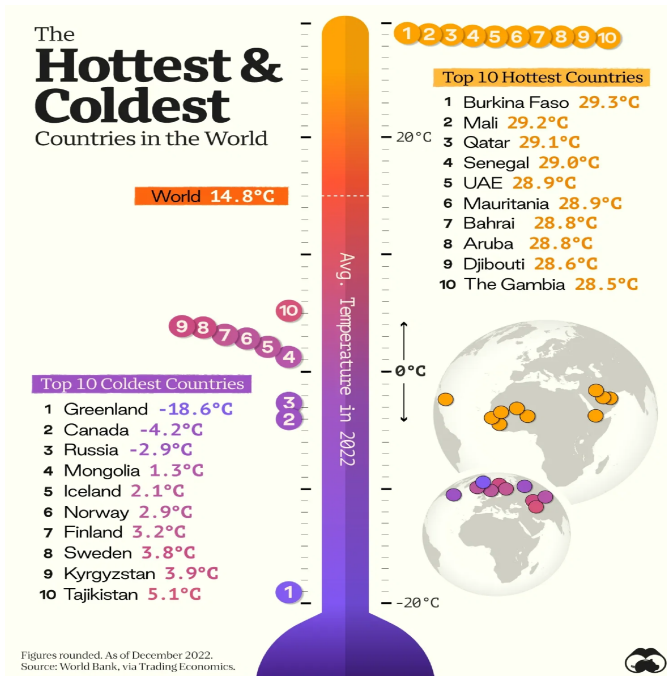


Climate Science and Policy for Nonscientists

One Picture is Worth a Thousand Words.



HOTTEST+COLDEST COUNTRIES

The world is warming at a rate of roughly 2 F per century. To put that number in perspective - the hottest country, Burkina Faso, averages 87, and the coldest, Canada, averages 24, a difference of 63 degrees.

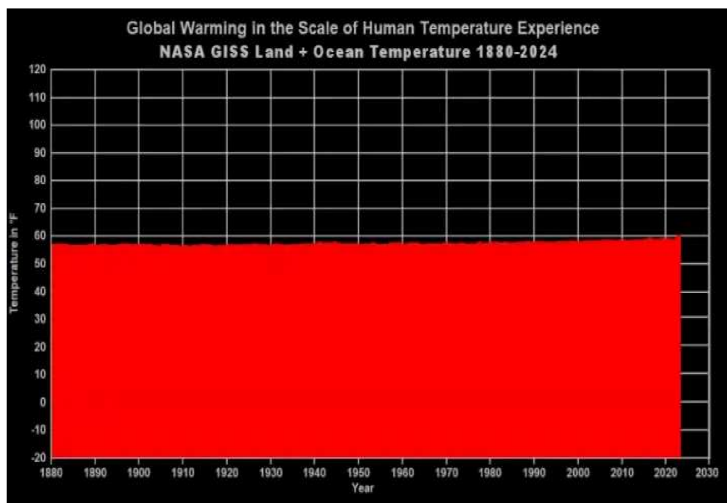
The median temperature of all the world's countries is 74 F, which is significantly higher than the world average temperature of 59 F. The land is significantly warmer than the oceans, which cover 70% of the world's surface, and this explains why the country median is so much higher than the world average.

There follows a limited list of average country temperatures in degrees F from the hottest to the coldest. The countries were chosen to demonstrate the great range of average temperatures among well-known countries:

Burkina Faso	87
Nigeria	81
Brazil	78
India	77
Portugal	61

World ave. 59

Greece	56
Spain	56
Germany	49
Great Britain	49
US	49
Russia	25
Canada	24
Greenland	-02
Antarctic	-46

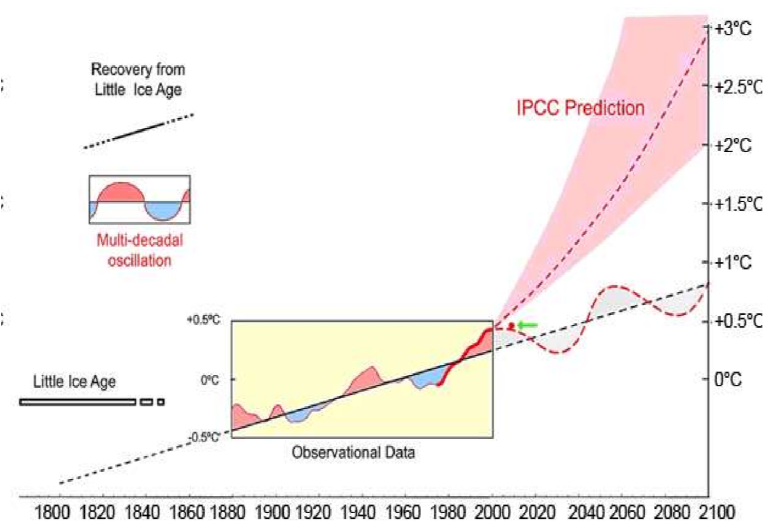


The IPCC in its most recent Assessment Report concluded that the world had warmed about 2 F from the pre-industrial period (1850-1900) to the decade 2010-2020 (AR 6, p.5), and it has warmed a little more since then. The rate of warming has been approximately 2 F per century. From 1880 to the present the world average temperature has risen from 57 F to 59F, as shown by the graph.

The IPCC in its first Assessment Report in 1990, applying the science of the day, found nothing unusual about the warming over the prior 100 years. (AR1, p.80)

IPCC #1 1990 REPORT - CONCLUSION ON CAUSATION

- “The size of [the warming over the last 100 years] is broadly consistent...with natural climate variability.
- Thus the observed increase could be largely due to this natural variability.”



This graph shows a linear, trend-line prediction of world temperatures rising at the rate of about 2 F (1 C) per century. In 1987, three years before the first Assessment Report, James Hansen, then director of NASA’s Goddard Space Center, published an article predicting that burning fossil fuels would increase global temperatures by about 5 F (3 C) by 2100. This is the basis of the line in the pink cone on the graph. For at least 39 years, alarmists have been predicting accelerated temperature rises of that magnitude, but such accelerations have never happened.

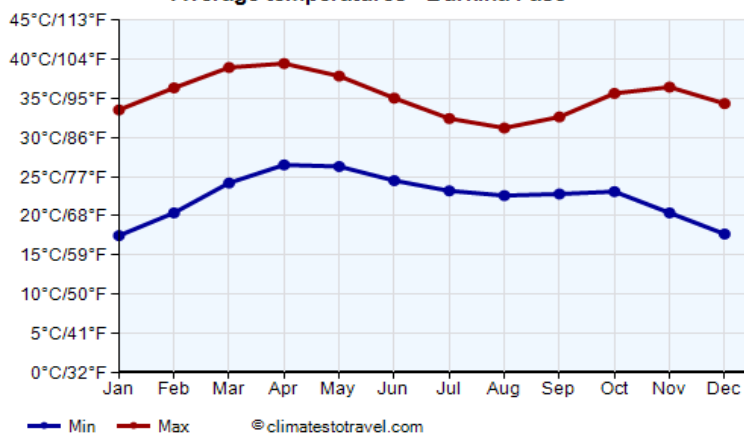
Rather the rate of rise has remained roughly constant at the prior 2 F per century. If the world average temperature rises another 2 F by 2100, what difference will it make? The US average temperature might rise from 49 to 51, which is still 8 F less than the present world average 59 F.

If a person moves South in the US about 100 miles, the average temperature increases 2 F. The average temperature of Boston is 51 F and of Miami 78 F, and Massachusetts retirees routinely move to Florida, because, among other things, they prefer the climate.

The world's hottest country is Burkina Fasao (the former Upper Volta), which is landlocked in Western Africa just South of the Sahara Desert. It has an average temperature of 87 F, which is 28 degrees higher than the world average of 59 and 38 degrees higher than the US average of 49. Does that high temperature have a negative effect on Burkina Fasao?

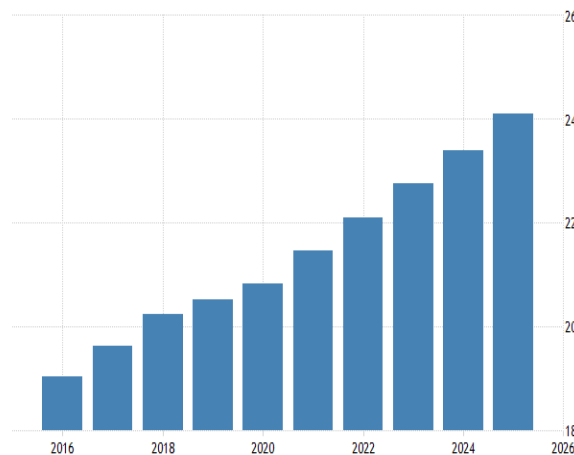


Average temperatures - Burkina Faso

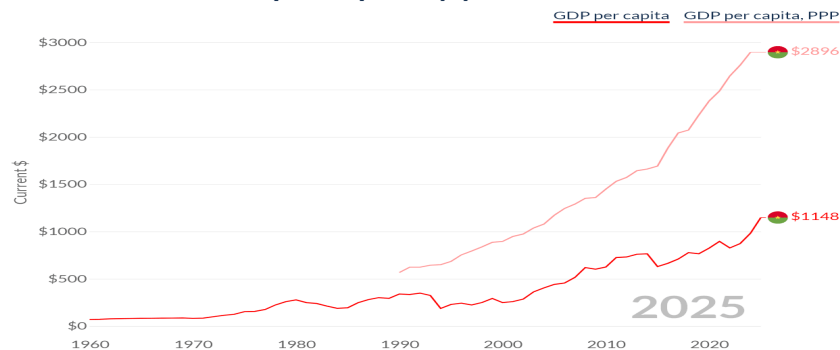


In Burkina Fasao each month, March through May, has an average maximum temperature over 100 F.

Despite these temperatures the population has been steadily growing and is presently 24.6 million. Life expectancy has increased from 36 years in 1960 to over 60 years. Burkina Fasao is about the size of Colorado, which has a population of only 6 million, and about the size of Nevada, which has a population of only 3 million.

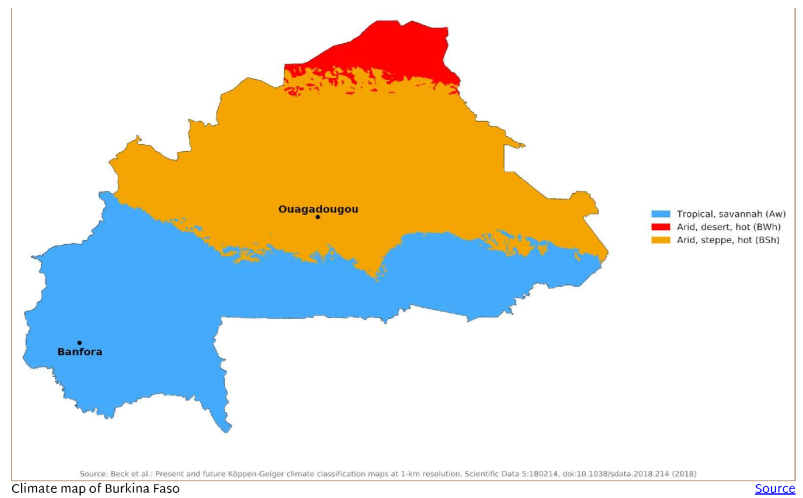


Burkina Faso GDP per capita by year



Burkina Fasao's per capita GDP has been steadily growing, and, when adjusted for differences between the cost of living in various countries (GDP per capita, PPP), it is growing even faster.

The country has 3 basic climate zones from North to South: arid-desert, arid-savanna, and tropical savanna.



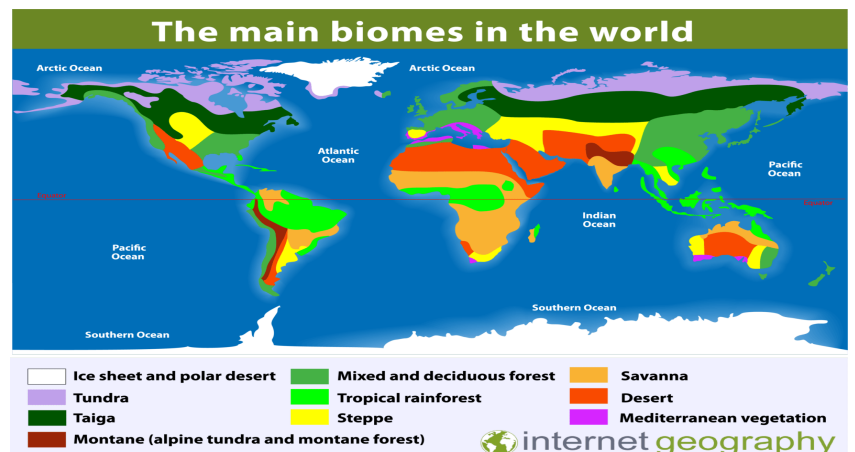
Climate map of Burkina Faso

[Source](#)

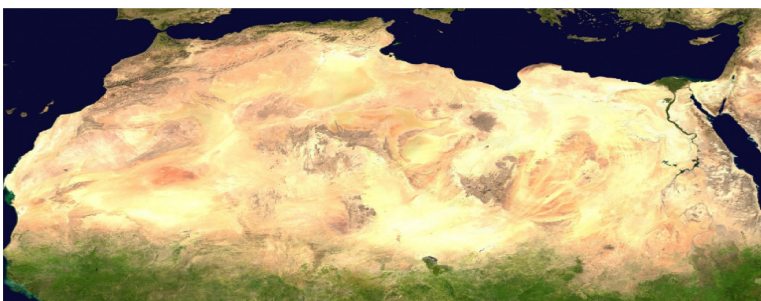


The image gives a sense of African savanna.

Approximately half of Africa is savanna.



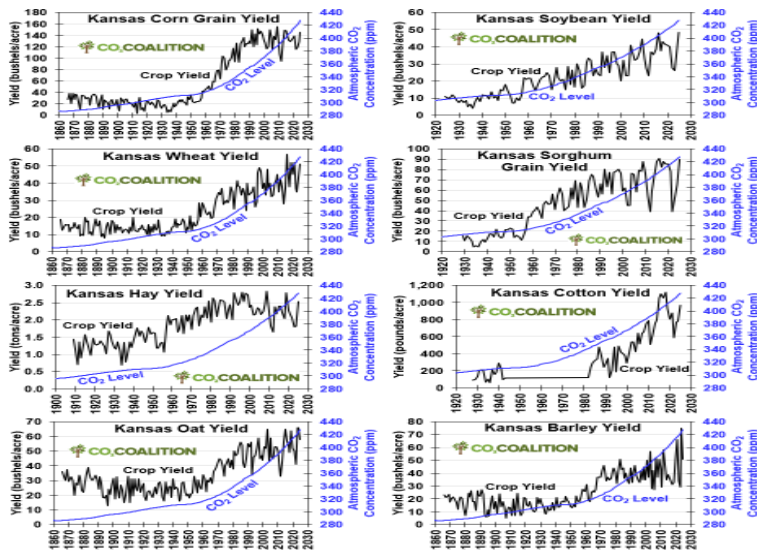
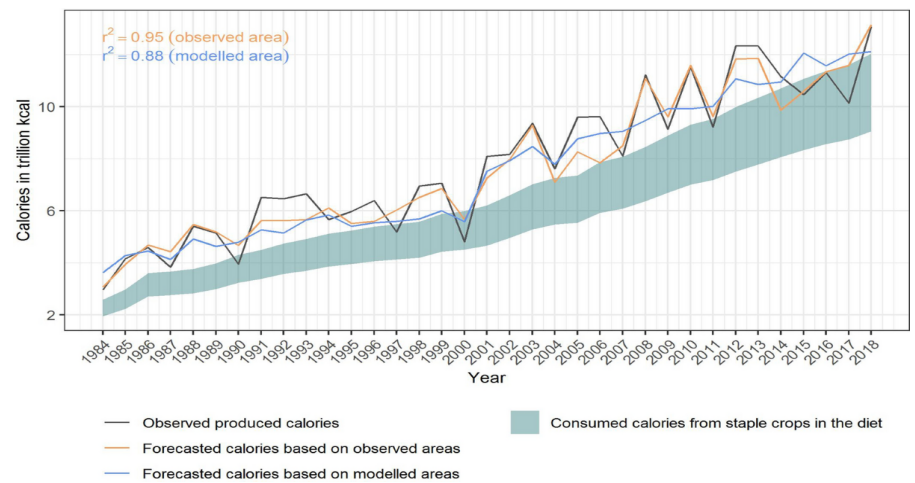
Using satellite images, Venter et al. 2018 found an eight percent increase in woody vegetation in sub-Saharan Africa over the last three decades, underscoring the global “greening trend”.



Recent study by Venter et al finds that the Sahara has shrunk by 8% over the past three decades. NASA image, public domain.

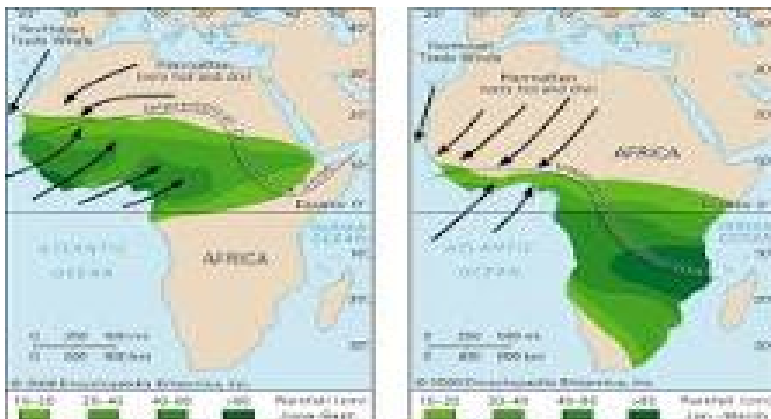
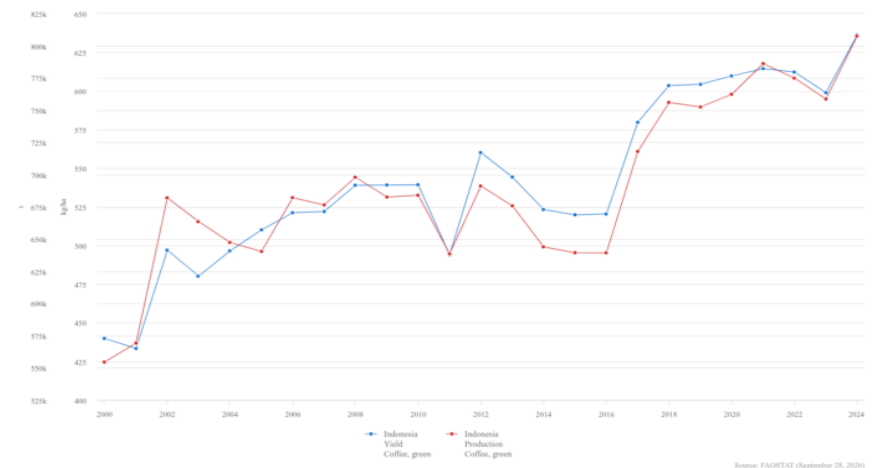
The country is benefitting from the greening occurring along the southern rim of the Sahara, primarily as a result of rising levels of atmospheric CO₂. A study of the Kruger National Park (South Africa), which is mostly savanna, found a 28% increase in plant growth 1989-2021 with CO₂ increase the “main factor.” (And see CliSciPol science topic: Greening World).

The country has been making significant progress in increasing food production.



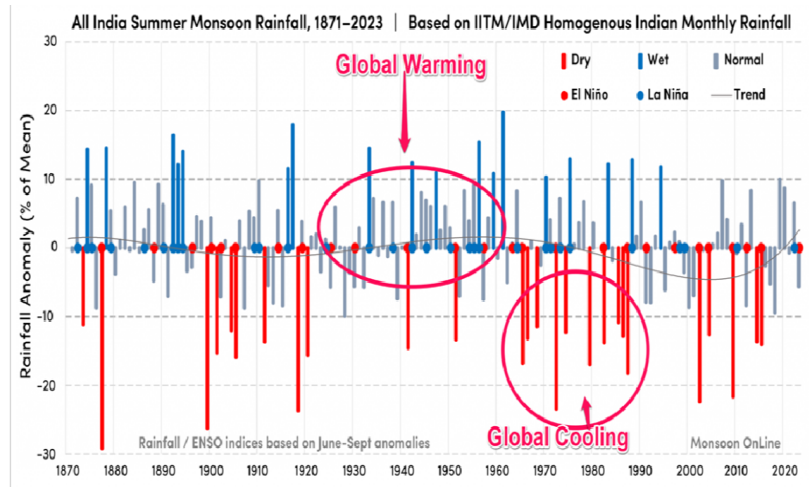
Kansas is a particularly hot and dry US state. The Wichita area recorded 28 days over 100° this past summer. (Kansas had 53 days over 100° in 1936 during the Dust Bowl.) Nevertheless Kansas crop yields have been significantly increasing, particularly since around 1960 when atmospheric CO₂ levels started to rise significantly.

Another example of increasing agricultural production in a hot country is Indonesia, which has an average temperature of 79 F. One of its principal agricultural products is coffee. Both the coffee yield per acre and overall production increased dramatically from 2000 to 2024.



Perhaps Burkina Faso's main weather blessing and curse is the annual rain/drought cycle of the African monsoon. The heavy rains of the monsoon season are essential for agriculture, but they often bring floods, as has been the case for many hundreds, if not thousands, of years.

Monsoon rainfall varies with the El Nino/La Nina cycle, but, overall, at least since 1870, there has been little upward or downward trend in total rain. The worst year (least rain) was in 1877, causing the Great Famine in India and Pakistan when over seven million people starved to death.



CONCLUSION

Burkina Fasao's main problem is poverty, not climate change. Per capita GDP presently ranks 170th out of 190 countries in the world. Its economy is pre-industrial with 80% of the population farmers. Despite the number of the farmers, the country has still not achieved food self-sufficiency. The government is making major efforts to increase the use of modern agricultural machinery and fertilizers to improve crop yields.

Only 20% of the population has access to electricity, but the World Bank and the African Development Bank have refused to make loans to African countries to finance power plants using fossil fuels. This refusal has been condemned as hypocritical, because developed countries continue to build large numbers of such plants. In 2025 natural gas provided about half of New England's power generation, and wind and solar only 8%. Massachusetts' Democratic Governor Healey is now pleading with the Trump Administration to expedite permits for pipeline construction to bring more natural gas to Massachusetts.

A recent survey of Africans asked them to rank 34 issues facing their countries in order of importance. Africans ranked climate change 31st.

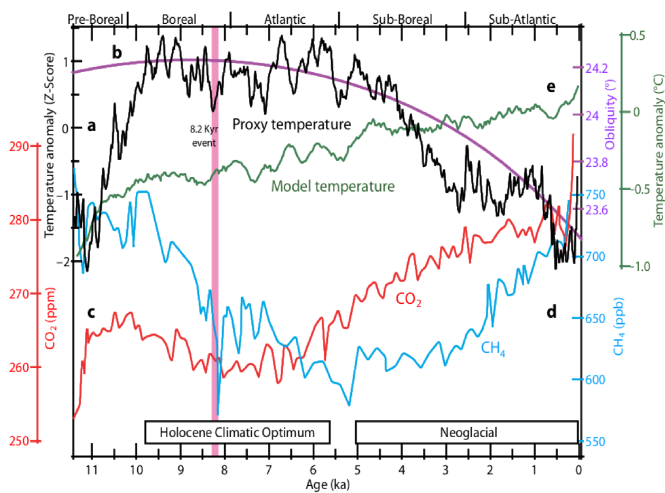
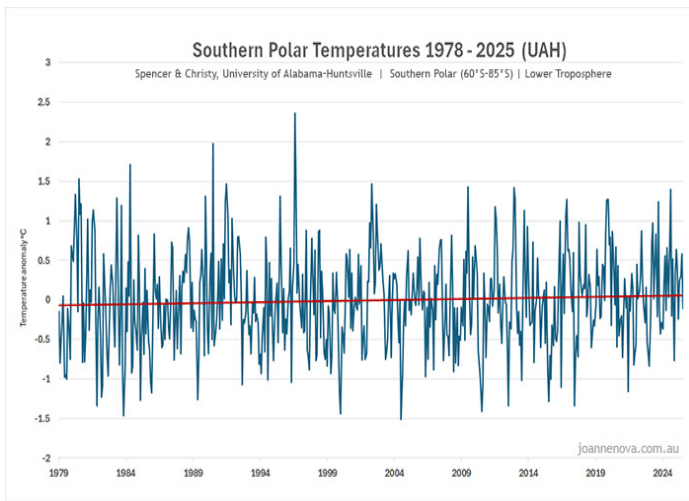


Fig. 4.5 Temperature and greenhouse gases during the Holocene

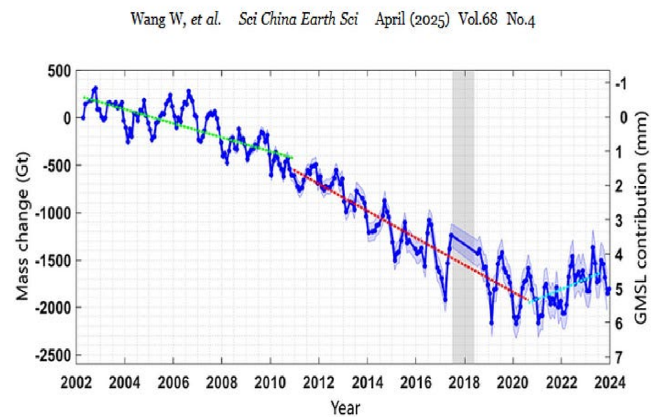
During the Holocene Interglacial, which began about 11,000 years ago the world was significantly warmer than today, and these higher temperatures led to human flourishing. The Holocene Climatic Optimum, as shown, was roughly 4 F (2 C) warmer than today. The warmer climate resulted in the beginning of the Agricultural Revolution, based on the farming of crops such as wheat, barley, and various legumes along with the domestication of sheep, goats, cattle, and pigs. This, in turn, led to the rise of populations and the appearance of towns and cities, and eventually the world's first empires and civilizations in the warm climates of Mesopotamia and Egypt. Temperature rise and decline during the Holocene were not correlated with the rises and declines of the greenhouse gases CO₂ and CH₄ (methane).



ANTARCTIC, SEA LEVEL RISE, UPDATE

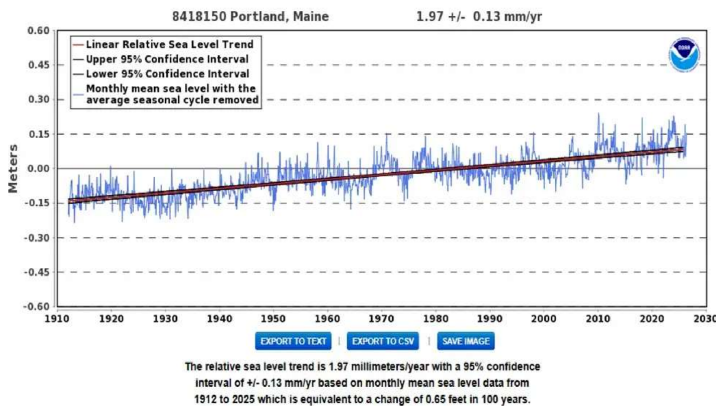
The Antarctic has been warming at only a trivial rate, far slower than the global average of around 2 F per century. This contradicts the CO2 Control Knob Theory, which predicts that the temperature rise over the polar regions should exceed world average temperature rise. CO2 and CH4 (methane) are “well-distributed” gases, e.g. the concentration over the Antarctic is roughly the same as over the rest of the world, so the Antarctic temperature rise should be at least comparable to the rise over the rest of the world.

Studies have shown that the Antarctic Ice Sheet (AIS) was shrinking until around 2020 but, since then, has been growing. Now one 2026 study has calculated that the sea level rise from 1992 to 2020, attributable to the AIS shrinkage, was trivial, only 0.3 inches, which adjusts to 1.1 inch per century. Another 2026 study has calculated that the sea level rise from 2003 to 2024, attributable to AIS net shrinkage, was only 0.15 inches or 0.7 inches per century. This study also confirmed the gain in the AIS since 2020. Yet another study has concluded that over the period 2020-2024 the net of the AIS ice gain and Greenland ice loss together resulted in a rate of sea level rise of only 0.9” per century.



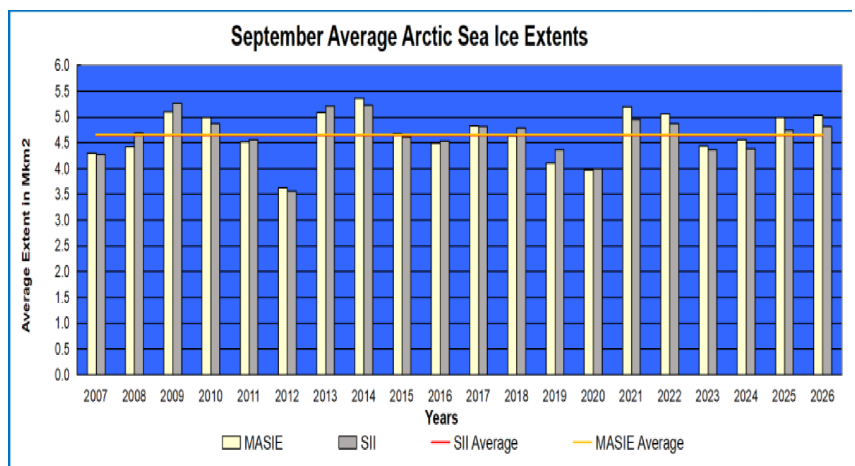
Mass change series for the AIS from April 2002 to December 2023. The grey shadow shows the gap between GR

Tide gauge data through 2025 shows sea level rising only at a slow and steady rate. The data shown here for Portland, Maine, shows a rate of rise of 0.65 feet or 8 inches per century. This is typical for coastal areas where the land is not rising or sinking significantly. The principal cause of sea level rise (about 50% of the total) is thermal expansion. (AR6, p.11). This historical rate of sea level rise has, in general, not caused significant problems worldwide.

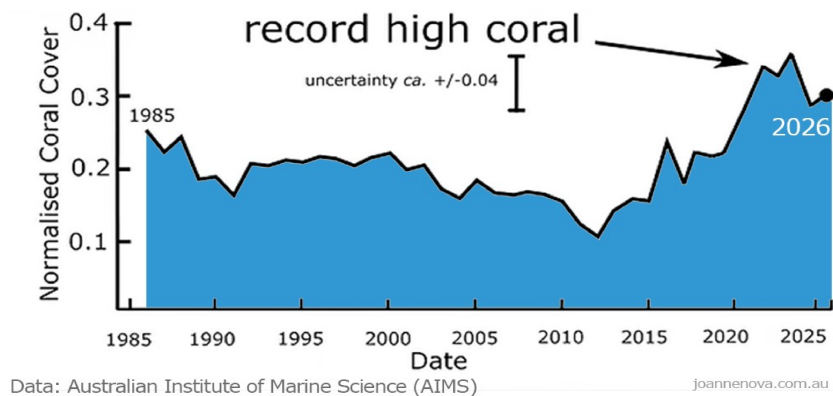


ARCTIC UPDATE

September is the month of minimum sea ice in the Arctic. The data for September 2026 from two satellite data sets is now available. As shown, the extent of Arctic September sea ice has been virtually unchanged for 19 years, and the years 2025 and 2026 were slightly higher than the average for the period.



Great Barrier Reef Coral Cover



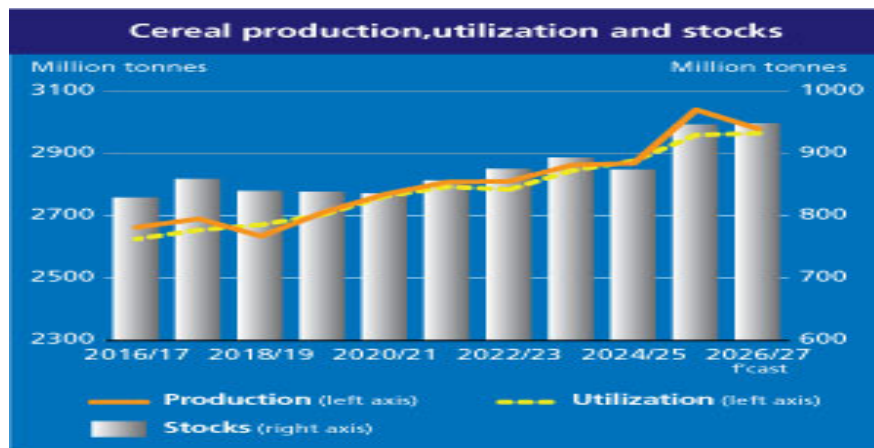
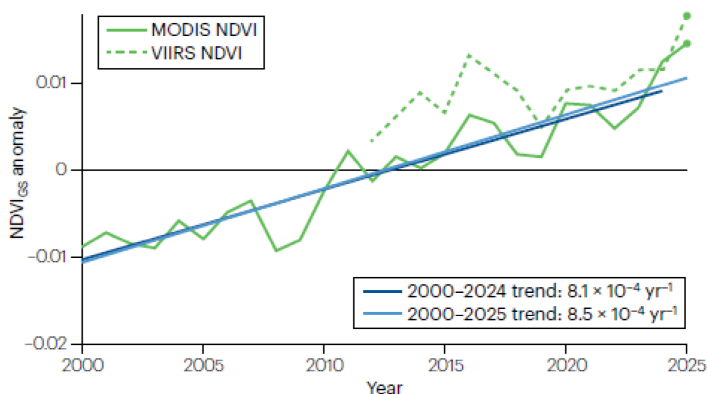
CORAL UPDATE

The Australian government has now released the data for fiscal year 2026 on coral coverage on the Great Barrier Reef. Coverage has increased from 2025 after a decline from 2024 to 2025. But all years since 2021 have been the highest ever recorded since the data set began in 1985, and there is a clear upward trend since 2012.

GREENING UPDATE

There are two satellite systems that track the World Vegetation Index. Results through the end of 2025 have now been published and show that greening has reached a record high: 60% of world forests are greening, 72% of grasslands, and 78% of crop lands. One of the few areas to show browning is Eastern Siberia, where the browning has been attributed to anomalous cold. One positive effect of rising world temperatures is that the boreal (Northern) forests have expanded northward, increasing overall area by 12% from 1985 to 2020 according to a recent study.

a Global mean NDVI_{GS}



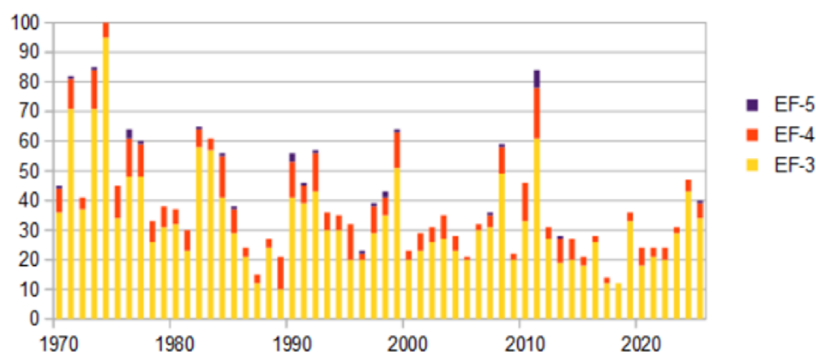
While the UN IPCC continually predicts future decreases in food production due to climate change, the UN Food and Agriculture Organization continually documents actual increases in food production.

TORNADO UPDATE

The frequency of strong tornadoes in the US was down slightly in 2025 from 2024. The trend from the unusually low year 2019 has been upward, but there was a more pronounced upward trend from 2001 to 2012, and the overall trend since 1970 has been clearly downward with significant cyclical variation.

Annual US Tornado Count EF-3 and Stronger

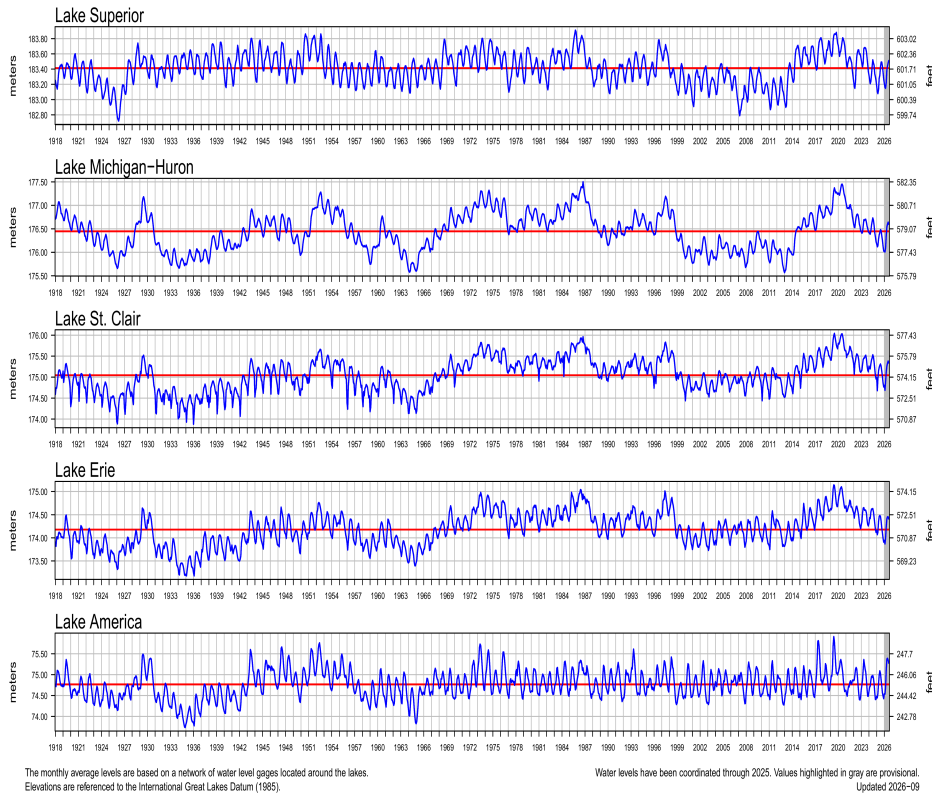
1970 to 2025





Great Lakes Water Levels (1918–2026)

— Monthly Mean Level — Long Term Average Annual



GREAT LAKES UPDATE

The water levels of some lakes, such as Lake Mead and Lake Powell in the US South-West, vary significantly over time due to cyclical drought conditions and due to increased human water withdrawals. Those two lakes are presently at unusually low levels. But water levels in all of the Great Lakes have been remarkably stable for over 100 years. The vertical axes of the graphs do not go to zero. For example, for Lake Superior the vertical axis only goes from 182.60 meters to 184.00 meters. The lowest ever recorded in the period covered was a little more than 182.60 in 1926 and the highest was a little less than 184.00 in 1986, so the swing from lowest to highest was less than 0.8%.

7. Global precipitation

The stability of the Great Lakes' water levels is consistent with global data showing virtually no change in precipitation. This contradicts a key assumption (increasing atmospheric humidity and cloud cover) of the models that calculate dangerous global warming.

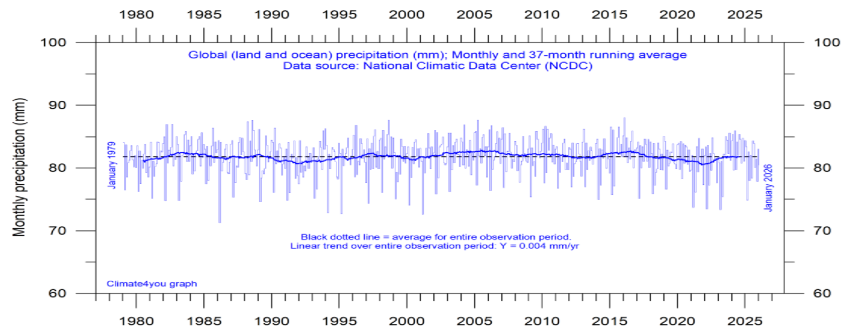


Figure 9: Global precipitation 1979 - 2026.

ATLANTIC BASIN STORMS 2026 TO OCT. 13

	<u>Number</u>	<u>Multi-year Average</u>
Tropical Storms	9	11.6
Hurricanes	1	5.7
Major Hurricanes	1	2.5
Accumulated Energy	18	97

HURRICANE UPDATE

Isais became a tropical storm on October 6. When it was upgraded to a hurricane on Oct. 8, it became the first Atlantic hurricane of this season, but it rapidly lost strength and lasted as a tropical storm only until Oct. 10. The last time there was a season with such a late first hurricane was 1905, which was 121 years ago. This remains an extraordinarily inactive Atlantic hurricane season.