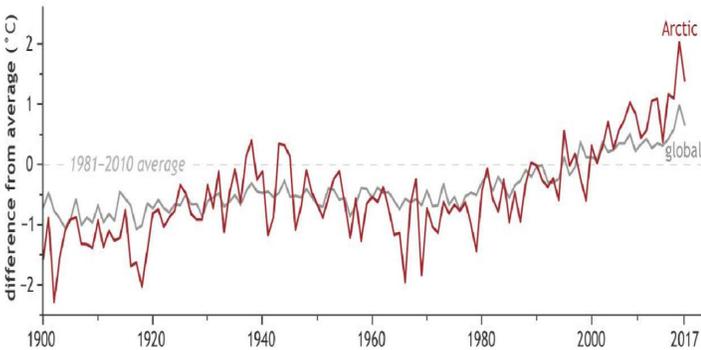


Climate Science and Policy for Nonscientists

One Picture is Worth a Thousand Words.

ARCTIC WARMING TWICE AS FAST AS GLOBAL AVERAGE



NOAA Climate.gov
Data: ARC 2017

Arctic temperatures have in fact been rising faster than temperatures in all the rest of the world since at least the preindustrial period, defined as 1850-1900. Relatively little warming has been occurring in the Southern Hemisphere, South of the equator.

ARCTIC AND ANTARCTIC

Climate change in the Arctic and Antarctic continues to disagree with the predictions of the CO2 Control Knob Theory. Actual Arctic temperatures have been rising significantly more rapidly than the average world temperatures. The IPCC in AR6 states that the warming is twice as great as the average, as shown. [AR6 WGI p.1771 (2021)]

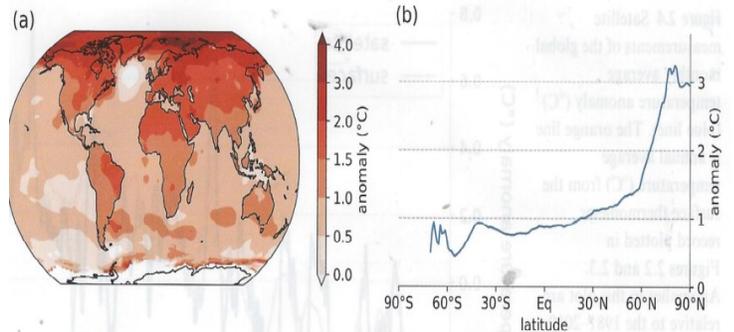
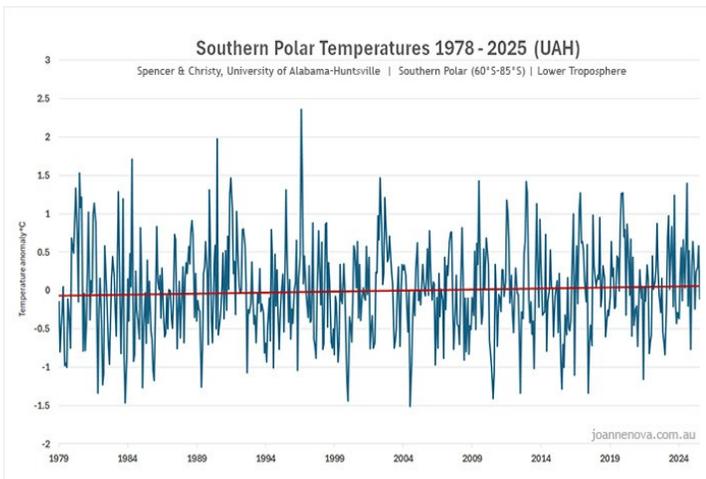
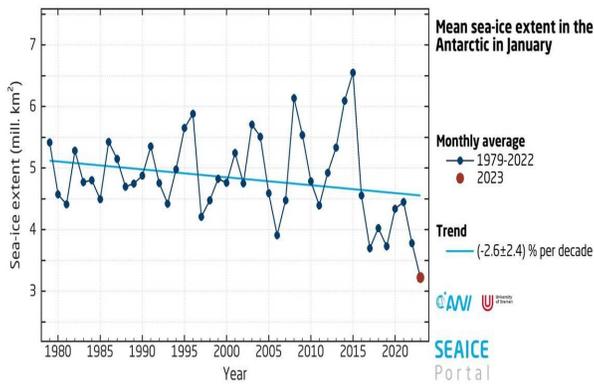
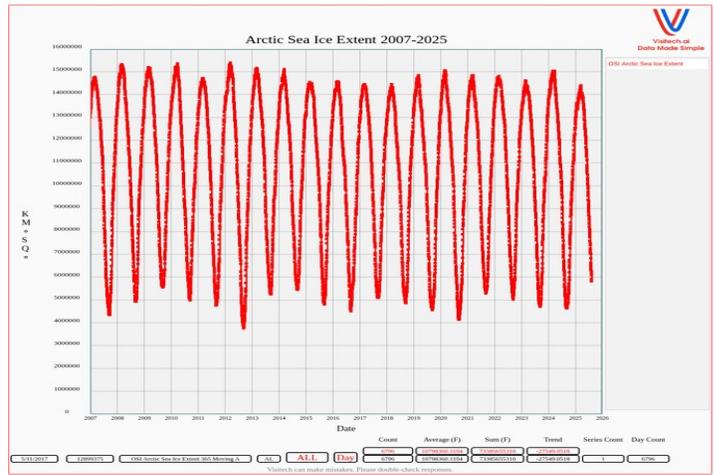


Figure 2.3 The distribution of modern warming (in °C). (a) Spatial distribution of the warming; (b) the warming as a function of latitude. Warming is calculated as the difference between the 1850–1900 average and 2009–2018 average. Data are from Berkeley Earth (<http://berkeleyearth.org/data/>, retrieved October 14, 2020).

The average Antarctic temperature is virtually unchanged over the last 47 years (1978-2025). CO2 is a “well-mixed” Greenhouse gas,” meaning that its concentration is relatively equal all over the world. (AR6 WGI p.5). Therefore the CO2 Control Knob Theory predicts that warming should be the same in the Arctic and Antarctic, which it obviously is not.

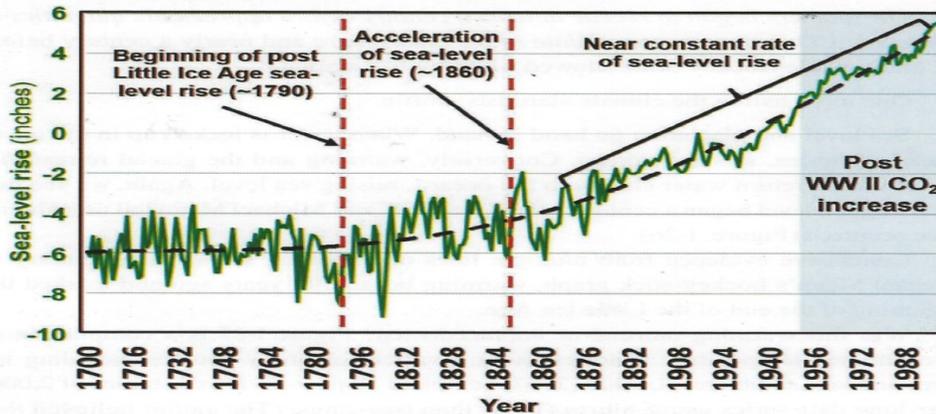


The Arctic warming is supposed to be causing Arctic sea ice to melt, but, as shown, Arctic sea ice has remained virtually unchanged from 2007 to 2025 after having declined significantly from 1980-2007. Nothing significant happened around 2007 with respect to CO2 that might explain this change in sea ice melt rate.



By contrast Antarctic sea ice was virtually unchanged from 1979-2015 but then declined dramatically 2015-2017 and has declined even more since then. These results challenge the generally accepted theory that temperature rise is the principal cause of sea ice loss. The Arctic results suggest that ocean currents are the principal cause. The Antarctic results suggest that storms were the principal cause of the 2015-2017 ice loss. These issues are unsettled with different scientists advocating different theories.

Figure I-26: Greater than 200 years of sea-level rise

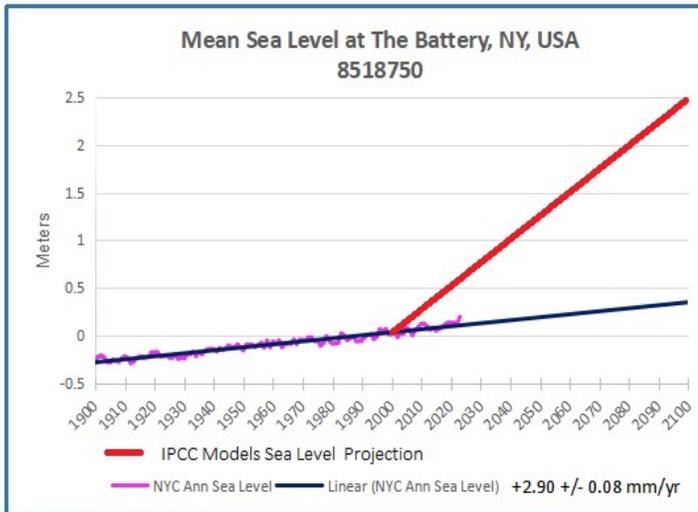
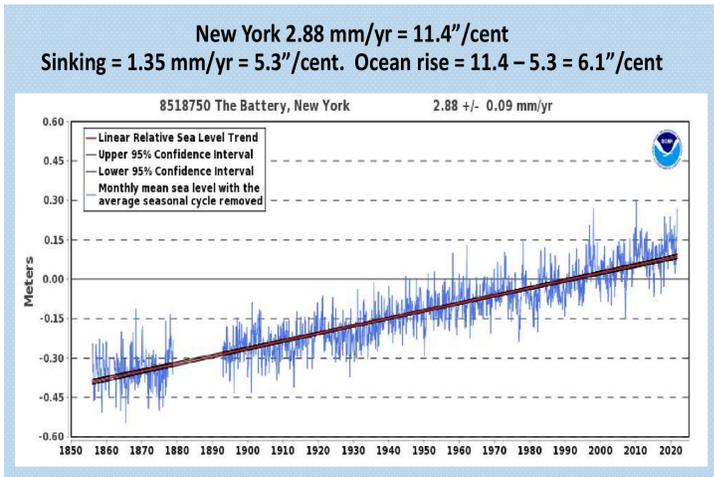


(Source data: Jevrejeva 2008, PSMSL 2008)

SEA LEVEL RISE

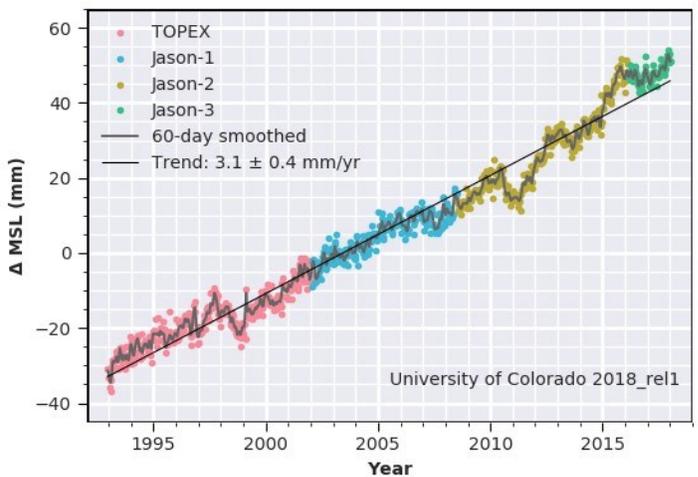
One of the principal reasons to be concerned about melting ice is the contribution it makes to sea level rise. There has been disagreement as to the rate of sea level rise due to the existence of two datasets that show significantly different numbers. Also scientists disagree about whether the rate of rise is accelerating. One dataset is based on tide gauge measurements, which show the relative sea level change as particular points along the shore. As shown above, this dataset indicates that the modern sea level rise started in the mid-1800s, and that it has continued at a relatively steady rate of about 6" per century. But the modern increase in significant atmospheric CO2 only began in the 1950s and has produced no increase in the rate of sea level rise since then, according to the tide gauges.

For example, the New York tide gauge data shows a linear rate of relative rise of 11" per century of which 6" is due to the sea rising and 5" is due to the land sinking. Particular places along the US shoreline, such as the Norfolk Beach, Virginia, area, are sinking much faster than the actual ocean is rising.



There is a long history of models predicting that much greater rates of sea level rise will occur in the future. These models have been given much attention in IPCC reports and in the media. But, year after year, the actual tide gauge data does not show such greater rates occurring.

The second dataset of sea level rise measurements is obtained from satellites and started in 1993. The linear trend line shows a rise of 3.1 mm/yr or 12.3"/century, with no appreciable acceleration. The rate of rise is about twice the rate of rise measured by the tide gauges (6"/century). There is, as yet, no consensus among scientists about why the satellite data is so different from the tide gauge data.



A recurring problem for climate scientists is how to relate the data from different datasets. Generally the older the data, the less reliable and the less comprehensive. Datasets beginning more recently tend to be more accurate, but, since they cover only a relatively short period of time, they will not show natural trends that occur over longer periods of time. And do the different datasets actually measure the same thing? The image shows how rapidly the datasets measuring Atlantic hurricanes have evolved.

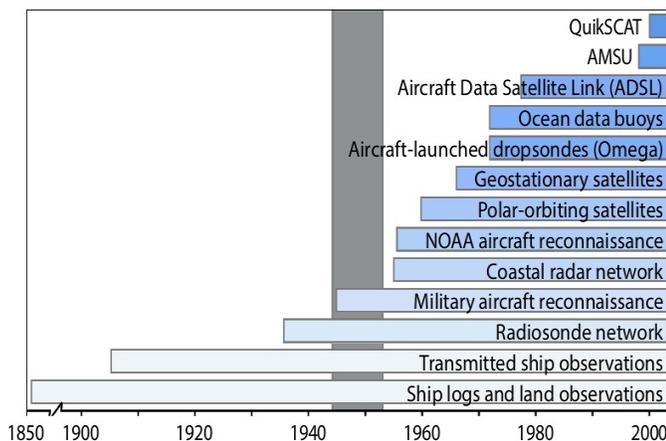
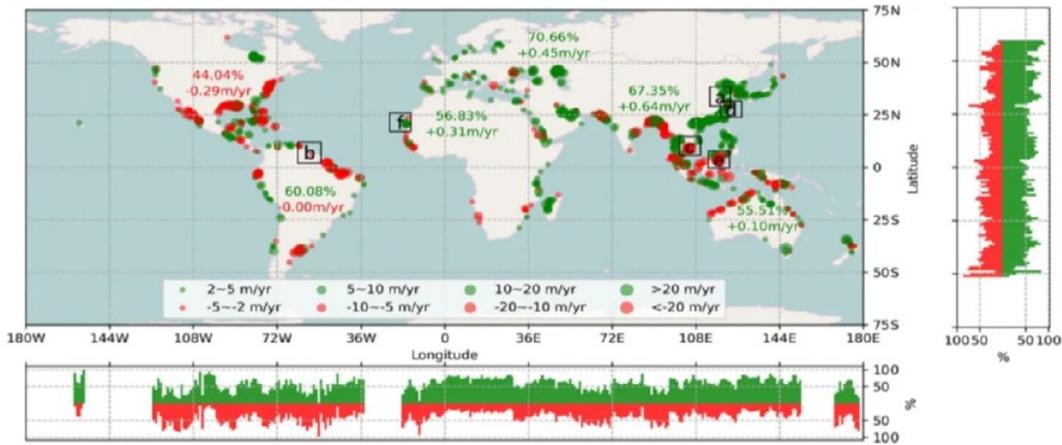


Figure 1: Changes in observational technologies for hurricanes. Adapted from Hagen and Landsea.

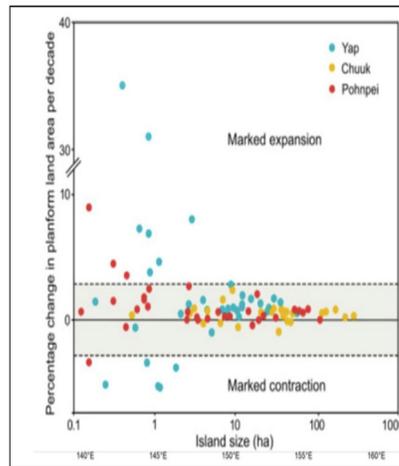


At almost all latitudes and longitudes landification is winning out over erosion and SLR. Figure 9 from [Mao et al. 2021](#).

A number of scientists claim that sea level rise is accelerating, and well known environmentalist Bill McKibben claims that the rate of sea level rise has doubled in the past 10 years. But a group of Dutch scientists recently performed an analysis of over 200 tide gauge stations around the world specifically looking for evidence of acceleration. Their study was published in 2025 and concluded: (1) that the average measured rate of rise in 2020 was about 5.9"/century, (2) that only a "small percentage" of the sites studied showed acceleration, and (3) that IPCC models "significantly overestimate local sea level rise in 2020."

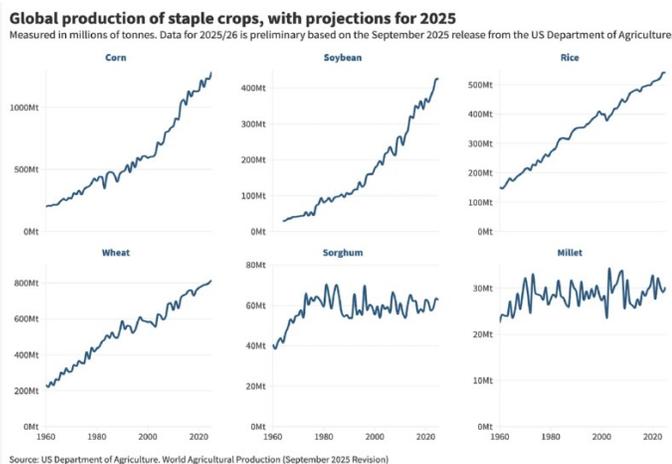
One way to evaluate the danger of sea level rise is to look at the net change in the amount of land worldwide. Sea level rise covers and erodes land, but natural processes also create land, a process known as landification. As shown above by one study, the total amount of land worldwide is net increasing, not decreasing.

And a massive study of over 700 islands in the Pacific and Indian Oceans has found that 73% of the islands were stable in size, 16% were growing, and 11% were shrinking. This study was cited by the IPCC in AR6 WGII p.2055, as supporting its conclusion that over last 3-5 decades the shorelines of reef islands have been stable. (AR6 WGII p.2055).



A 2019 global-scale analysis of 709 islands in the Pacific and Indian Oceans revealed 89% were either stable or growing in size, and that no island larger than 10 ha (and only 1.2% of islands larger than 5 ha) had decreased in size since the 1980s ([Duvat, 2019](#)).

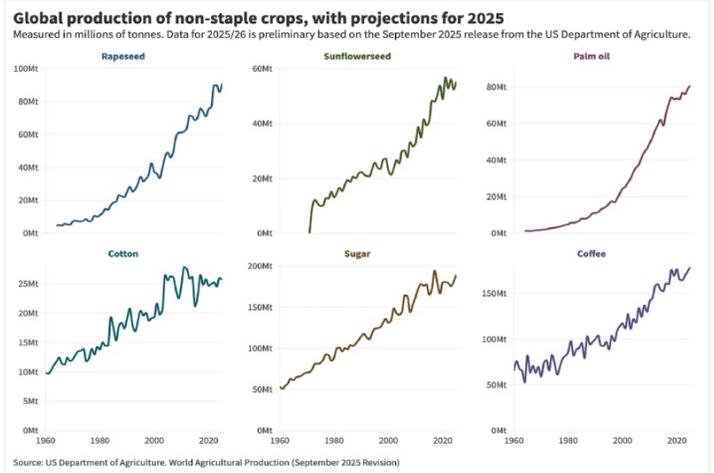
A new analysis of post-2000 trends also indicates global-scale stable to expanding shorelines for hundreds of Pacific and Indian Ocean islands, with over half of the net growth (39 km² of 62 km²) occurring from 2013 to 2017.



FOOD PRODUCTION

In June 2025 CNN published claims that climate change would cut world crop production dramatically, including by as much as 50% in the US. Environmentalist Bill McKibben has warned that corn, wheat and soybean production could fall 40% or more with rising temperature. But Department of Agricultural data through September 2025 shows staple crop production increasing over the last 65 years along with increasing temperature and atmospheric CO₂ levels.

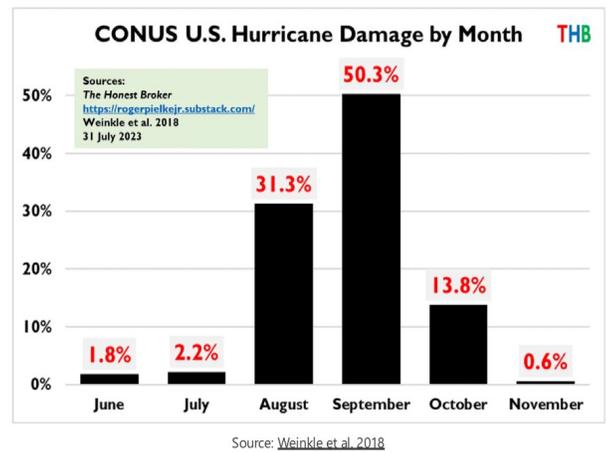
Other important crops (but not considered “staples”) show similar increases in production.



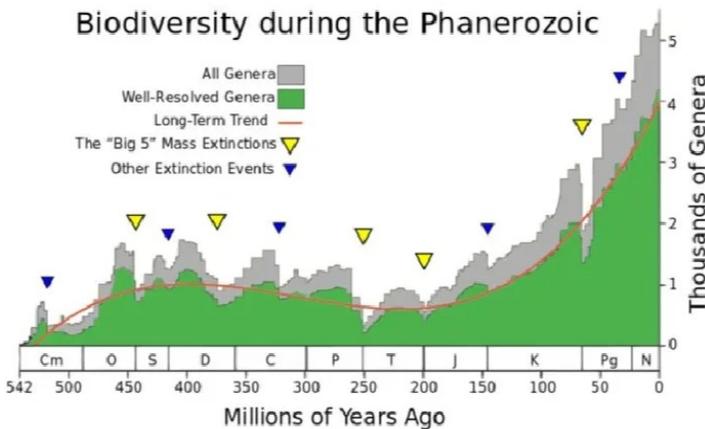
In early summer 2025 German media was issuing dire warnings that a blistering hot summer and severe drought threatened a “dreadful” harvest. With summer now ended, the harvest in Germany has turned out to be significantly better than in 2024. Rising levels of atmospheric CO₂ (plant food) and the moderate levels of temperature rise that has occurred over the last century are causing the earth to “green.” (See CliSciPol Science Topic: Greening World).

HURRICANES

By far the most damage caused by hurricanes striking the US occurs in August and September. We are now more than half way through October, and not a single hurricane has hit the US during the 2025 season. Named storm Chantal, which never reached hurricane strength, and which lasted only three days, hit South Carolina on July 6 before quickly fizzling out. The consensus of scientific predictions was that this season would be more active than average. So far, it has been less active than average.



Biodiversity during the Phanerozoic



BIODIVERSITY

Despite the five mass extinctions that have occurred, world biodiversity has been increasing significantly over the last 542 million years since the Cambrian Explosion. (See CliSciPol Science Topic: Extinctions)

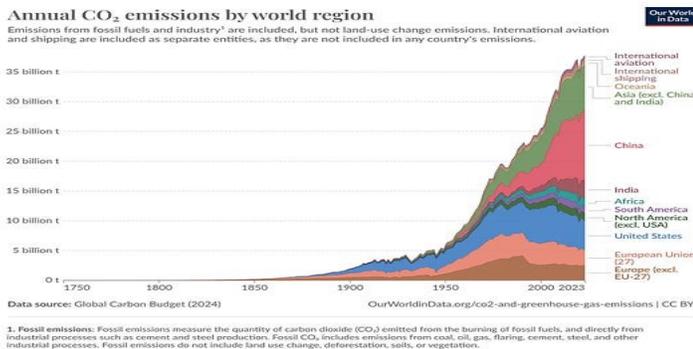
INDOOR AIR POLLUTION

A recent report by the International Energy Agency concludes that about one billion Africans cook over open fires or with fuel that is hazardous to their health and the environment. Two billion people across the world still cook on open fires or with stoves fed by wood, charcoal, agricultural waste, or manure. About 815,000 premature deaths occur each year in Africa alone due to poor indoor air quality, largely resulting from a lack of access to clean cooking. Women and children spend hours each day searching for fuel to keep the fires going. Some studies show that, if coal-fired power plants provided the energy for cooking rather than open fires, it would actually reduce CO₂ emissions and significantly reduce the emission of various air-borne pollutants. As a result, deaths from indoor air pollution would be substantially reduced..



ECONOMIC GROWTH

Human CO₂ emissions first became significant in the world in the 1950s. At the same time human emissions also started to spike upward significantly at a fairly linear rate.



Global GDP is closely correlated to world, human CO₂ emissions. In 2025 Fossil fuels still provide over 80% of world energy. Our standard of living is heavily dependent on the use of fossil fuels.

Global GDP 1500-2024

Total output of the world economy. These historical estimates of GDP are adjusted for inflation.



Chart: The Argument • Source: Eurostat, OECD, and World Bank (2025); Bolt and van Zanden — Maddison Project Database 2023; Maddison Database 2010 — with major processing by Our World in Data • Embed

Citations are to the Intergovernmental Panel on Climate Change's publication, Climate Change 2021 The Physical Science Basis, the first part of the Sixth Assessment Report (AR6).