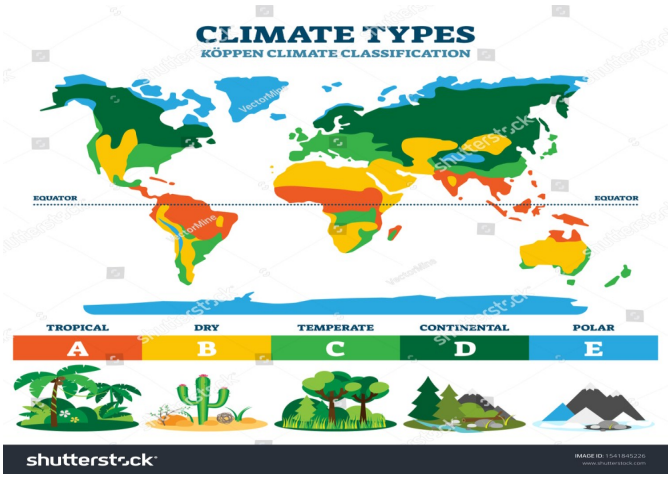
September 2025

CliSciPol

Climate Science and Policy for Nonscientists

One Picture is Worth a Thousand Words.

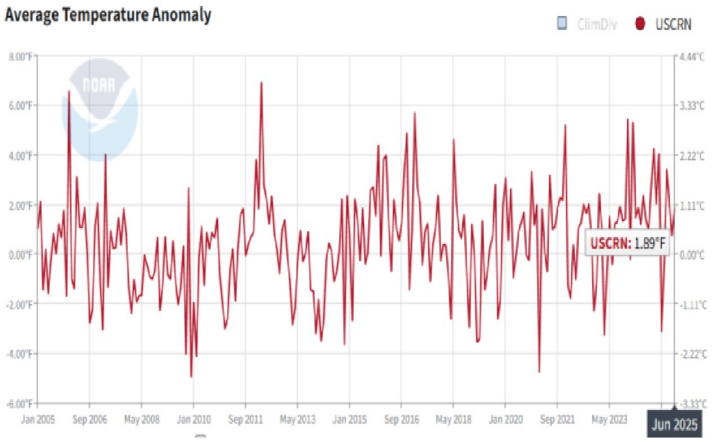


Regional Climates

The world's average climate is a statistical construct that does not actually exist anywhere. Scientists divide the world's land into five basic regions, each of which has a significantly different climate from the others. If world average temperature rises, to assess the effect scientists must determine in what regions the rise actually occurs and how it affects the particular region. A temperature rise may be beneficial in one region and harmful in another, and a third region may have

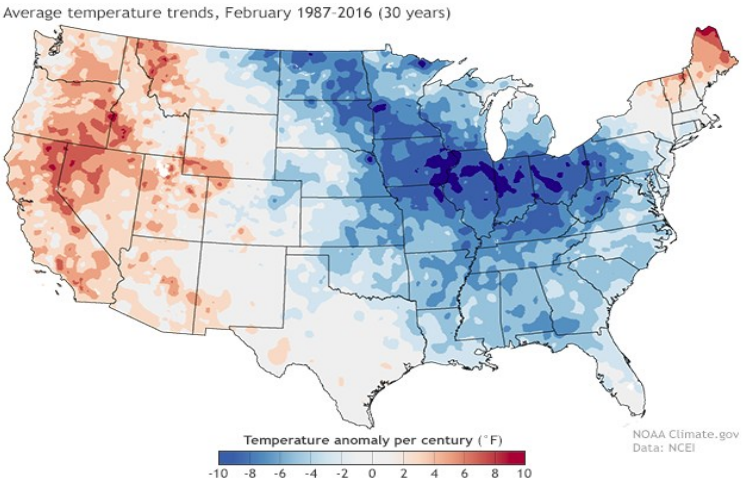
US scientists divide the continental US into seven regions. Obviously a one degree increase in temperature will have a different effect in the Northeast Region from the same increase in the Southwest Region.

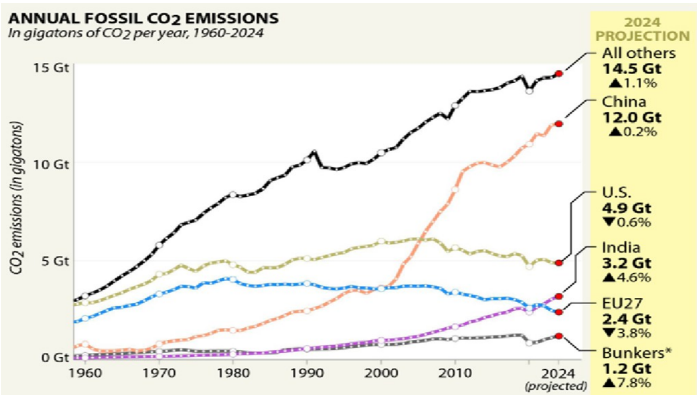
Figure 1: *National Climate Assessment Regions. USGCRP (2018)*



Average temperatures can be deceptive. For example, the US government's most accurate data set shows no temperature change for the continental US since 2005, when the data set first began collecting data, to June 2025.

But the average conceals that the Western US and Northern New England have been warming while the Eastern and Central US have been cooling. CO2 and methane are considered "well -distributed" greenhouse gases, so the green-house gas concentrations are roughly the same in the Western US as in the Eastern and Central US. The difference in temperature can not be explained by the greenhouse effect.





The US has been reducing its CO2 emissions. Most of the increase in CO2 emissions is coming from China, India, and other non-European countries. The reality is that there is little that the US can do to reduce climate change that is caused by greenhouse emissions. And there is nothing the US can do to stop climate change that is caused by natural variability. In the US studies are increasingly analyzing not only the climate in a particular region, but also the climate in a single state. Such studies can be of great assistance to state governments in considering various forms of adaptation to climate change and to weather.

A study of the Texas climate, published in 2025, found that there has been basically no change in average temperature in Texas since 1895.

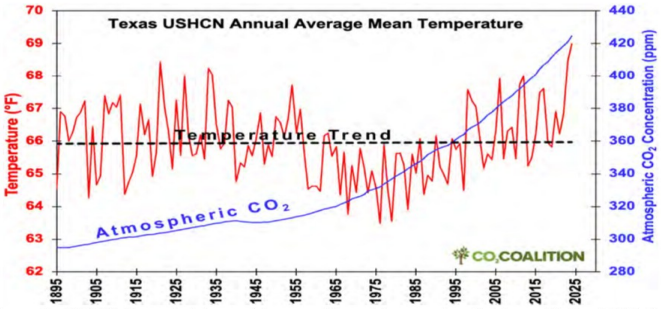


Figure 3: *USHCN Corrected Annual Average Mean Temperature in Texas, Plotted With the Atmospheric CO_2 Concentration. Temperature: NOAA National Centers for Environmental Information (2025d), CO_2 concentration (1958 and prior): NASA Goddard Institute for Space Studies (2018), CO_2 concentration (1959 onward): Lan and Keeling (2025) (NOAA)*

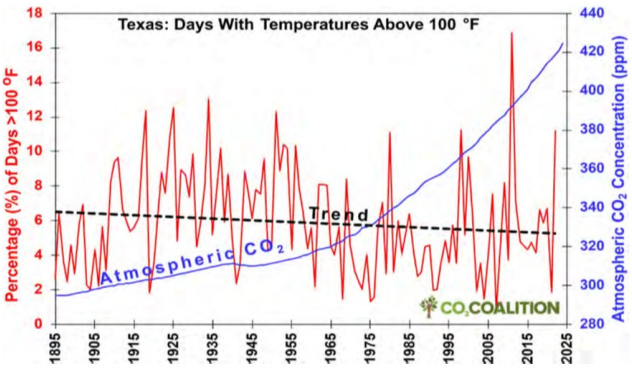


Figure 6: *USHCN Average Maximum Temperature in Texas, Plotted With the Atmospheric CO_2 Concentration. Temperature: NOAA National Centers for Environmental Information (2025d), CO_2 concentration (1958 and prior): NASA Goddard Institute for Space Studies (2018), CO_2 concentration (1959 onward): Lan and Keeling (2025) (NOAA)*

The number of days of extreme heat (over 100 F) have declined since 1895

Rainfall has increased slightly. Since Texas has basically a dry climate, this change is beneficial

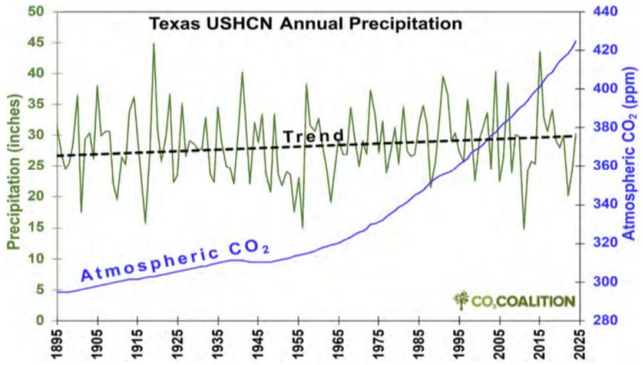


Figure 7: *Annual Precipitation in Texas, Plotted With the Atmospheric CO_2 Concentration. Precipitation: NOAA National Centers for Environmental Information (2025d), CO_2 concentration (1958 and prior): NASA Goddard Institute for Space Studies (2018), CO_2 concentration (1959 onward): Lan and Keeling (2025) (NOAA)*

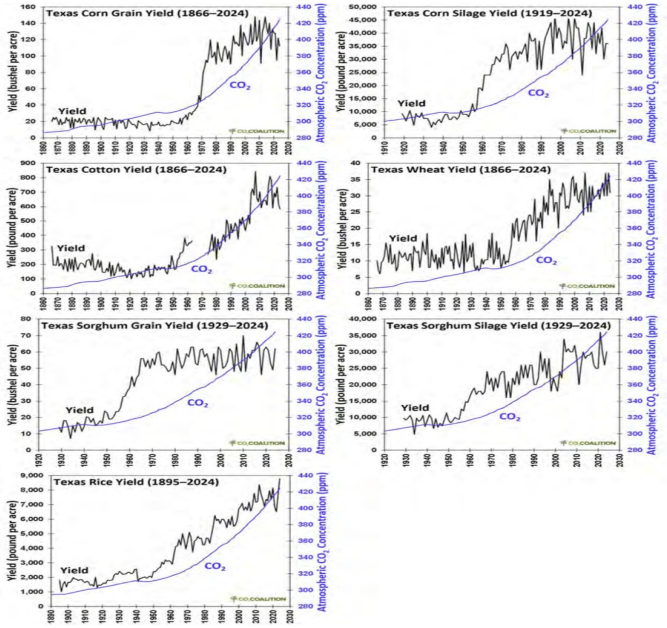


Figure 17: *Primary Crop Yields in Texas, Plotted With the Atmospheric CO_2 Concentration. Crop yield: USDA National Agricultural Statistics Service (2025), CO_2 concentration (1958 and prior): NASA Goddard Institute for Space Studies (2018), CO_2 concentration (1959 onward): Lan and Keeling (2025) (NOAA)*

Since CO2 is both a plant food and a plant fertilizer, rising atmospheric CO2 levels have contributed to increasing crop yields in Texas.

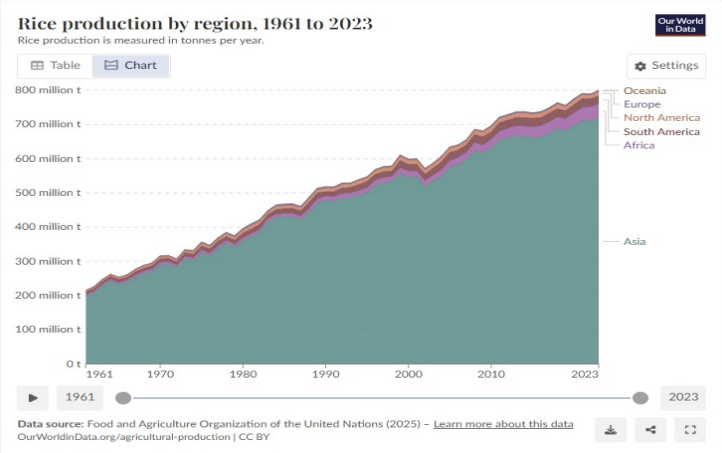
Using satellite images, Venter et al. 2018 found an eight percent increase in woody vegetation in sub-Saharan Africa over the last three decades, underscoring the global "greening trend".

The world in general is greening. For example, over a recent 30 year period the Sahara shrank in area by 8% due to the greening along its Souther rim.

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

Greenhouses routinely uses CO2 generators to increase the CO2 concentration, because it significantly speeds plant growth and yield.

Crop yields are increasing not only in Texas but around the world. The amount of increase in crop yield varies with the particular crop. The image shows the global increase in rice production per year since 1961.



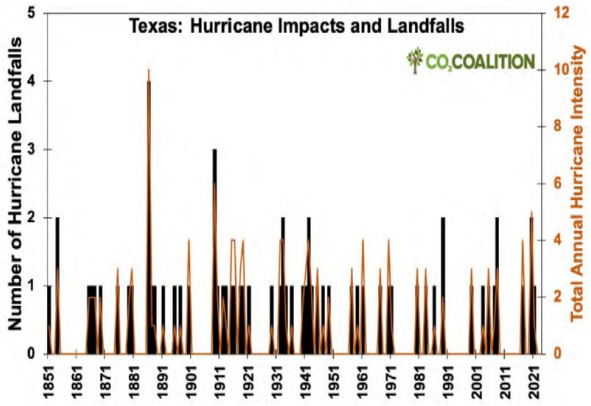


Figure 13: *Annual Number and Total Intensities of Hurricane Impacts and Landfalls in Texas. NOAA Atlantic Oceanographic & Meteorological Laboratory (2024)*

While Texas is regularly hit by hurricanes, there has been no increase in landfalls or impact since 1851.

The number of powerful tornadoes that hit Texas per year is declining.

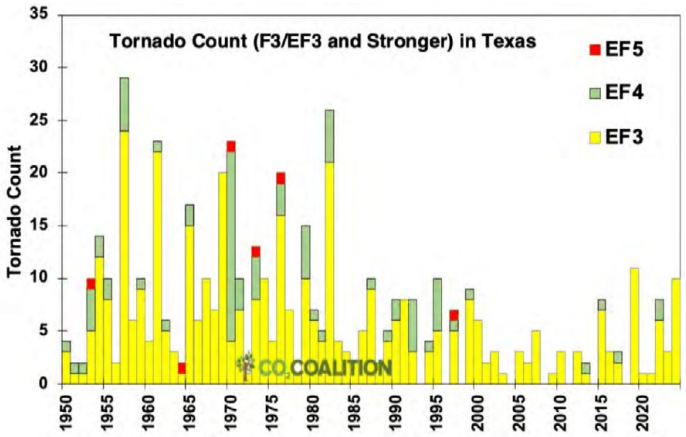


Figure 11: *Annual Reported Number of Tornadoes in Texas. NOAA National Centers for Environmental Information (2025c)*

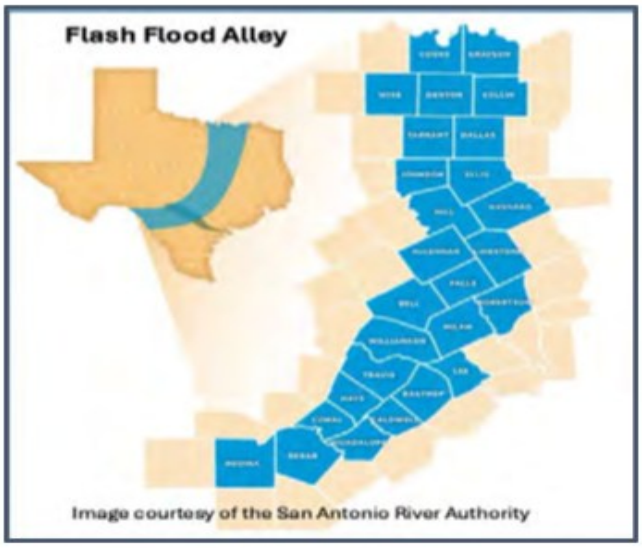


Figure 8: *Flash Flood Alley. Carnett (2023)*

Texas has a particular weather problem in that it is vulnerable to flash floods. In June 2025 there was a particularly deadly flash flood in Kerr Country that received great media coverage nationwide.

The data since 1996 shows large year-to-year variability in the number of such floods but no upward trend. Climate change is not an issue, but every year Texas can expect a significant number of flash floods for which state and local governments should prepare.

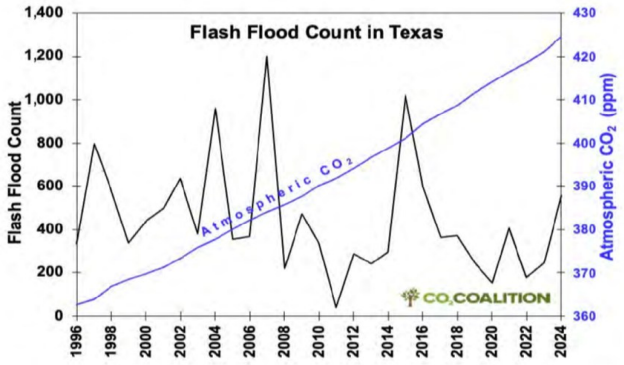


Figure 9: *Annual Reported Number of Flash Floods in Texas, Plotted With the Atmospheric CO_2 Concentration. Flash floods: NOAA National Centers for Environmental Information (2025c), CO_2 concentration (1958 and prior): NASA Goddard Institute for Space Studies (2018), CO_2 concentration (1959 onward): Lan and Keeling (2025) (NOAA)*

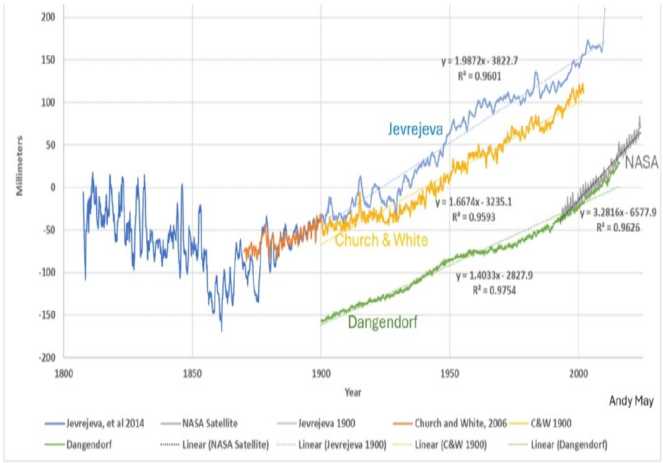
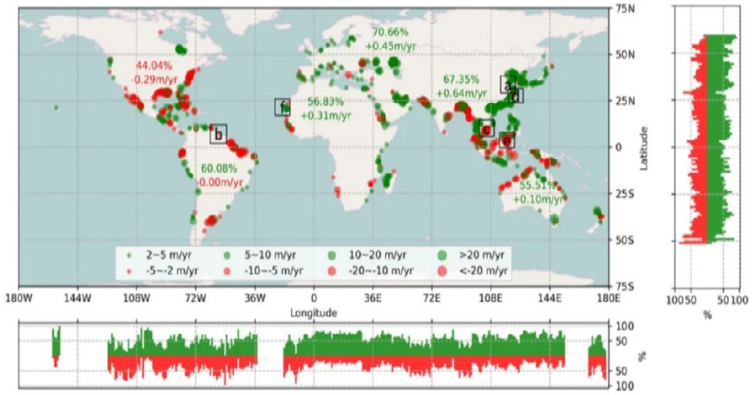


Figure 2. A Comparison of various estimates of the rate of global sea level rise. The Jevrejeva and Church & White estimates are from tide gauges, the NASA estimate (Beckley, Callahan, Hancock, Mitchum, & Ray, 2017) is from satellite measurements, and the Dangendorf record is a complex hybrid.

Sea level rise ("SLR") is caused by rising world temperatures and hence is an example of climate change. It is usually discussed as a global average, which, as measured by the tide gauges around the world, has been at a manageable rate of about 8" over the last century. But SLR started around 1860, long before atmospheric CO2 levels could possibly have been a cause, and has risen, since then, at a relatively linear rate, which suggests that CO2 has been a relatively minor cause of SLR, and that most of the observed SLR rise has been caused by natural variability

The seas not only cause land loss by covering the land, but they also cause land loss by erosion. And they cause new land to be formed by a process called progression or landification. Once thriving sea ports, such as Ephesus and Pisa, are now many miles inland. One 2021 study concluded the world is actually net gaining land rather than losing land.



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

But there is very significant variation from place to place. For example, the coast to the South and South-East of Houston may well experience a *relative* SLR of over three feet during the next century, because those stretches of the coast are sinking even faster than the actual sea level is rising. Much of the Louisiana coast, including New Orleans, is similarly threatened.

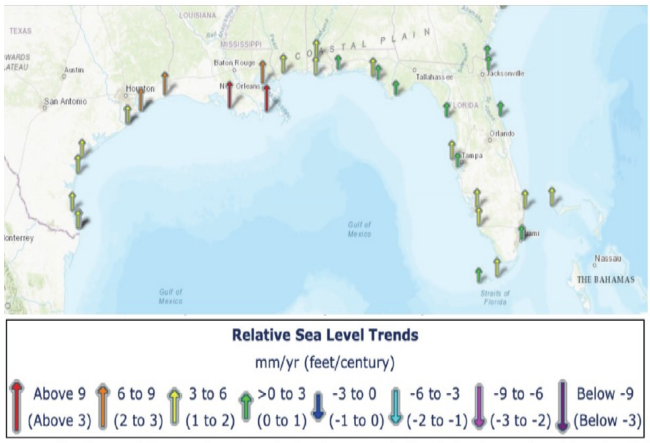


Figure 13. Relative change in sea level at various tide gauge stations along the southeastern US coastline (NOAA). These values essentially provide the net change when considering changes in land elevation as well as sea elevation.

CONCLUSION

Global climate averages conceal significant differences from one region to another and from one country to another. Particular places have significant climate or weather problems that are specific to the particular place. In the US studies are increasingly appearing that focus on a particular state, and so provide guidance to state and local governments of the particular state.

Texas, as discussed, has particular problems with hurricanes, tornadoes, and flash floods despite the lack of any climate change with respect to those variables. These events are part of the state's natural weather. The coast South and South-East of Houston is of particular concern, because that part of the coast is sinking so rapidly. Texas state and local governments can do very little about global CO2 emissions, but they can do much to reduce the impact on the people of Texas of the particular climate and weather problems that regularly occur in Texas.