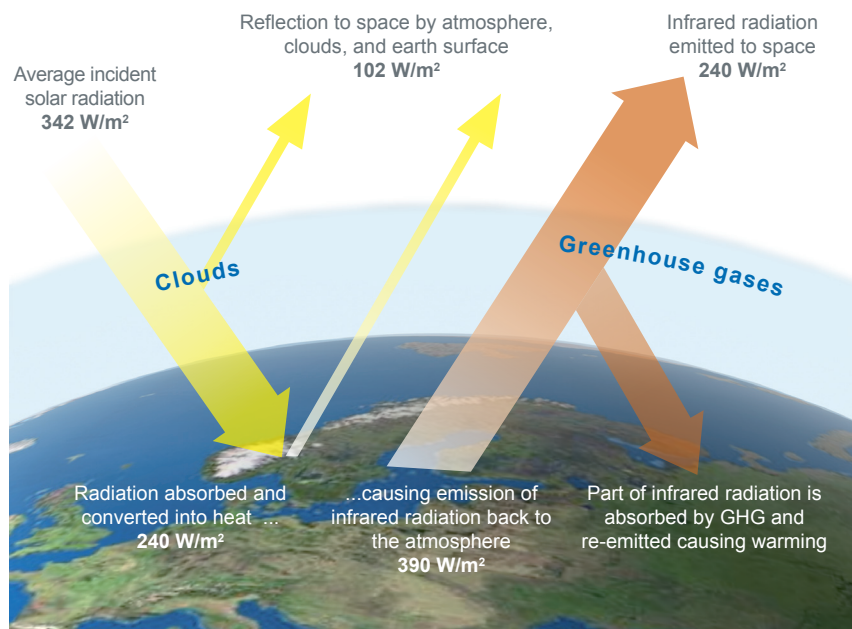


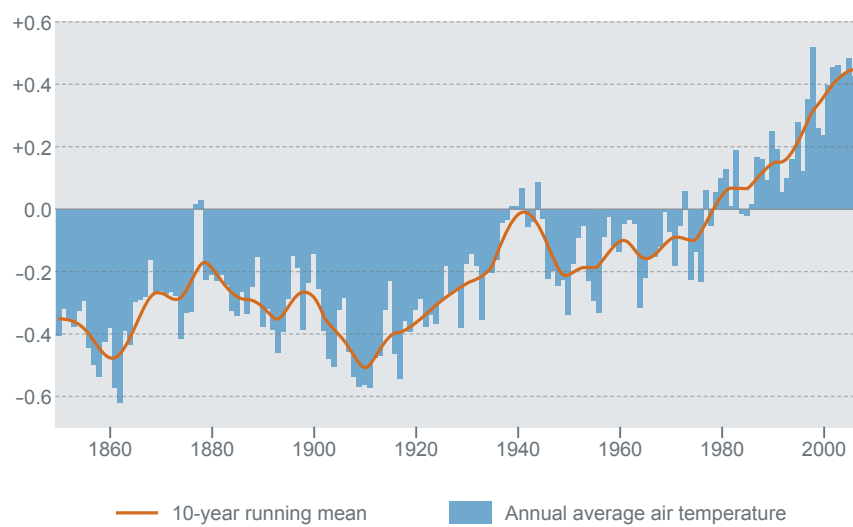
Earth's energy balance and the greenhouse effect



Antropogenic greenhouse gases emission contribute to global warming by increasing the proportion of infrared radiations re-emitted to earth.

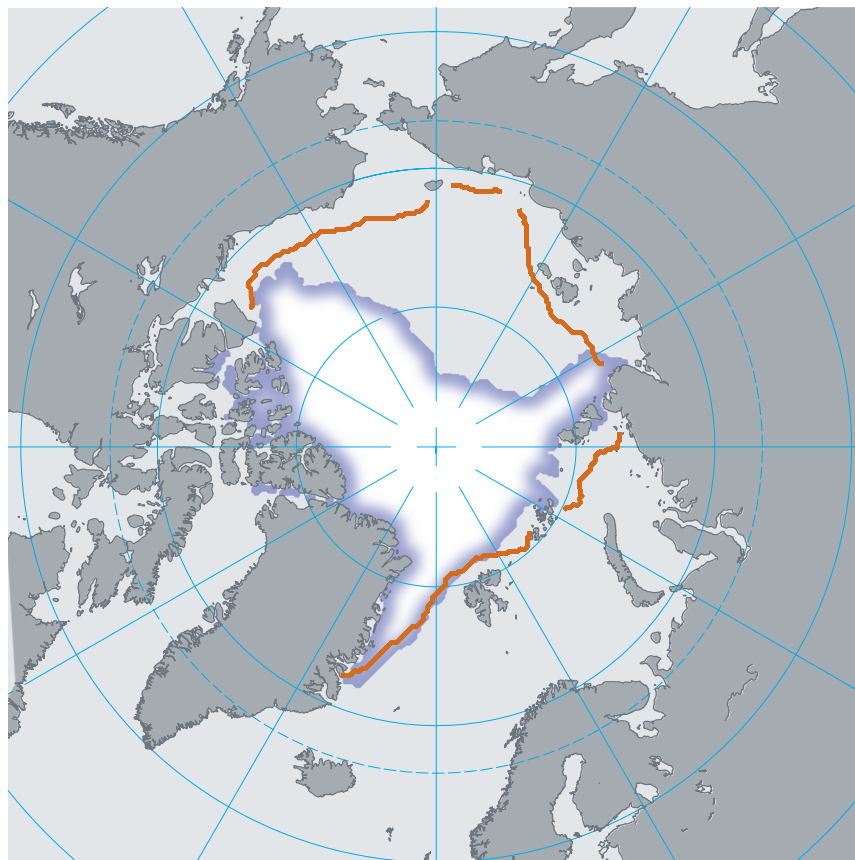
Observed changes in global average surface temperature

Differences are relative to corresponding averages for the period 1961-1990



Based on Brohan *et al.* (2008)

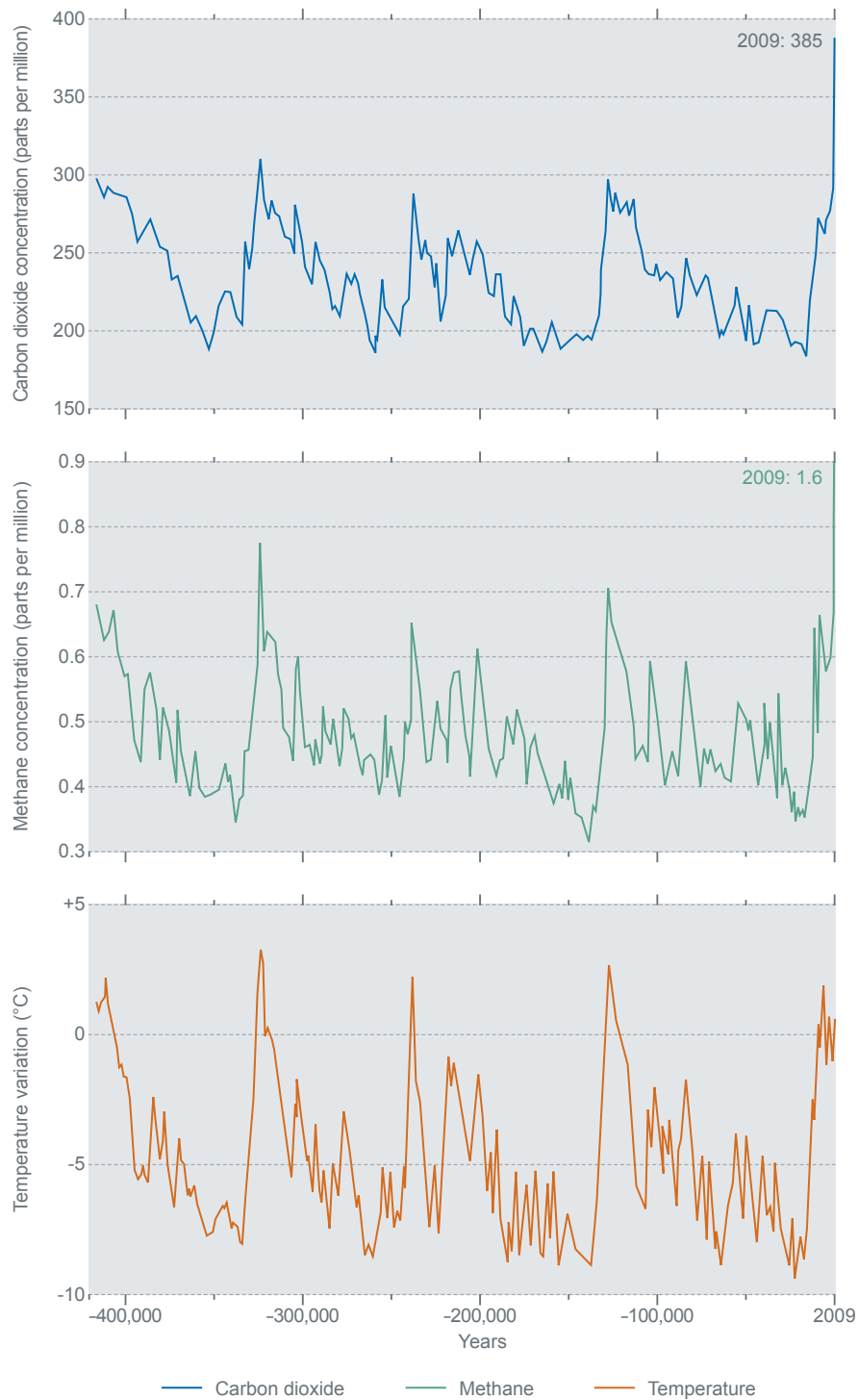
Evolution of sea ice surface area on the Arctic ocean



— Average sea ice in September 1979-2000 Sea ice coverage on 16 September 2007

Based on Spreen *et al.* (2007) and data from the National Snow and Ice Data Center

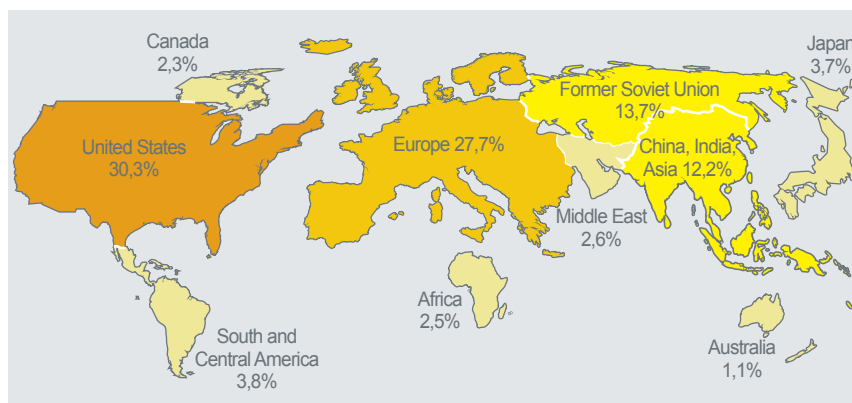
Evolution of carbon dioxide, methane and temperature over the last 420,000 years



Note that the change in carbon dioxide from 290 ppm in 1900 to 385 ppm in 2009, and in methane from roughly 0.7 ppm in 1850 to about 1.6 ppm in 2009 are much much faster than any of the earlier changes, even those that appear very steep on the 400,000-year scale. On this scale, the warming since 1900 hardly appears. Note that the “*present*” when dates are given as “*before present*” or B.P. corresponds by convention to the year 1950.

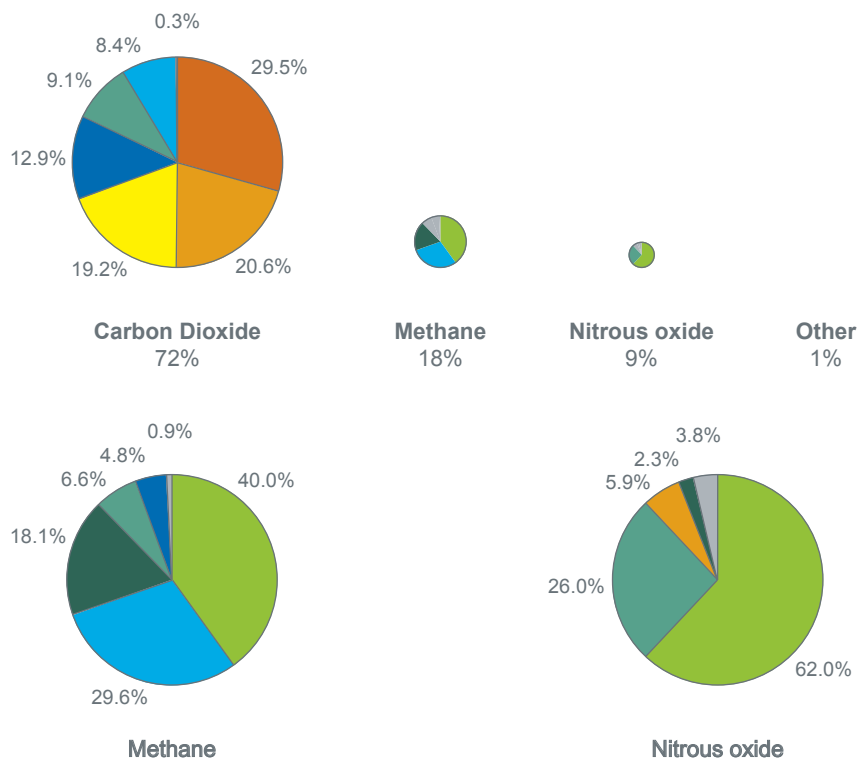
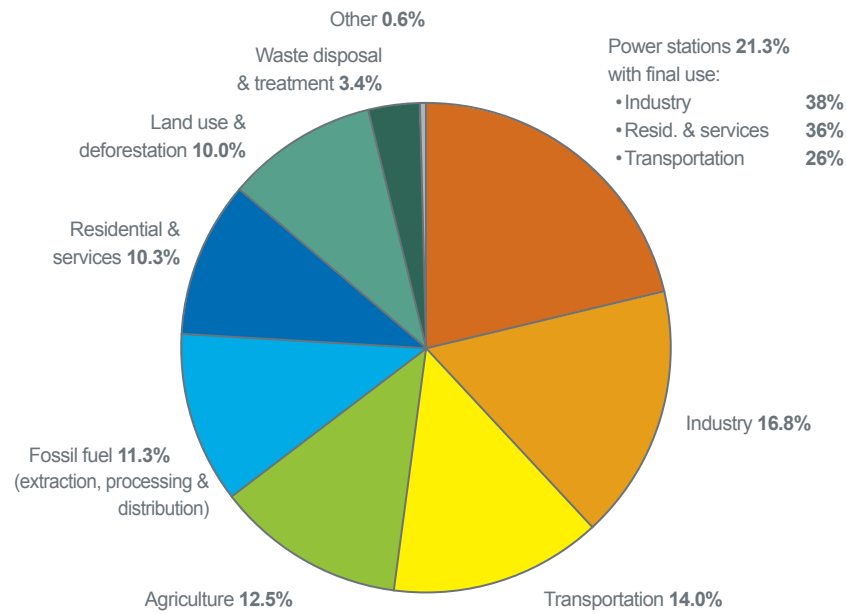
Source: Petit *et al.* (1999) - Ice core samples from the Vostok records.

Map of the world proportional to carbon dioxide emissions (1900-1999)



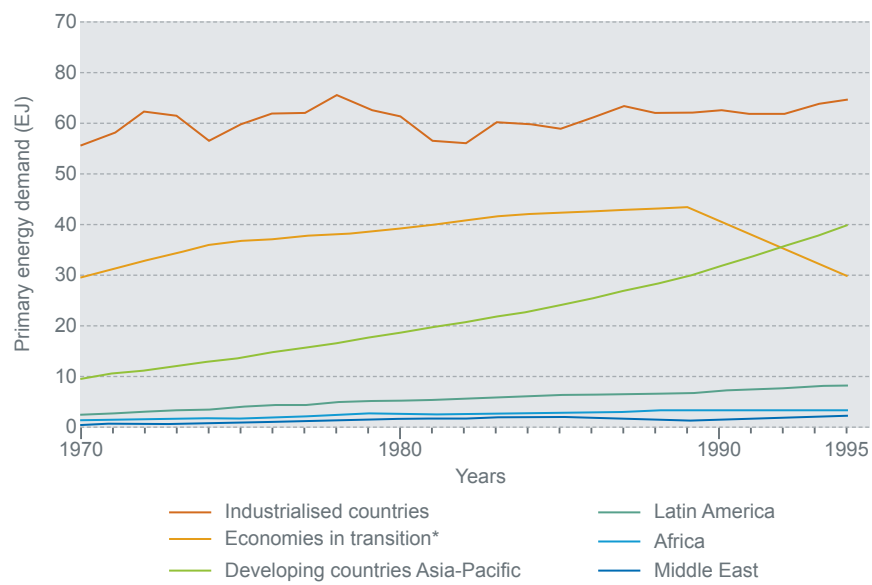
Source: World Ressource Insitute.

Greenhouse gas emissions by sectors



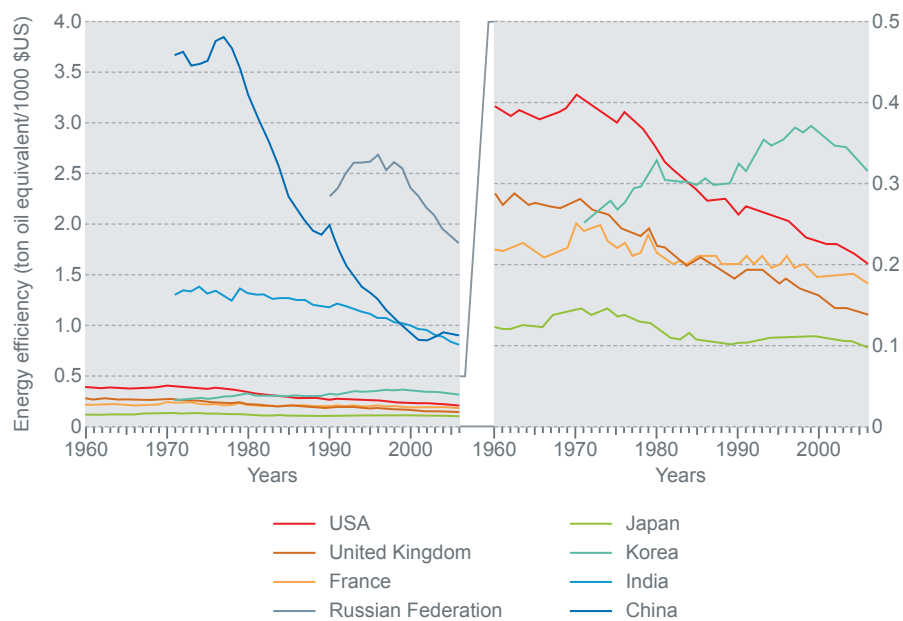
Source: Emission Database for Global Atmospheric Research.

Evolution of industrial energy use



* Industrialized countries of the former Soviet bloc, in transition to a market economy.
Source: IPCC3 - TAR - Figure 3-11.

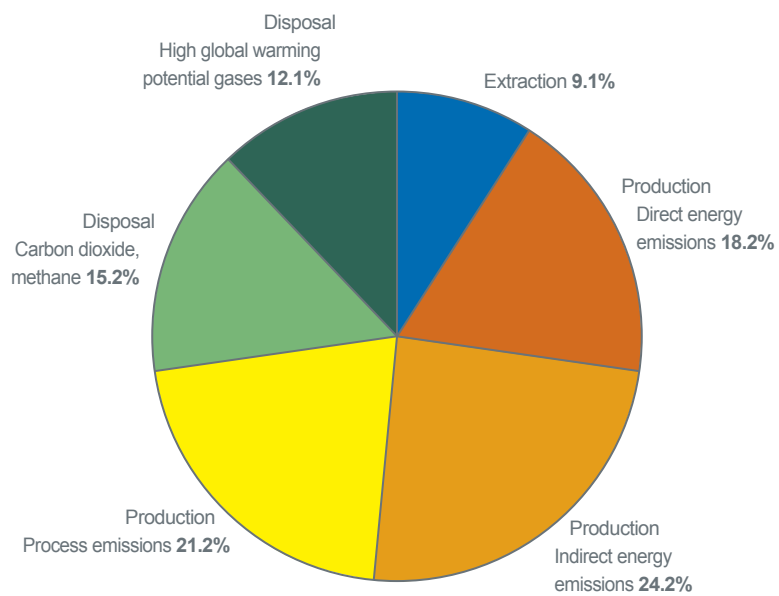
Evolution of energy efficiency



Because part of the upward infrared radiation from the surface is absorbed by atmospheric greenhouse gases (and clouds) and re-emitted downward, the surface is warmed to an average temperature of +15°C and emits 390 W/m² of infrared radiation upward to the atmosphere. Anthropogenic emissions of greenhouse gases intensify the natural greenhouse warming by increasing the proportion of infrared radiation re-emitted to the Earth's surface.

Source: World Resources Institute - OECD/IEA.

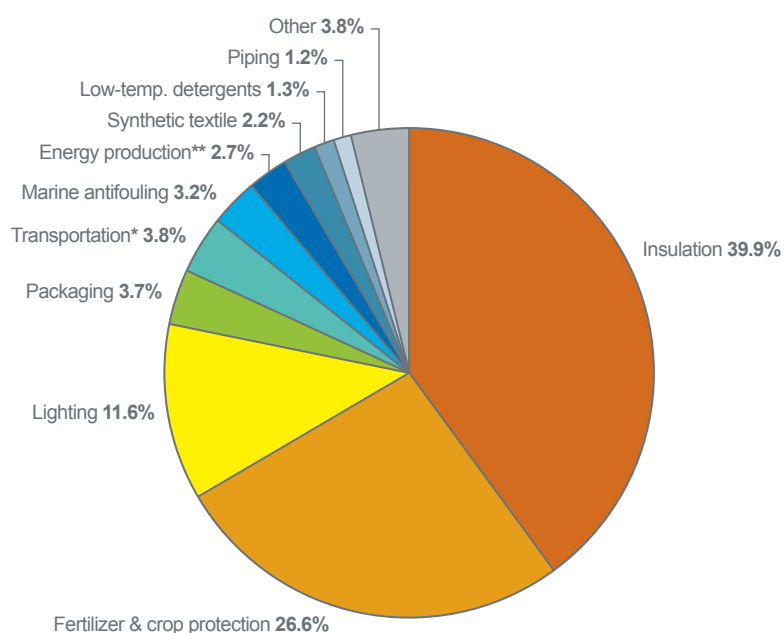
Total lifecycle emissions of chemical industry products (2005)



Total greenhouse gas emissions of the chemical industry was 3,300 million tons of carbon dioxide equivalent in 2005. This figure does not include emissions savings enabled by products of the chemical industry.

Source: ICCA Report

Chemical industry applications and the net abatement (final product savings in industry emissions) they allowed in 2005



Total net greenhouse gas emissions abatement allowed by chemical industry application was 6,010 million tons of carbon dioxide equivalent in 2005 (including fertilizer and crop protection). Without agriculture, the abatement is 4,000 million tons. These figures also include 850 million tons of carbon dioxide equivalent for which no realistic non-chemical alternative exist.

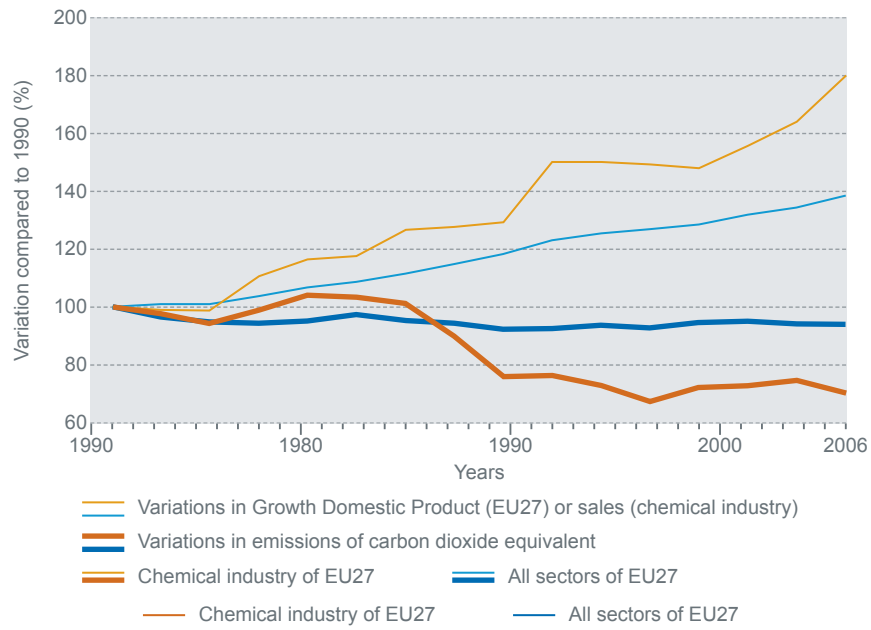
* Transportation: automotive weight reduction (120 MtCO₂e), improved engine efficiency (70 MtCO₂e)

and green tyre (40 MtCO₂e).

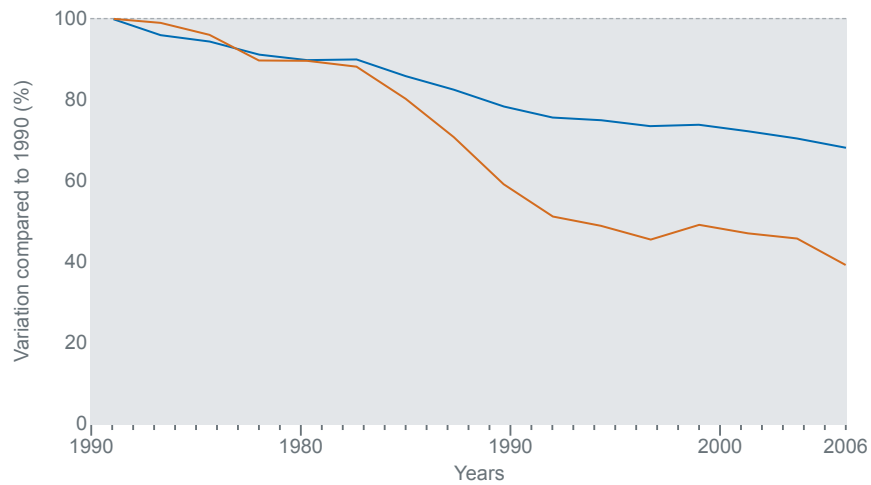
** Energy production: wind power (60 MtCO₂e), solar power (40 MtCO₂e) and district heating (60 MtCO₂e).

Source: ICCA Report.

Comparison of evolution of economic growth and carbon dioxide emissions

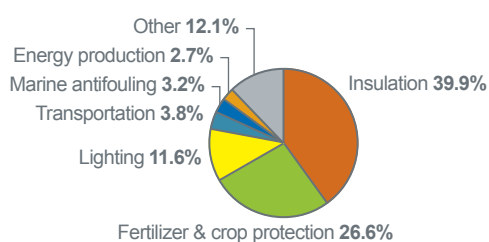


Evolution of carbon intensity for EU27 and chemical industry of EU27



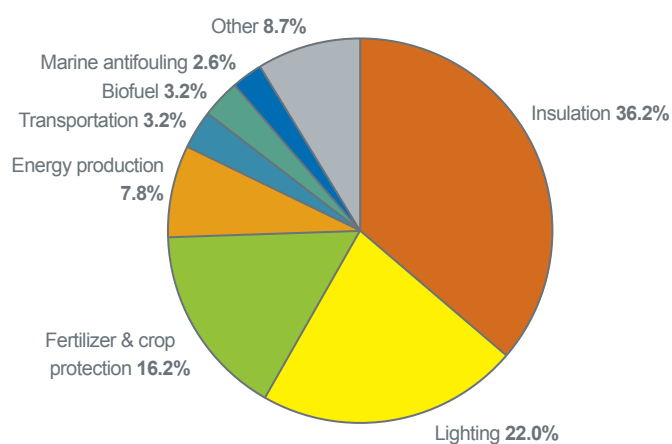
Sources: European Environment Agency and Eurostat

Greenhouse gas emissions savings enabled by chemical industry products in 2005 compared with those estimated in 2030 for different scenarios



2005

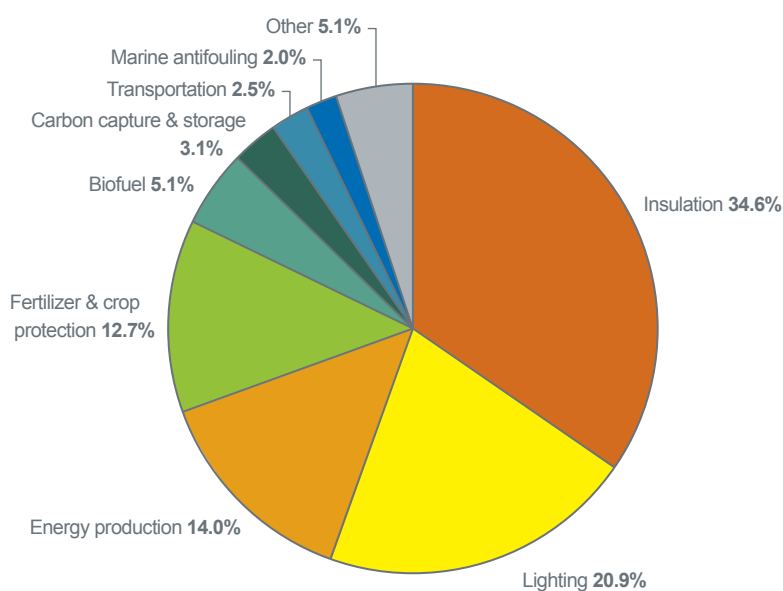
6,010 million tons of carbon dioxide equivalent



2030 - "Business as usual" scenario

15,450 million tons of carbon dioxide equivalent

2.57 fold savings enabled in 2005

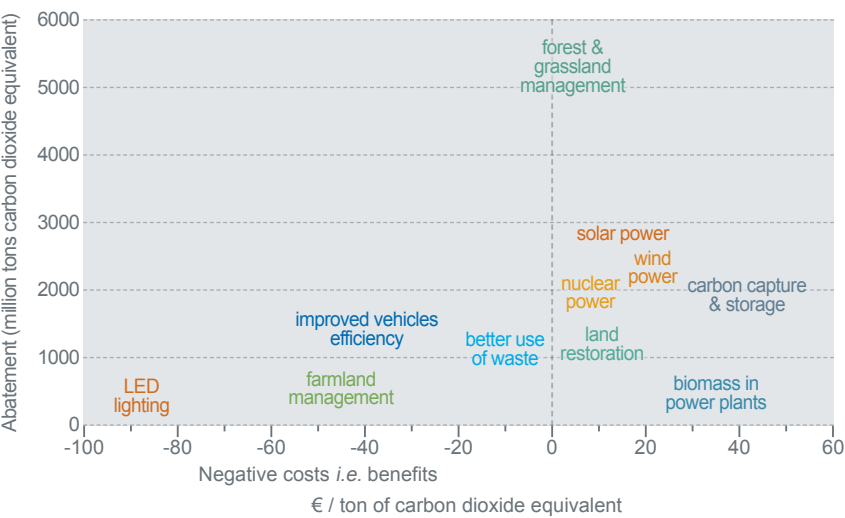


2030 - Abatement scenario

19,650 million tons of carbon dioxide equivalent

3.27 fold savings enabled in 2005

Some examples of abatement scenario costs



Source: ICCA Report