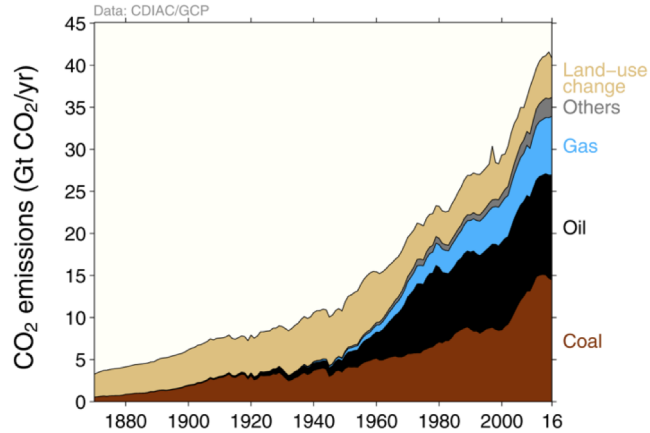
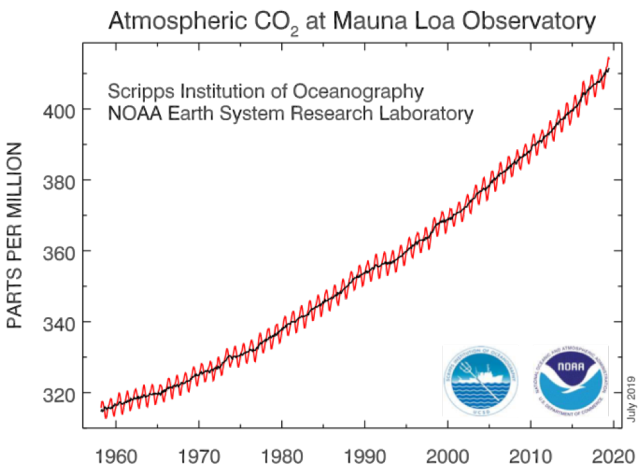
# Climate Change Fact Sheet

Global emissions of $CO_2$, the most important greenhouse gas (GHG), have grown exponentially since the industrial revolution. The large majority of CO2 emissions from industrial activity arise from combustion of fossil fuels (coal, oil, and natural gas), totaled more than 37 billion metric tons (37 $GtCO_2$/year) in 2018, and are projected to grow in the absence of strong action. Emissions from land use change (e.g., deforestation) add another ≈5 GtCO2/year to the total. Deforestation is also increasing globally.



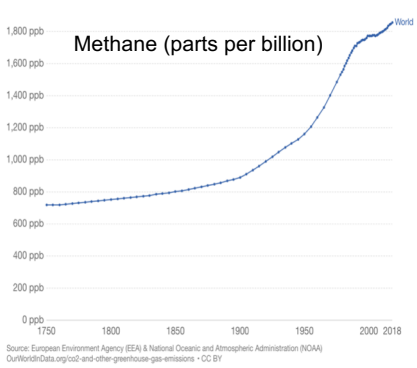

https://unfccc.int/files/adaptation/application/pdf/i.4_gcp_peters.pdf

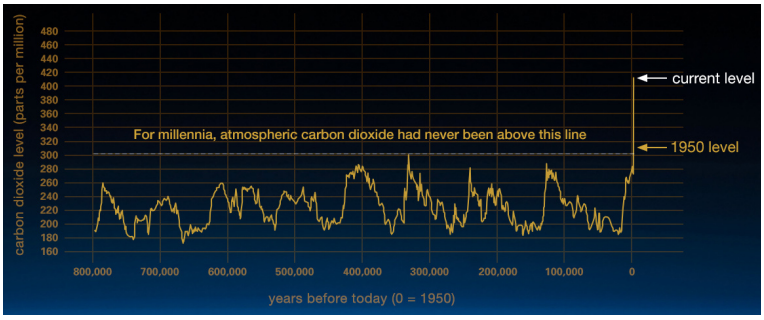



https://www.esrl.noaa.gov/gmd/ccgg/trends/

Approximately half of human $CO_2$ emissions are taken up by the oceans (causing ocean acidification), or by plants on land. The rest accumulates in the atmosphere. As a result, atmospheric $CO_2$ is rising, and now exceeds 410 parts per million (ppm), compared to preindustrial levels of about 280 ppm.

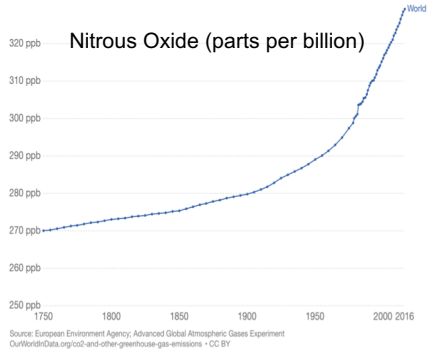
$CO_2$ concentrations today are higher than any time in the past 800,000 years, and likely higher than any time in the past 3 million years, long before humans existed (Willeit et al., 2019, Science Advances, http://dx.doi.org/10.1126/sciadv.aav7337).




https://climate.nasa.gov/evidence/

As seen here, atmospheric concentrations of $CH_4$ and $N_2O$ are growing rapidly.




Other GHGs are also growing rapidly, including methane ($CH_4$), nitrous oxide ($N_2O$), and many species of fluorinated hydrocarbons ("F- Gases"). Together these gases cause about a quarter of global warming today. Molecule for molecule, many of the non-$CO_2$ gases contribute tens, hundreds, or thousands of times more to global warming over the next century than $CO_2$. Many remain in the atmosphere for hundreds or thousands of years.

https://ourworldindata.org/co2-and-other-greenhouse-gas-emissions

CLIMATE INTERACTIVE

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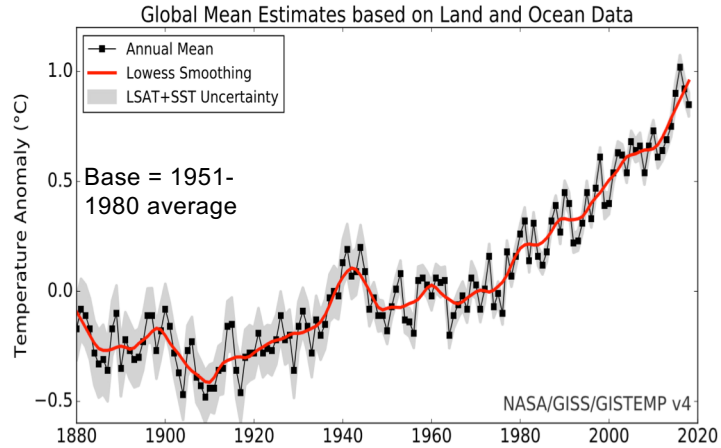
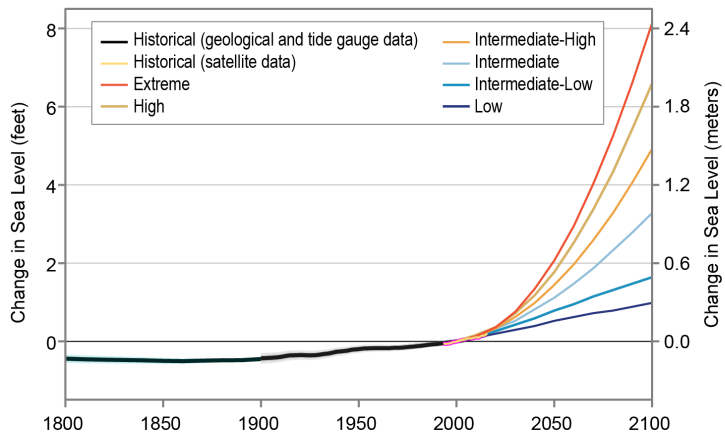
GHGs in the atmosphere trap energy that would otherwise radiate into space. Without natural levels of GHGs the Earth would be about 0°F [-18°C]. But today's high GHG levels mean the Earth radiates less energy to space than arrives from the sun, causing the Earth to warm. The Earth has already warmed approximately 1°C (1.8°F) above preindustrial levels. Warming would be even higher if the oceans were not taking up much of the excess energy.




NASA (GISS) https://data.giss.nasa.gov/gistemp/graphs_v4/

Global warming is already causing sea level rise due to melting of the ice sheets of Greenland and Antarctica, loss of other glaciers, reduced winter snowpack, and thermal expansion of the oceans (warm water is less dense than cold water). Future sea level rise depends on GHG emissions, the sensitivity of the climate to GHG concentrations, and the rate of ice sheet melting, but could be 2 meters (6.5 feet) or more by 2100.




https://nca2018.globalchange.gov/downloads/NCA4_2018_FullReport.pdf

The Intergovernmental Panel on Climate Change (IPCC) projects even 2°C (3.6°F) of warming will cause serious harm to the ecosystems upon which we depend for food, water, and other critical resources. Higher levels of warming caused by delays in reducing GHG emissions are expected to cause "irreversible loss in land ecosystem functions and services required for food, health, habitable settlements and production, leading to increasingly significant economic impacts on many countries in many regions of the world." https://www.ipcc.ch/site/assets/uploads/2019/08/4.-SPM_Approved_Microsite_FINAL.pdf.