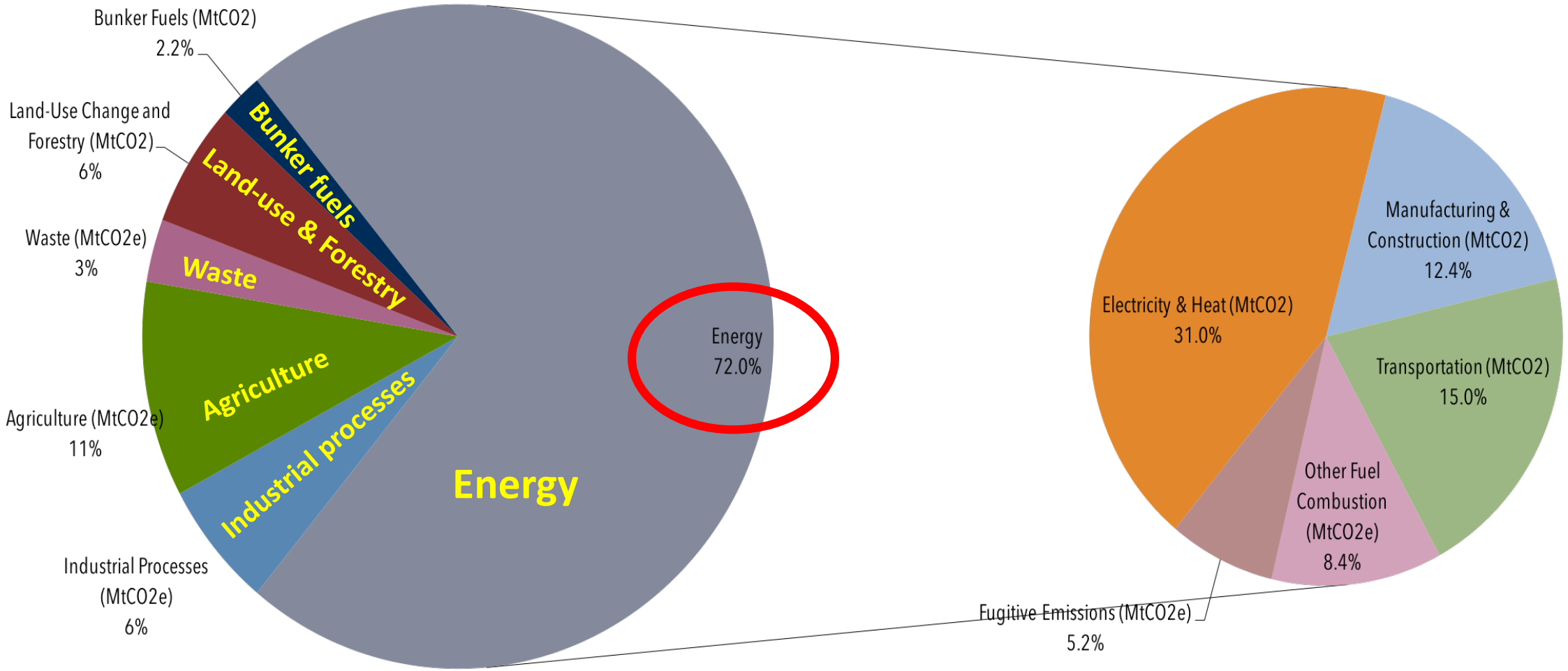
- **Carbon dioxide CO2: 74%**
- Methane CH4: 17%
- Nitrous oxide N_2O: 7%
- Others: 2%



Source: EDGAR v5.0/v4.3.2 FT2017 CO_2 (Olivier *et al.*, 2018) and Global Carbon Project (Le Quéré *et al.*, 2018).

* LUC = Land Use Changes

Global Manmade GHG emissions by sector



*MtCO2e = Metric tons of carbon dioxide equivalent

Consequences - Health

- Air pollution: 8.8 million deaths/year – 24.000 people/day
- ± half of these victims = particular matter-related (energy chain accounts for 85% of all particular matter emissions)
- Air pollution is cutting average life expectancy in Europe by 2,2 years

Fighting pollution, an instrument of ‘soft power’

- ‘Ecological civilization’
- 2017: world leader in renewable energy investment
  - 44 billion USD foreign direct investment (Belt & Road initiative)
- China as the world’s climate leader
- Green policy as a geopolitical tool -> soft power -> legitimizing Beijing’s governance practices

Pollution, Climate change, and Conflict

- Climate change = Threat multiplicator & Accelerator of instability
- N
  - Exacerbate resource competition, threaten livelihoods, and increase the risk of instability and violence
  - Open up new arenas for potential conflict: **Arctic region**

- A *highly significant* correlation between climate change and conflict*:
  - 1 standard deviation shift in heat or rainfal ➡ increase of risk for riots/civil war/conflict with **14%**
  - A global temperature increase of ≥ 2°C ➡ large & substantial increase of risk for political instability, intergroup violence, civil war, and conflict in fragile areas

* *Quantifying the Influence of Climate on Human Conflict*; S. Hsiang, M. Burke, E. Miguel; Science, 13 Sep 13, Vol. 341, issue 6151

Pollution, Climate change, and Conflict

Pollution, Climate change, and Conflict


+1,5°C
Greenland Sea
Kara Sea
Laptev Sea
Beaufort Sea
Baffin Bay
Barents Sea
East Siberian Sea
Norwegian Sea
Hudson Bay
Labrador Sea
Gulf of Alaska
North Sea
Sea of Okhotsk
Bering Sea
North Pacific Ocean
North Atlantic Ocean
Med. Sea
East China Sea
North Pacific Ocean
Gulf of Mexico
Caribbean Sea
Arabian Sea
Bay of Bengal
South China Sea
South Atlantic Ocean
Indian Ocean
Coral Sea
South Pacific Ocean
Tasman Sea


+1,5°C
Greenland Sea
Kara Sea
Laptev Sea
Beaufort Sea
Baffin Bay
Barents Sea
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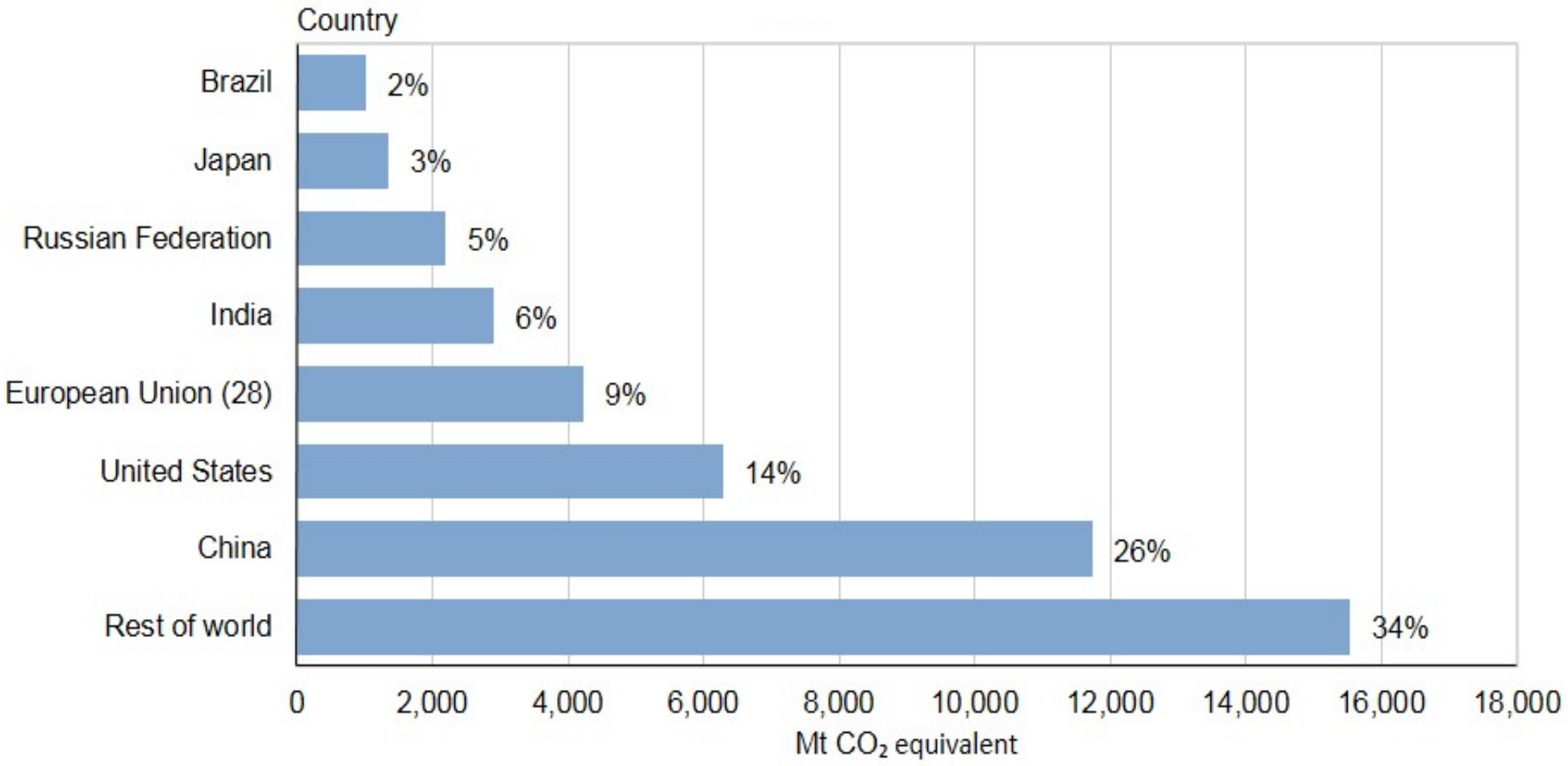
Norwegian Sea
Hudson Bay
Labrador Sea
Gulf of Alaska
North Sea
Sea of Okhotsk
Bering Sea
North Pacific Ocean
North Atlantic Ocean
Med. Sea
East China Sea
Gulf of Mexico
Caribbean Sea
Arabian Sea
South China Sea
Coral Sea
South Atlantic Ocean
Indian Ocean
South Pacific Ocean
Tasman Sea


≥ 2°C
Greenland Sea
Kara Sea
Laptev Sea
Beaufort Sea
Barents Sea
East Siberian Sea
Baffin Bay
Norwegian Sea
Hudson Bay
Labrador Sea
Gulf of Alaska
North Sea
Sea of Okhotsk
Bering Sea
North Pacific Ocean
North Atlantic Ocean
Med. Sea
East China Sea
Gulf of Mexico
Caribbean Sea
Arabian Sea
South China Sea
Coral Sea
South Atlantic Ocean
Indian Ocean
South Pacific Ocean
Tasman Sea

“”The situation, for much of the Cold War, was stable. And the challenge was to keep it stable, to stop the catastrophic event from happening. We spent billions on that strategy. Pollution and climate change are exactly the opposite. We have a catastrophic event that appears to be inevitable. And the challenge is to stabilise things – to stabilise carbon in the atmosphere. Back then, the challenge was to stop a particular action. Now the challenge is to inspire a particular action. We have to act if we’re to avoid the worst effects”.

General (Retired) Gordon Sullivan, USA

Gross global GHG emissions by country/region



Source: Climate Analysis Indicators Tool; World Resources Institute

CO_2 Emissions

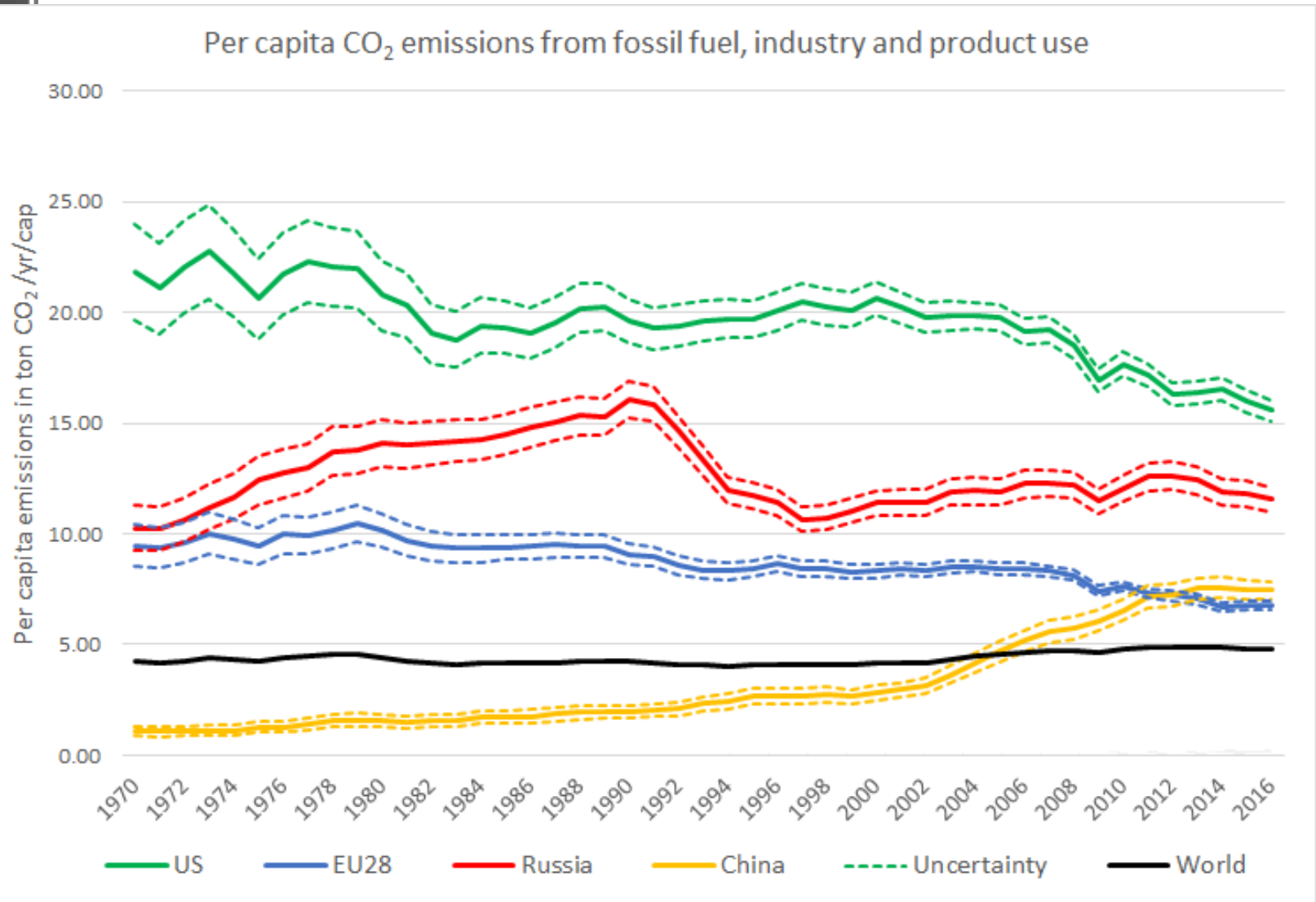
> 1750: 43% increase in atmospheric concentrations

2017: 36 GigaT (fossil fuel = 22 GigaT)

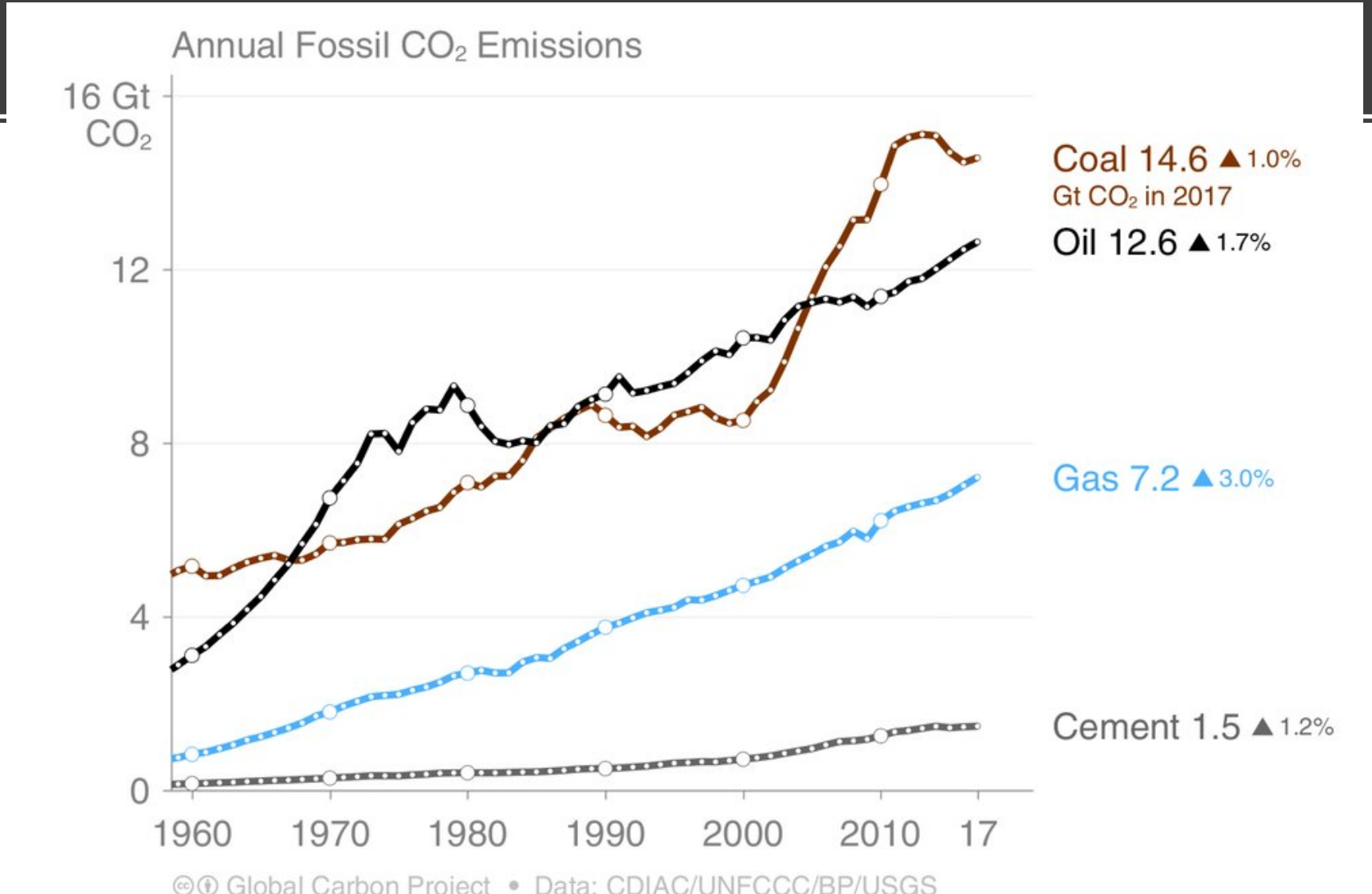
Energy related emissions: 1990-2018 = 1750-1990

Sources of CO_2 emissions:

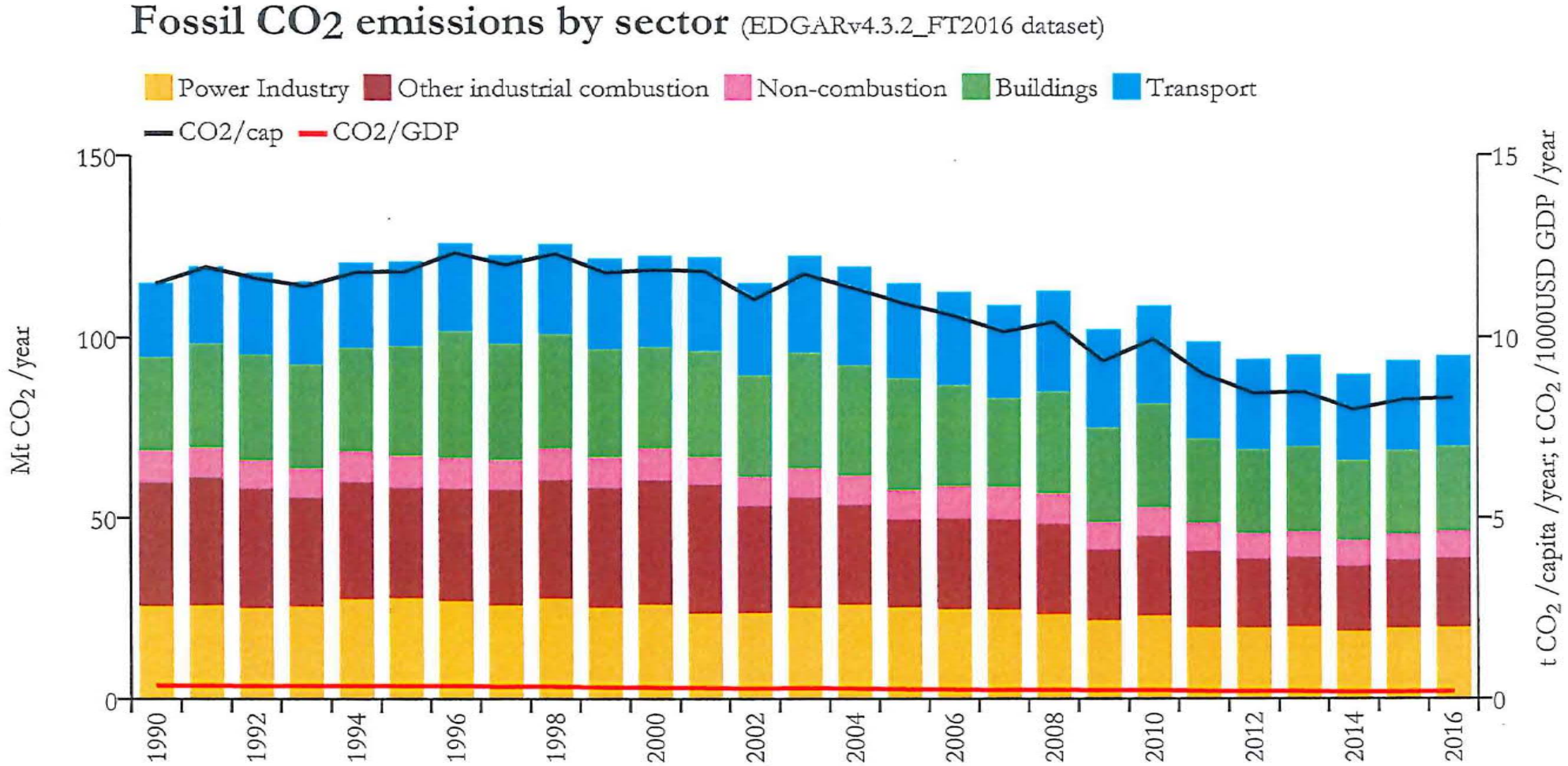
- Fossil fuel use:87%
- Land use changes: 9%
- Industrial processes: 4%



Annual Fossil CO_2 emissions - Sources



Belgium



Year	Mt CO_2/yr	t CO_2/cap/yr	t CO_2/kUSD/yr	population
2016	94.723	8.309	0.199	11358379
1990	114.882	11.488	0.379	10006544

Global fossil CO_2 emissions (2017 vs 2005)

Power Industry

+ 24 %

Other industrial combustion

+ 28 %

Buildings

+ 3 %

Transport

+ 21 %

Other sectors

+ 40 %

EU-28 fossil CO_2 emissions (2017 vs 2005)

Power Industry

- 21 %

Other industrial combustion

- 21 %

Buildings

- 21 %

Transport

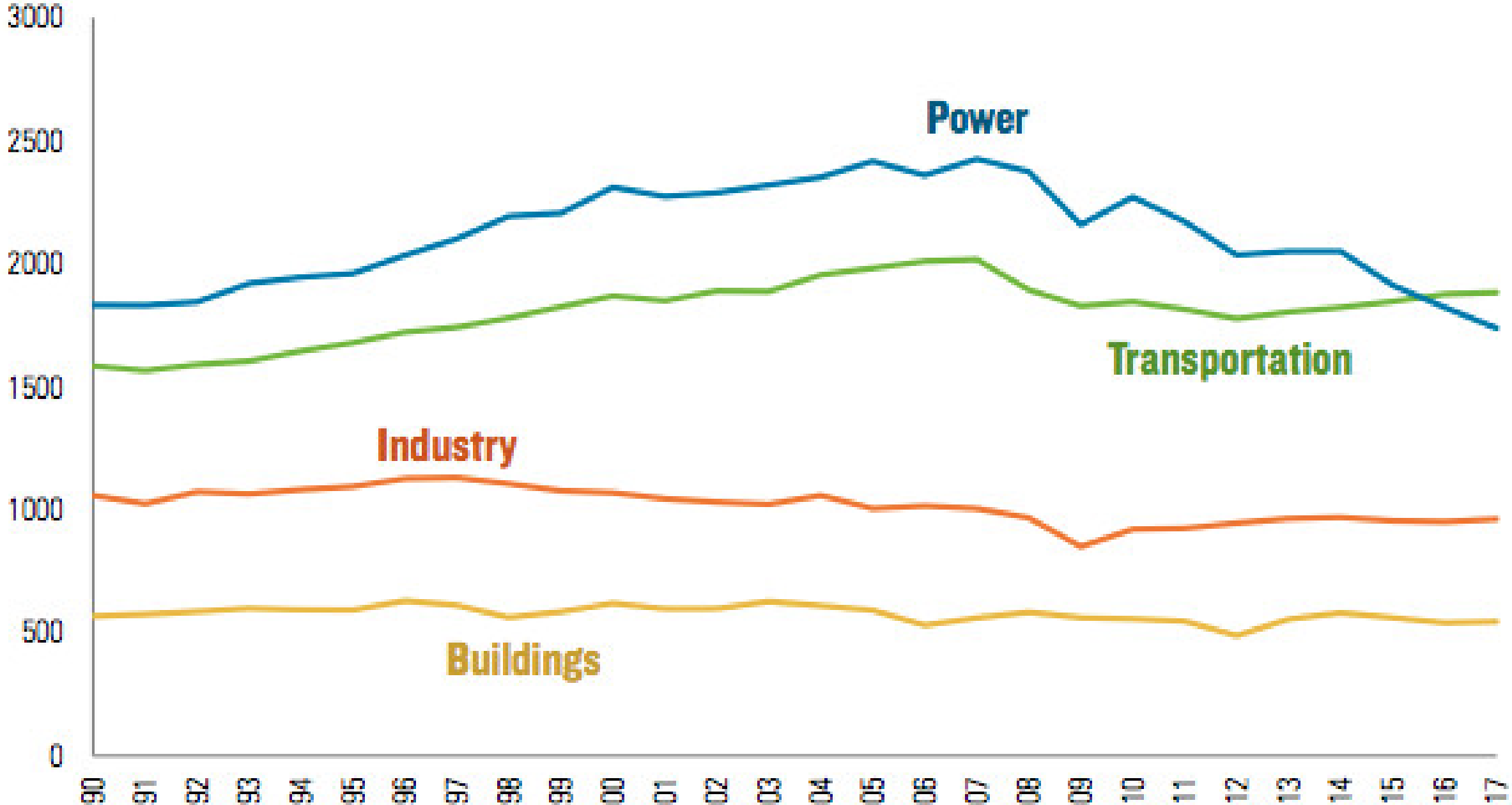
- 6 %

Other sectors

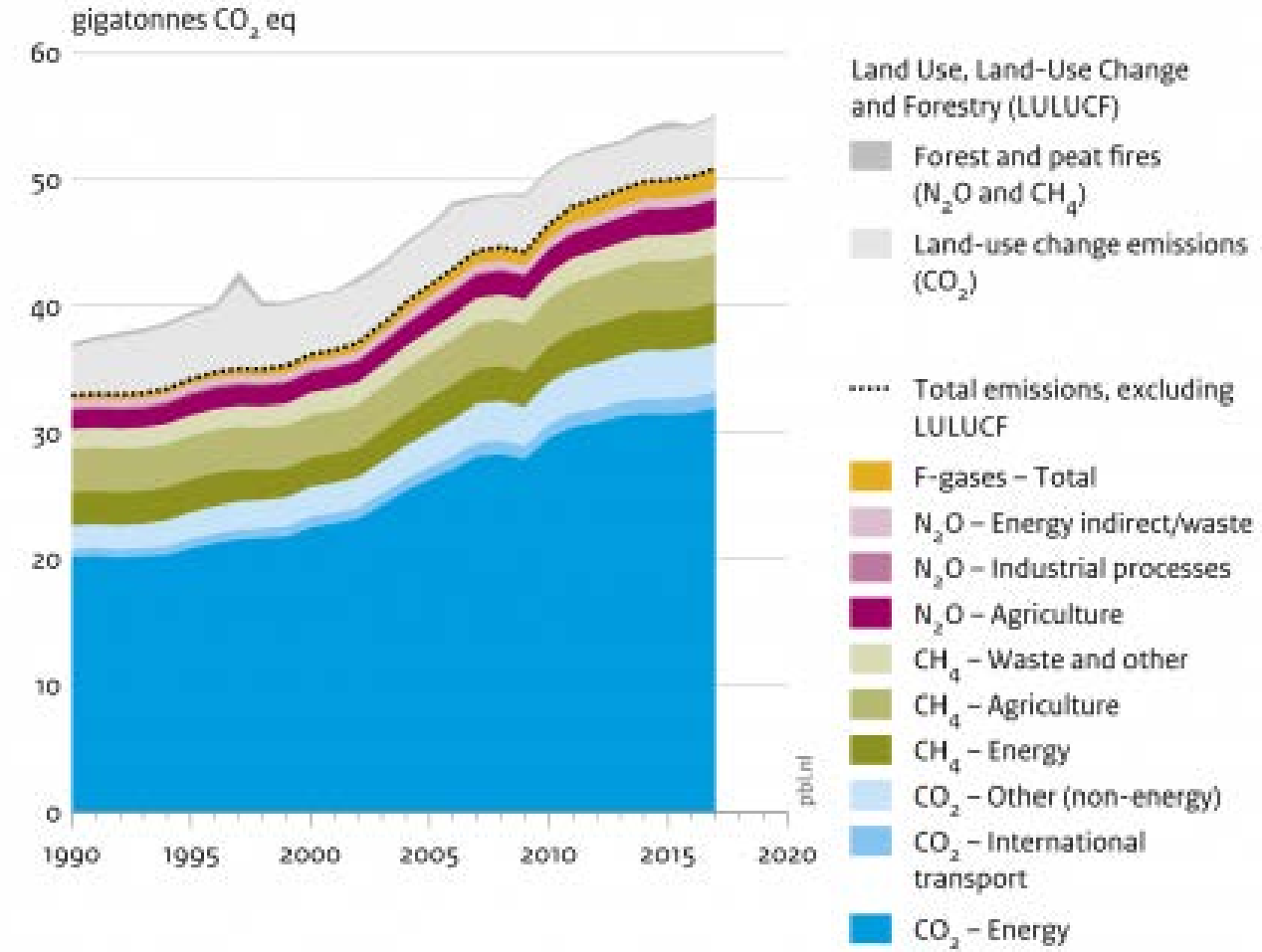
- 6 %

Figure 4: Energy-related CO_2 emissions by sector

Million metric tons



Global greenhouse gas emissions, per type of gas and source, including LULUCF



Source: EDGAR v5.0/v4.3.2 FT 2017 (EC-JRC/PBL, 2018); Houghton and Nassikas (2017)

Global GHG emissions increased steadily to 46,4 GigaT CO_{2eq}/year

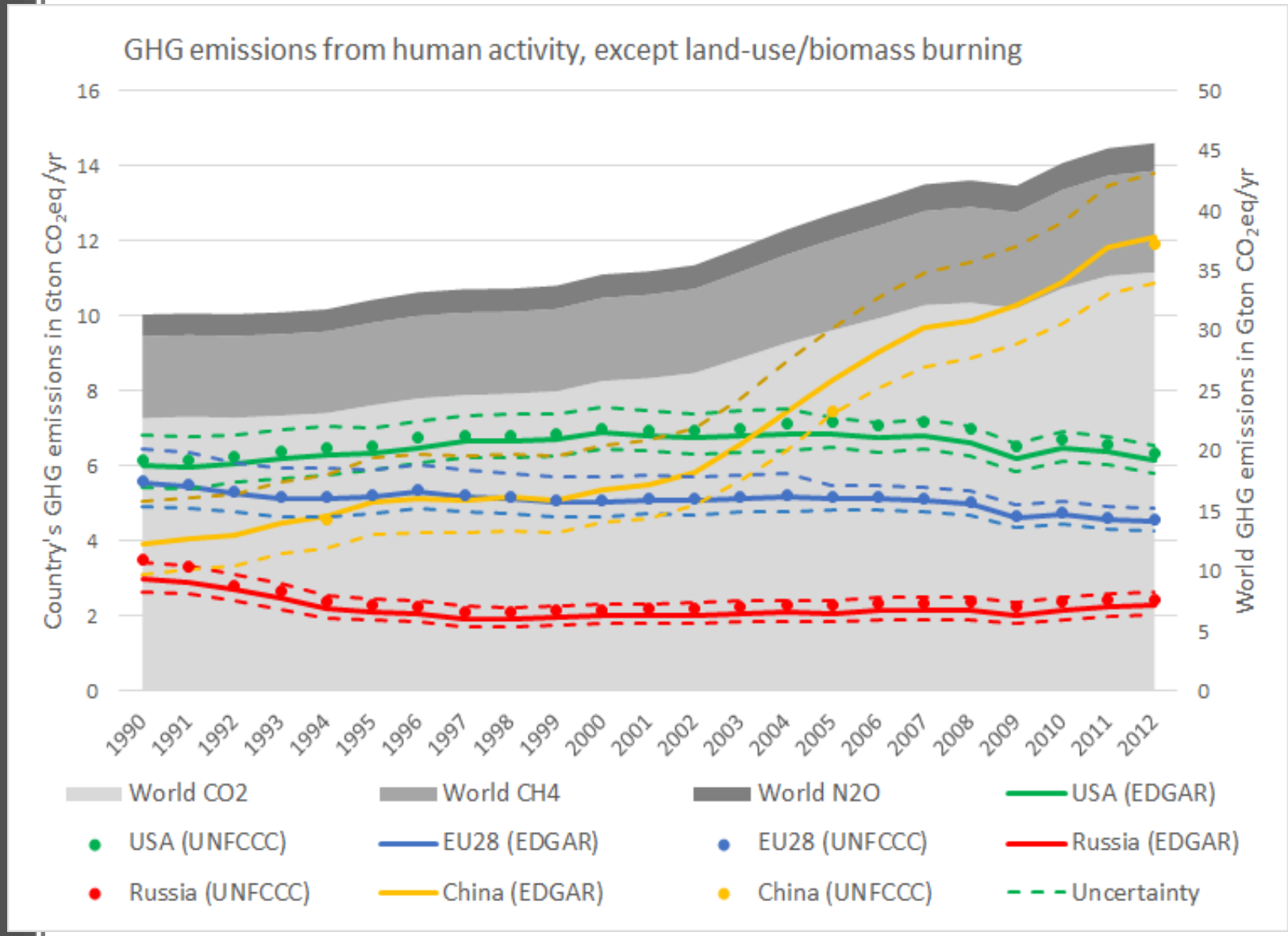
Increase since 1970 = 91%

Sulfur-dioxide emissions = > 99% energy-related

Particular matter = 85% energy-related

GHG emissions:

- Carbon dioxide CO_2: 75%
- Methane CH4: 19%
- Nitrous oxide N_2O: 6%



CO_2 Biggest emitters