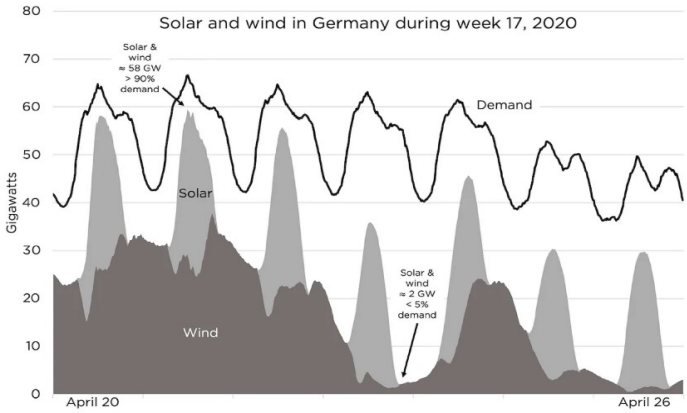
Newsletter July-August 2024

CliSciPol

Climate Science and Policy for Nonscientists

One picture is worth a thousand words.

A new Policy Topic has now been posted on the CLISCIPOL website titled, "WIND+SOLAR: UNRELIABLE? EXPENSIVE?". Wind and solar are strongly advocated as sources of electric power by many, including Massachusetts government officials. But has this put Massachusetts on the path: (1) to blackouts due to wind and solar unreliability, and (2) to very expensive electricity?



Vineyard Wind off Nantucket is not even completed , but one of the massive turbines (each blade 351 feet long weighing 70 tons) has disintegrated (July 2024) in calm weather. Tons of debris have washed up on Nantucket causing many beaches to be shut down. Nantucket fisherman, Bob DeCosta has said, " The only thing green about [Big Wind] is the money going to the offshore wind companies." Imagine a hurricane hitting an offshore wind farm.

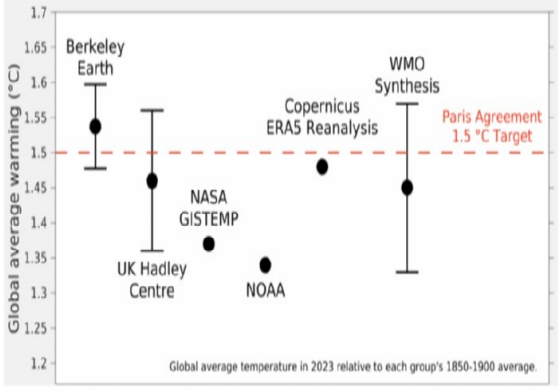
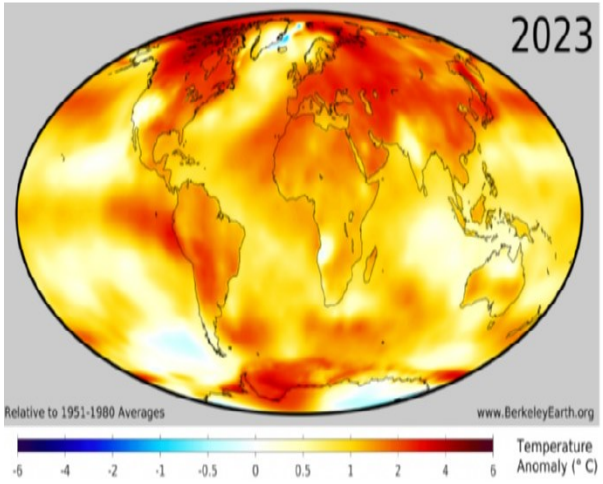


Figure 3. 2023 global surface temperature anomaly over pre-industrial baseline in six datasets.

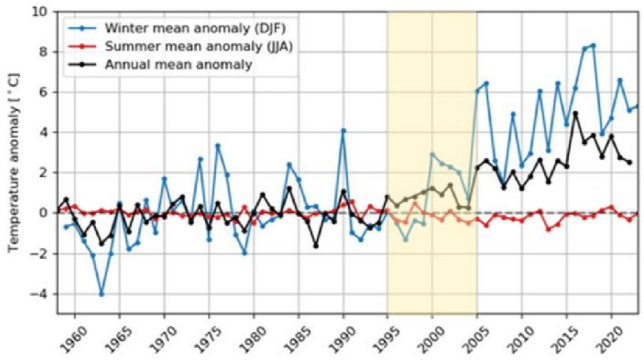
MEASUREMENT ISSUES

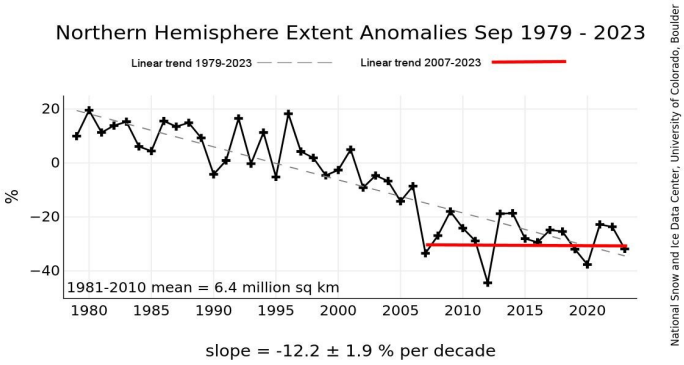
Measuring an average world temperature is very difficult. Over the years government and scientific organizations have constructed a number of different datasets to do this. The image shows how much 6 commonly-cited datasets disagree about the amount that the earth has warmed since the preindustrial period, which is generally defined as 1850-1900. So scientists agree that there has been global warming (a little over 1 C), but they disagree by about 0.2 C as to the amount of the warming.



The earth on average is warming, but particular regions are warming (or cooling) at different rates, because temperature change varies around the world. Climate is regional. But CO2, CH4, and the other human-emitted greenhouse gases are "well-distributed." The Greenhouse Control-Knob Theory has difficulty explaining the differential pattern of warming.

It is generally agreed that in recent years the Arctic is warming faster than the rest of the earth, but the warming is seasonal, not general. Virtually all of it occurs during the winter when temperatures are far below freezing so there is little likelihood increased ice melting. In general, global warming occurs mostly in the winter, in the middle of the night, and at high latitudes, so it has much less effect on mid-summer day-time highs than might be expected.

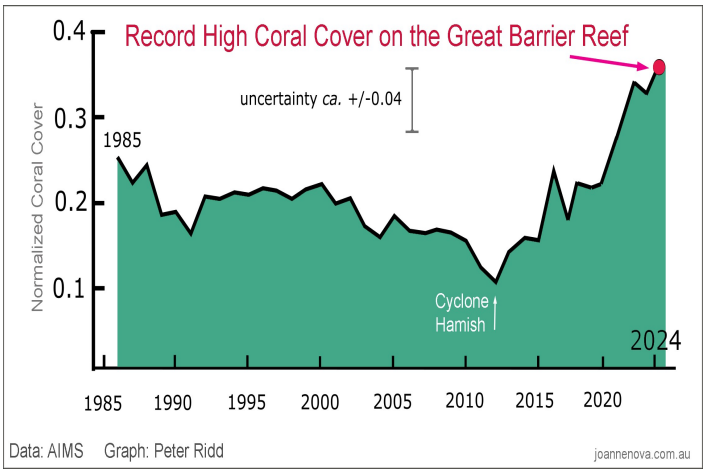


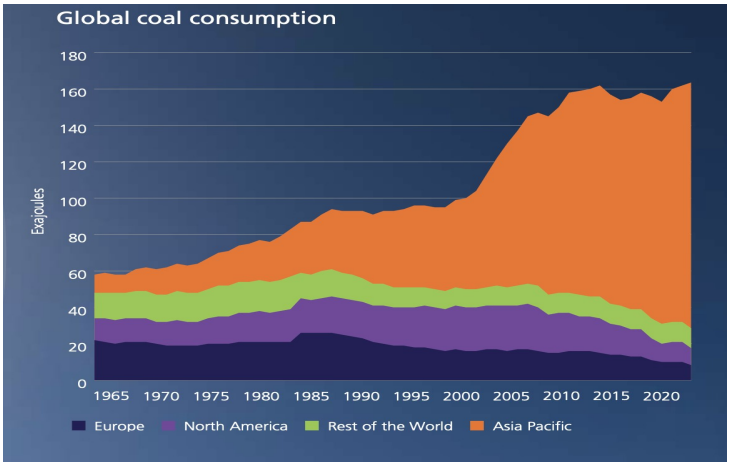


The absence of summer warming is a possible explanation for the lack of any significant change in the extent of minimum summer sea ice, which occurs in September since 2007. Polar bears are not starving; they are thriving.

CORAL

Coral cover on the Great Barrier Reef continues to grow since the low of 2012. Most coral grows in shallow water, so one of its greatest threats comes from tropical cyclones (hurricanes) such as Hamish. The other great threat is invasions of crown of thorns starfish. (AIMS is the Australian Institute of Marine Science, the government agency charged with oversight of the reef).



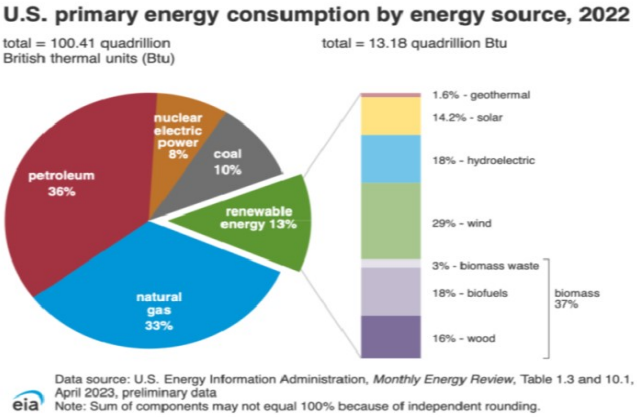


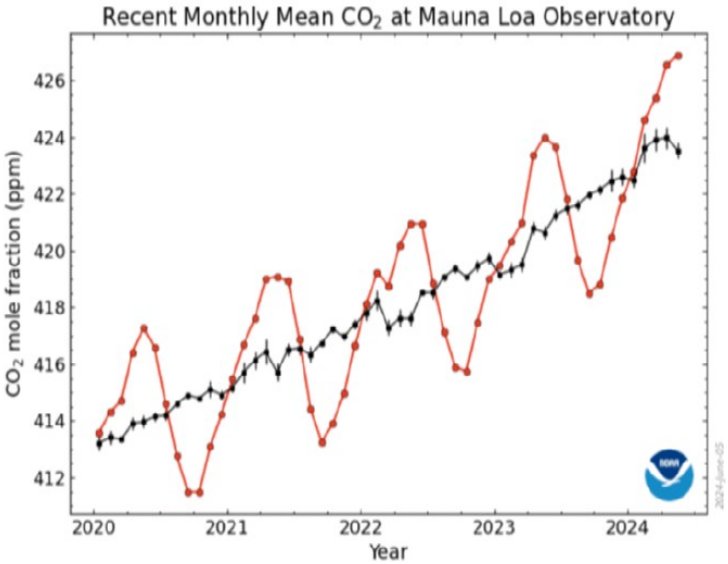
COAL USE

Global use of coal remains high and continues to grow, because it remains the cheapest way to generate electricity. The graph shows coal use by region. The growth is virtually all happening in the Asia Pacific region, in particular in China and India, where cheap energy is needed to lift hundreds of millions of people out of poverty.

SOURCES OF ENERGY

As of 2022 fossil fuels and nuclear were still providing 87% of global energy. As commonly used, the word "renewables" includes hydro and biomass. The amount of energy produced by solar is only 14.2% of 13% = 1.8% and the amount produced by wind only 29% of 13% = 3.8%. These numbers have not changed much since 2022.



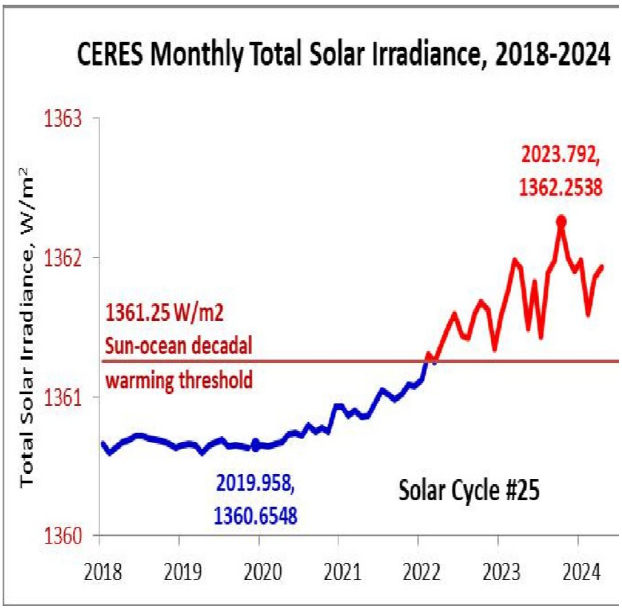


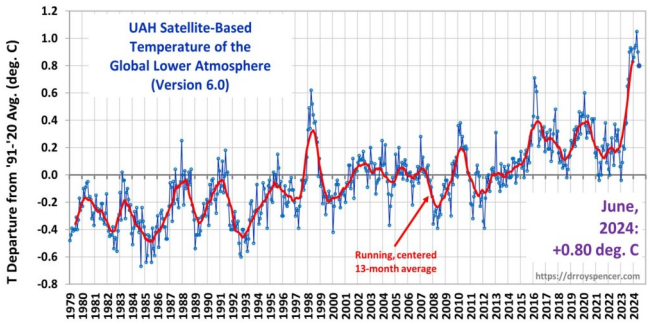
ATMOSPHERIC CO2 LEVELS

The so-called "energy transformation" has, as yet, had no apparent effect on the rising level of atmospheric CO2. (Data through June 2024). The data does show a significant seasonal effect The red line is monthly readings, and the black line is rolling 12-month averages. 68% of the world's land is in the Northern Hemisphere, so there is much more plant life there. The dips are during the Northern Hemisphere summer when Northern Hemisphere plants eat much more CO2 than Southern Hemisphere plants eat during the Southern Hemisphere summer. The data does *not* show any dip during 2021-2022 when Covid reduced world energy use/CO2 emissions by about 6%.

SUN'S CONTRIBUTION TO WARMING

There is a major disagreement among scientists as to how much of the earth's warming over the last 150 years has been caused by the sun. The IPCC and many scientists maintain that solar variation is very small, and that therefore the sun has caused virtually none of the warming. But it is only in recent decades that satellites (in particular the CERES network) have been providing high quality data on a key variable, Total Solar Irradiance ("TSI"). The data for the last 6 years shows that the variation is, in fact, very small - only up about 1 W/m2 from 1361.5 W/m2. The margin of error of the measurements is much greater than that. But a 1 W/m2 TSI increase is more than enough to explain most of the earth's warming without reference to CO2 and other greenhouse gases. (See CLISCIPOL Science Topic: Earth's Energy Budget)

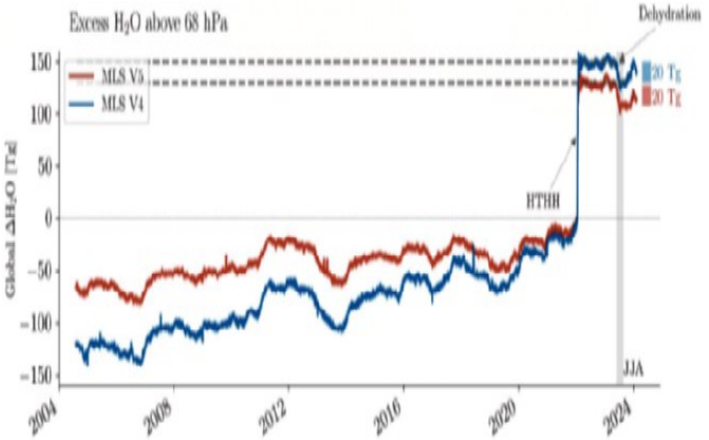




The theory gaining attention (but by no means generally accepted) is that it was caused by the Hunga Tonga underseas volcano explosion in 2022. Volcanoes usually eject large amounts of aerosols into the troposphere, causing global cooling. But Hunga Tonga erupted at just the right underseas depth (about 400-500 feet) to throw massive amounts of water vapor (H2O) into the stratosphere (as shown), where it can cause global warming This was an unprecedented event, and scientists are struggling to understand its consequences.

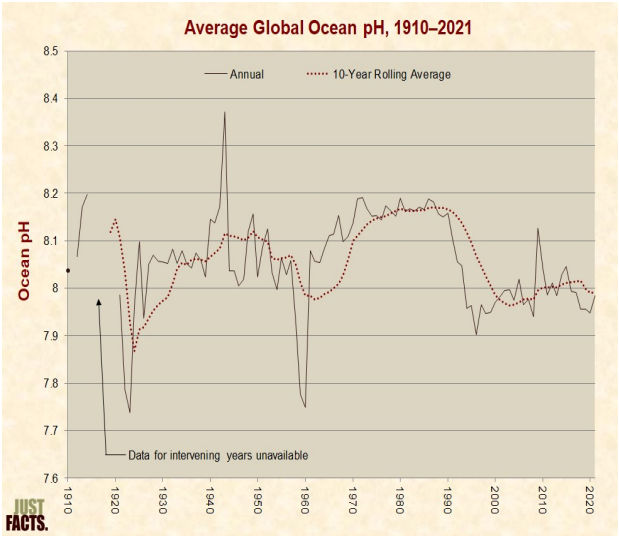
THE 2023-2024 TEMPERATURE SPIKE

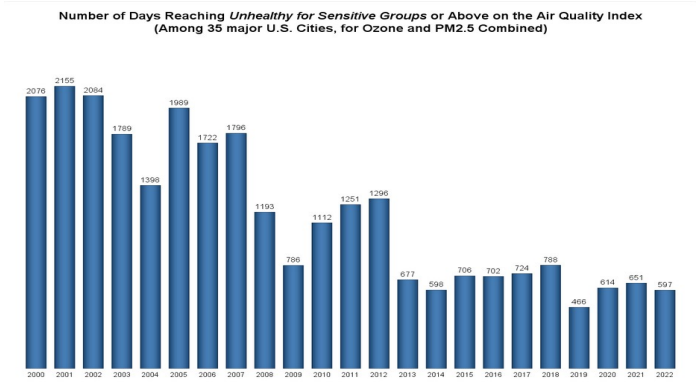
It is clear that during 2023-2024 world temperatures have spiked upwards and now exceed any previous temperature in the modern temperature record (since 1850-1900). But, as yet, there is no consensus as to the cause of this spike. It is clearly not caused by increases in any greenhouse gases, because those gases have just been continuing their slow, steady increases.



OCEAN ACIDIFICATION

Climate scientists are constantly struggling with lack of reliable data., i.e. data measured with modern scientific instruments. This is particularly true with ocean pH. Accurately measured data only goes back perhaps 30 years in relatively few places. To judge long-term trends , scientists must create estimated reconstructions. The image is of one such recent reconstruction for the period 1910-2021 that shows:: (1) variability but no particular upward or downward trend, and (2) no correlation between pH levels and atmospheric CO2 levels, which have been steadily rising since the 1950s.





US AIR QUALITY

This graph came from a recent EPA report on US air quality. There has been a dramatic decrease in the number of days reaching unhealthy levels for sensitive groups in 35 major cities from 2000 to 2022.

This image came from the same EPA report and summarizes actual measurements of "pollutants." A "pollutant" has traditionally been understood to mean something that is harmful to humans. The EPA includes on the list carbon monoxide (CO), which kills people, but has not included CO2. CO2 is harmless to people. We create it in our bodies as part of normal metabolism. CO2 is plant food, essential to plant life on earth. Increasing atmospheric CO2 levels are greening the earth and increasing crop yields. (see CLISCIPOL Science Topic: Greening World)