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Climate and Climate Change Science

A Crusade in Pursuit of a Fantasy

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Highlights and Lowlights

Recent research suggests far lower climate sensitivity to CO₂ doubling.

Temperature anomaly producers still “adjusting” flawed temperature measurements.

Climate modelers finally acknowledge that models are “running hot”.

No climate model has yet been verified or demonstrated predictive skill.

Satellites document global greening. CO₂ improves plant growth rates and water management.

Large disparity between satellite and tide gauge sea level rise measurements persists.

Recent research shows no linkage between climate change and extreme weather events. Cloud formation is also substantially affected by cosmic ray bursts.

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Climate model based “scary scenario” studies dominate media coverage of climate change.

Recent research establishes dominant solar influence on earth’s climate and cloud formation.

UNFCCC already claiming that the Paris Accords do not go far enough to reduce CO₂.

The US has begun its exit from the Paris Accords and the Green Climate Fund (GCF).

The UNFCCC seeks to increase GCF funding from \$100 Billion to \$425 Billion per year.

The US has terminated contributions to the Green Climate Fund.

The US has not begun its exit from the UNFCCC, as required by US law.

US EPA has proposed an open debate on the status of climate science.

US EPA has not begun efforts to remove the 2009 Endangerment Finding.

US EPA has disavowed “Sue and Settle” approach to environmentalist lawsuits.

Environmentalists are threatening numerous lawsuits against US EPA over Clean Power Plan.

Recent research documents that renewables increase electricity costs, despite claims.

Meeting US energy demand with wind turbines would require ~2.3 million 3MW turbines.

Energy efficiency of US economy continues to increase.

Meeting US energy demand with solar would require ~12 million square miles of collectors., equivalent to four times the area of the US.

Solar and wind equipment efficiency is increasing; and, equipment cost is decreasing.

Storage technology to support full renewable transition is not currently economically available.

Recent rolling blackouts in California demonstrate the necessity of adequate conventional backup.

Conventional power generation facilities continue to be ordered to cease operation.

The US continues to reduce its CO₂ emissions, despite exiting the Paris Accords.

The UN and US environmental groups continue to aggitate for greater US “ambition”.

Recent research suggests that the potential effects of CO₂ in the atmosphere are “saturated”.

The US has rejoined the Paris Accords.

There appears to be a new hiatus in global annual temperature anomaly increases.

The US has “committed” to emissions 50% below 2005 by 2030.

Recent widespread blackout in Texas reemphasizes need for adequate conventional backup.

The US has “committed” to net zero emissions from electric generation by 2035.

Numerous studies emphasize critical role of nuclear base load.

US EPA is returning to “secret science” and “sue and settle”.

US EPA has still not issued the CO₂ NAAQS required by the 2009 Endangerment Finding.

US EPA will attempt to regulate CO₂ by imposing very tight Ozone NAAQS.

CMIP6 climate models run even hotter than CMIP5 models.

The US has no plan to achieve its announced climate objectives.

The US is starving the fossil fuel industry by canceling pipelines and restricting E&P activity.

The US is reducing fossil generating capacity far faster than it is installing renewable capacity.

New renewable capacity is being delayed by regulatory reviews.

The renewables industry is demanding that utilities provide transmission infrastructure.

The renewables industry is demanding that utilities provide grid-scale storage.

Citizen resistance to renewable installations is growing.

The critical role of storage in a renewables plus storage grid is becoming more obvious.

The Fall 2021 “wind drought” in the UK and the EU highlighted the risk of multi-day wind outages.

Blackouts in California and Texas highlighted the essential nature of adequate conventional generation.

Russian gas curtailments to the EU and UK highlighted the risks of dependence on foreign energy suppliers.

Russian gas curtailments have caused the EU and UK to delay coal and nuclear plant closures. Russian gas curtailments have raised questions regarding dependence on China for critical materials.

Lithium battery fires have raised concerns about EV fires.

Unverified attribution models are being used to attribute extreme weather to climate change.

Improbability of RCP 8.5 acknowledged, but it still drives IPCC AR6 and US National Climate Assessment.

EPA Endangerment finding being challenged in court.

Atmospheric effects of CO₂ and CH₄ are essentially saturated, so limited future temperature effect.

No significant trends in extreme weather events frequency or intensity.

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US eastern temperatures overestimated by factor of 2.

New research continues to find lower climate sensitivity.

Winter Gatekeeper hypothesis suggests minimal CO₂ role in global temperatures.

COP 27 to focus on funding magnitude and timing.

Energy shortages are driving return to fossil fuels.

New “pause” now at 8 years.

Developing nations continue to choose development over climate change.

CO₂ and CH₄ emissions continue to increase despite “pledges”.

UN continues “Red Alert” claims based on AR6.

Executive Summary

The sun at the center of our solar system is the source of virtually all of the thermal energy the planets receive. Their distance from the sun determines the incident solar energy received by each of them. Their atmospheres determine the fraction of the incident solar radiation which reaches each planet's surface; and, the fraction of the incident solar radiation which is reradiated by each planet's surface. This energy balance determines the temperature near each planet's surface. Our focus is on the Earth, the "[water planet](#)".

The earth rotates around its own axis, which is tilted relative to the incident radiation from the sun and wobbles within a limited angular range. The earth also travels around the sun in an elliptical orbit which changes shape over long time periods. These variations are typically referred to as the [Milankovitch cycles](#). These changes affect the quantity of incident solar radiation and the angle of incidence of the radiation, thus affecting the earth's temperature.

The primary constituent of the earth's atmosphere which controls both the fraction of the incident solar radiation which reaches the surface and the fraction of that incident radiation which is reradiated back into space is water vapor. Water vapor is relatively transparent to the short wavelength radiation which reaches the earth's atmosphere from the sun but is a strong absorber of the longer wave radiation reradiated by earth's surface. This strong absorption retains heat in the atmosphere, thus warming the earth. Water, in either its liquid or frozen state, is relatively opaque to both the shorter and longer wavelength radiation.

Other constituents of the earth's atmosphere, which affect the radiation balance, include naturally occurring trace gases, such as carbon dioxide and methane, and aerosols and particulates injected into the atmosphere as the result of volcanic eruptions. These constituents also include trace gases, aerosols and particulates such as CO₂, SO₂, sulfate aerosols and carbon particulate injected into the atmosphere as the result of human activity, including the burning of fossil fuels and the practice of animal husbandry.

The earth's radiation balance is also affected by changes in the [albedo](#) of the surface. Examples of albedo change include: the natural transition from liquid ocean surface to sea ice; the transition from water to ice on lakes, rivers and streams; the melting of glaciers and seasonal ice; and, the transition of deciduous vegetation from summer to winter condition and to spring growth. Examples of human-induced albedo change include: the transition from forest, jungle and prairie to farmland; and, the construction of roads and buildings in rural, suburban and urban areas.

The surface temperatures on earth range from a maximum of [+58°C to a minimum of – 88°C \(+136°F to – 126°F\)](#). The global annual mean surface temperature is thought to be approximately 15°C (59°F), but is difficult to determine accurately because of the limited availability and coverage of temperature measuring stations and questions about the accuracy of the temperature readings from those stations. The average daily temperature range for the earth is estimated to be between [11 to 12°C \(~20 to 22°F\)](#). It is in this context that we discuss global mean near-surface temperature change estimated to be approximately [1°C \(1.8°F\)](#) over the 140 year period since 1880. It must be understood that we do not know the “ideal” global mean near-surface temperature for the earth, so we do not know whether the global mean near-surface temperature change over the past 138 years is approaching or retreating from the “ideal” temperature.

We have been measuring the near-surface temperature of the earth with instruments since the mid-1600s, beginning with the Central England Temperature (CET) record. Coincidentally, this temperature record began during the trough of the Little Ice Age and the period of the Maunder Minimum. Near-surface temperature measurement did not become “global” in scope until the late 1800s. Global instrumentation coverage remains non-uniform, with significant gaps in the southern hemisphere and over the global oceans.

The quality of the global near-surface temperature record is highly questionable. Many measuring sites have not been regularly maintained and recalibrated. Many sites have been encroached upon by urban and suburban sprawl. Many others have been moved to avoid the effects of encroachment. Many sites have been equipped with newer measuring stations and instruments. These issues were investigated by a group of volunteer site surveyors and their results are compiled at www.surfacestations.org. These volunteers concluded that the US near-surface temperature measurement sites were likely in error by an average of more than 2°C (3.6°F) based on the temperature measurement site criteria developed by the US National Climatic Data Center (NCDC) for the US Climate Reference Network. This study has been [revisited](#), concluding that 96% of the US temperature record is corrupted.

The organizations which produce the global near-surface temperature [anomaly](#) products use several approaches to deal with the poor quality of the near-surface temperature data. Each producer selects data from among the available measuring station data. Each producer then “adjusts” the data for such factors as location, encroachment issues, station and instrument type, time-of-observation differences, etc. One producer “infills” estimated temperatures where no data exists, particularly over the oceans. Each of the producers uses a different start date for their anomaly product, so the total anomalies are not directly comparable. However, the monthly changes in the reported anomalies can vary by a factor of approximately 2.5.

The magnitude of the adjustments to the near-surface temperature data are of the same order of magnitude as the total anomalies. For example, the MMTS sensors used by the USHCN have a [measured bias](#) ranging up to 1.25°C. [Aging of Stevenson Screens](#) can result in 1.65°C errors.

The US Climate Reference Network clearly demonstrates that it is possible to collect accurate near-surface temperature data which does not require “adjustment”. However, the CRN is regionally limited and has provided only 24 years of data.

The most comprehensive global temperature records are currently being collected by a series of [satellites](#), launched beginning in the late 1970s. These satellites use very sensitive temperature measurement devices, which are continuously referenced to space temperature and periodically checked using weather balloon readings. These satellite records show no warming for the 18.5+ years from early 1997 through October 2015. This is the “hiatus” or pause or plateau which has been actively discussed in the climate literature. This pause has been at least temporarily interrupted by the 2015/2016 super El Nino, which caused the reported global mid-tropospheric temperature anomaly for 2016 to exceed that temperature anomaly for 1998, another super El Nino year, by a reported 0.02°C. A new “hiatus” has now exceeded 8-year duration.

As discussed above, the “adjusted” data being used to “hindcast” the General Circulation Models (GCM) is subject to significant potential error. This situation, combined with uncertainties regarding the [climate sensitivities and feedbacks](#) which drive the models, makes the climate models of [questionable value](#). At the present, the modeled scenarios suggest significantly greater warming than is observed, even in the “adjusted” data. Essentially, the models are being [progressively falsified](#) by the near-surface temperature anomalies and the satellite temperature anomalies. Some members of the climate science community have recently acknowledged these issues with the [near-surface temperature record](#) and the [climate models](#) and recommended efforts to resolve them.

On the basis of the “adjusted” near-surface temperature anomalies and the unverified and largely falsified climate models, the United Nations Framework Convention on Climate Change (UNFCCC), the Intergovernmental Panel on Climate Change (IPCC) and numerous national governments are calling for the elimination of anthropogenic emissions of carbon dioxide (CO₂), methane (CH₄) and nitrogen dioxide (NO₂) by the middle of the 21st century. This would require the complete cessation of fossil fuel use and animal husbandry, or the complete capture and long-term storage of all of the related emissions. Fossil fuel use would be replaced by renewable sources of energy, including hydro, solar, wind, biomass, geothermal, Ocean Thermal Energy Conversion (OTEC) and wave energy; and, perhaps, nuclear energy.

The major overhaul of the global energy economy would involve enormous cost. I have estimated that the US investment alone would be approximately \$30 trillion, and the deadweight loss associated with abandoning fossil fuels in the ground would approach \$60 trillion. Global investment would approach \$150 trillion. All residential, commercial, institutional, industrial and electric utility fossil fuel end uses would be required to transition to more expensive and frequently unreliable and intermittent renewable sources of energy. The entire vehicle fueling infrastructure would have to be replaced, either with biofuels produced using currently non-existent or uneconomical technologies or by electric charging facilities.

This enormous investment requirement would compete with other [global imperatives](#), including clean water supply, sewage treatment, healthcare, education, etc. Energy users worldwide would be deprived of numerous common equipment choices. The recent US ban on incandescent lightbulbs is one trivial example of such elimination of choice. Several US cities plan to ban new residential and commercial natural gas service. The federal government intends to require all new vehicles to be EVs by 2035.

COP15 in Copenhagen, Denmark essentially divided the nations of the globe into three competing groups: nations with technology and financial resources; nations which want free access to the technology; and, nations which want free access to the financial resources. The less developed nations of the world are demanding annual transfer payments of \$100 billion (growing to ~\$425 billion by 2030) from the developed nations, essentially for mitigation of adverse climate impacts which have not yet happened and might well never happen. These transfers would occur through the [UN Green Climate Fund](#). There is also a growing demand for additional funding approaching \$400 billion per year for adaption to the effects of climate change, plus additional, undefined funding for “loss and damage” due to climate change.

The suggested vehicle for collecting these funds in the US is the assessment of the “social cost of carbon”, based broadly on various assessments of the environmental externalities costs of the emissions of CO₂, CH₄ and NO₂. The assessments of the “social cost of carbon”, to date, do not include any consideration of the positive environmental externalities of these emissions. Increased atmospheric CO₂ concentrations have been credited with the greening of the planet observed by [satellite platforms](#). Increased CO₂ concentrations have [expanded cropland and extended effective growing seasons](#). There is a reasonable possibility the current social cost of carbon is negative and will remain so for the foreseeable future.

COP21 in Paris, France in 2015 intended to develop an [enforceable agreement](#) on binding emissions reductions and transfer payments to the less developed nations. It developed an unenforceable agreement instead. The intent was that the costs of complying with the terms of this agreement would largely be borne by the developed nations; and, ultimately, by the citizens of those nations. The program would be administered by the UN, which has demonstrated its incompetence to administer such programs with (among others) the Iraq [“Oil for Food”](#) program.

Climate science remains the political science of unreliable data and models that don’t conform to observed reality. Climate science is a [crusade](#) in pursuit of a fantasy.

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A Crusade in Pursuit of a Fantasy

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Achieving Common Understanding

(“When I use a word, it means just what I choose it to mean — neither more nor less”, Humpty Dumpty)

Climate change has become a secular religion, with specific dogmas for believers:

- The earth is warming and will continue to do so, leading to a catastrophic melting of the polar ice caps, Greenland and glaciers, which will inundate coastal areas and islands throughout the world.
- This warming is caused by increases in atmospheric CO₂ from the burning of fossil fuels directly, in electric power generation and in transportation.
- Doomsday is inevitable unless fossil fuels are replaced by renewable energy: wind, solar, biomass, hydro, OTEC, and wave energy; and, perhaps, nuclear.

This secular religion has generated a politically charged atmosphere at the state, regional, national and international levels. In such a politically charged environment, it is extremely important that the conversation is clear and careful. Regrettably, that has not been the case in either developed or developing countries. Rather, the conversation has been characterized by ad hominem attacks and invective, mindless sloganeering and deliberate falsification of facts combined with efforts to elide the real issues. Therefore, we will begin this effort with an attempt to clearly define the basic terms and concepts with which we will be dealing.

Weather: the state of the air and atmosphere at a particular time and place: the temperature and other outside conditions (such as rain, cloudiness, etc.) at a particular time and place (Merriam-Webster)

Climate: the usual weather conditions in a particular place or region. (Merriam-Webster)

Global climate: the usual weather conditions over the entire globe.

Climate change: a change in the typical or average weather of a region or city. (NASA)

Global climate change: a change in the typical or average weather of the entire globe.

Anthropogenic climate change: a change in the typical or average weather of a city or region resulting from human activities.

Anthropogenic global climate change: a change in the typical or average weather of the entire globe resulting from human activities.

Global warming / cooling: a change in the typical mean temperature of the entire globe.

Anthropogenic global warming / cooling: a change in the typical mean [near-surface] temperature of the entire globe resulting from human activities.

Temperature data are readings taken from temperature measuring instruments.

“Adjustment” produces an estimate of what the data might have been, had they been collected timely from properly selected, calibrated, sited, installed and maintained instruments.

Climate is generally considered to be typical weather over a period of [30 years](#). Weather might well vary significantly over that 30-year period; and, those variations would be considered to be normal weather for the climate in that period. Weather might well also vary significantly after the 30 year “climate” period, but that would be considered either normal weather relative to that climate, if it was within the range of weather experienced during the 30 year “climate” period; or, abnormal weather if it were outside the range of weather experienced during the 30 year “climate” period.

Long term deviations from the normal climate (typically 15+ years) would represent a potential change in the climate, involving warmer or cooler mean temperatures, greater or lesser precipitation, increased or decreased frequency or intensity of storms, such as tornados and hurricanes, etc. Knowing that climate is changing, or has changed, requires a detailed and accurate record of what the climate was; and, of how the climate is changing. Accumulating such a record is a major challenge, made even more demanding by the fact that, with both weather and climate, each day is unique and cannot be recreated if there is an instrument or observational failure.

It Begins with the Sun

*(“Human consensus does not generate reality. Were it able to do so, the **sun** would have taken to orbiting the Earth some time ago.”, ursula goodenough)*

The sun experiences [sunspot cycles](#) of approximately 11 year duration. The strength of the sunspot cycles varies from cycle to cycle, in a longer cycle of approximately 100-year duration. An increase in sunspots is associated with an increase in Total Solar Irradiance (TSI) and solar magnetic activity. Periods with strong sunspot activity have been associated with periods of above average temperatures on earth. Periods with weaker sunspot activity have been associated with periods of below average temperatures on earth. A period of strong sunspot activity, referred to as the Medieval Maximum, is believed to have contributed to the Medieval Warm Period from 900 - 1300 AD. One relatively more recent period of weak sunspot activity, referred to as the Maunder Minimum, is believed to have contributed to the Little Ice Age from 1300 - 1850 AD.

The current long sunspot cycle, beginning about 1900, is referred to as the Modern Maximum. However, the most recent sunspot cycle, Cycle 24, is reputed to be the weakest sunspot cycle of the Modern Maximum. There is [growing speculation](#) that Cycle 25 may be even weaker; and, that the sun might be entering into a new minimum on roughly the same scale as the Dalton Minimum from 1790 – 1820; or, perhaps, even on the same scale as the Maunder Minimum. Such a minimum would likely be associated with reduced global near-surface temperatures, as occurred in the past.

A recent paper, [Soon, Connolly and Connolly \(2015\)](#), suggests that total solar irradiance is more variable than has been assumed by the IPCC; and, that increased total solar irradiance has been the primary driver of the recent global warming. This would also suggest that the weakness of the most recent solar cycle and the expected weakness of the current solar cycle would lead to less warming, stable temperatures, or even to cooling.

“When we compared our new [surface temperature] composite to one of the high solar variability reconstructions of Total Solar Irradiance which was not considered by the CMIP5 hindcasts (i.e., the Hoyt & Schatten reconstruction), we found a remarkably close fit. If the Hoyt & Schatten reconstruction and our new Northern Hemisphere temperature trend estimates are accurate, then it seems that most of the temperature trends since at least 1881 can be explained in terms of solar variability, with atmospheric greenhouse gas concentrations providing at most a minor contribution. This contradicts the claim by the latest Intergovernmental Panel on Climate Change

(IPCC) reports that most of the temperature trends since the 1950s are due to changes in atmospheric greenhouse gas concentrations (Bindoff et al., 2013)."

Soon, Connolly and Connolly suggest that climate change might both begin and end with variations in solar radiation.

Recent research at [CERN](#) , the European Organization for Nuclear Research, has experimentally demonstrated the effects of solar cosmic radiation on atmospheric aerosol formation and resulting cloud formation. The [CLOUD](#) experiment demonstrates that changes in solar cosmic radiation can affect cloud formation in earth's atmosphere, thus affecting both incoming and outgoing solar radiation. Cosmic radiation is known to increase during periods of [weak sunspot activity](#), such as the recent period.

"The [Winter Gatekeeper](#) hypothesis proposes that changes in the meridional transport of energy and moisture are the main way the climate changes now and in the past. Meridional transport variability has many causes and forces that act simultaneously and in different time frames on the climate system. Meridional transport is therefore an integrator of internal and external signals. It is not the only way the climate changes, but evidence suggests it is the main one."

Position and Orientation of the Earth

Milankovitch Cycles

The longest of the more predictable cycles are the [Milankovitch cycles](#). The [drivers](#) of these long cycles are changes in the distance of the earth from the sun (over ~400,000 and ~100,000 year cycles); changes in the tilt of the earth's axis (over ~41,000 years); and, changes in the precession of the equinoxes (over ~22,000 years). The longest cycles are believed to have caused the ice ages which have affected the earth over its history. The tilt of the earth's axis causes the change of seasons as the earth completes its annual rotation around the sun. Changes in the tilt of the earth's axis of rotation change the angle of incidence of solar radiation on the earth, affecting the severity of the seasons. The precession of the equinoxes determines whether these effects on the severity of the seasons will make the individual seasons warmer or cooler.

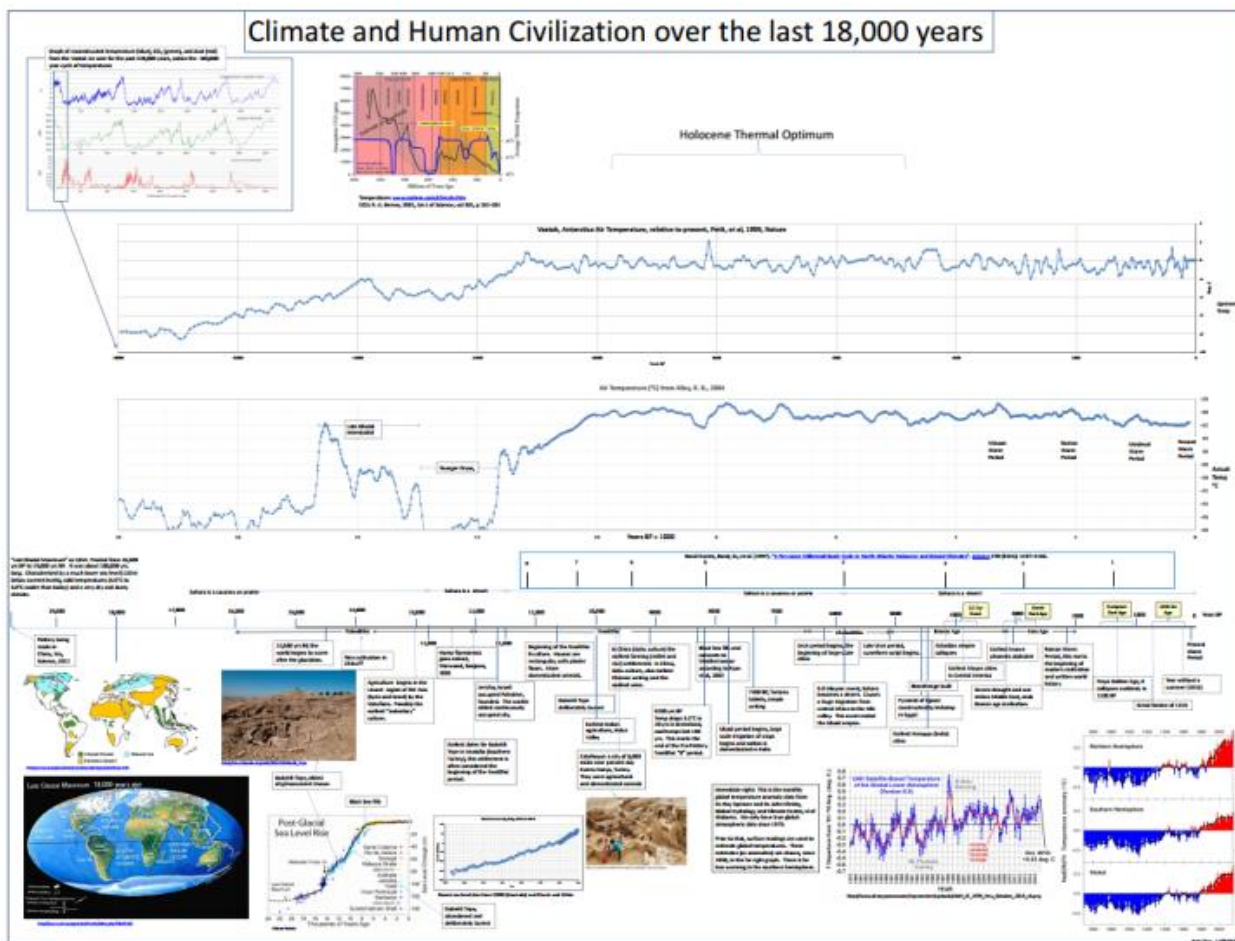
The Milankovitch Theory of Climate has been questioned by some scientists, who do not believe that the climate effects claimed by Milankovitch actually occurred as predicted. The difficulty here

is that time determinations for events in paleoclimatic history are based on proxies, which are difficult to interpret accurately.

It is certainly reasonable that the distance of the earth from the sun and the angle of incidence of the sun's rays on the earth should affect the earth's temperature. The affects have not been measurable because of the long cycle intervals of the Milankovitch cycles.

History of Climate Cycles

The [earth's climate](#) has changed continually over the entire period we have been able to study. Our knowledge of these changes is based on proxy records of various types -- tree rings, ice cores, ocean sediments, coral growth -- so we have [general reconstructions](#), with the exception of the past 138 years.



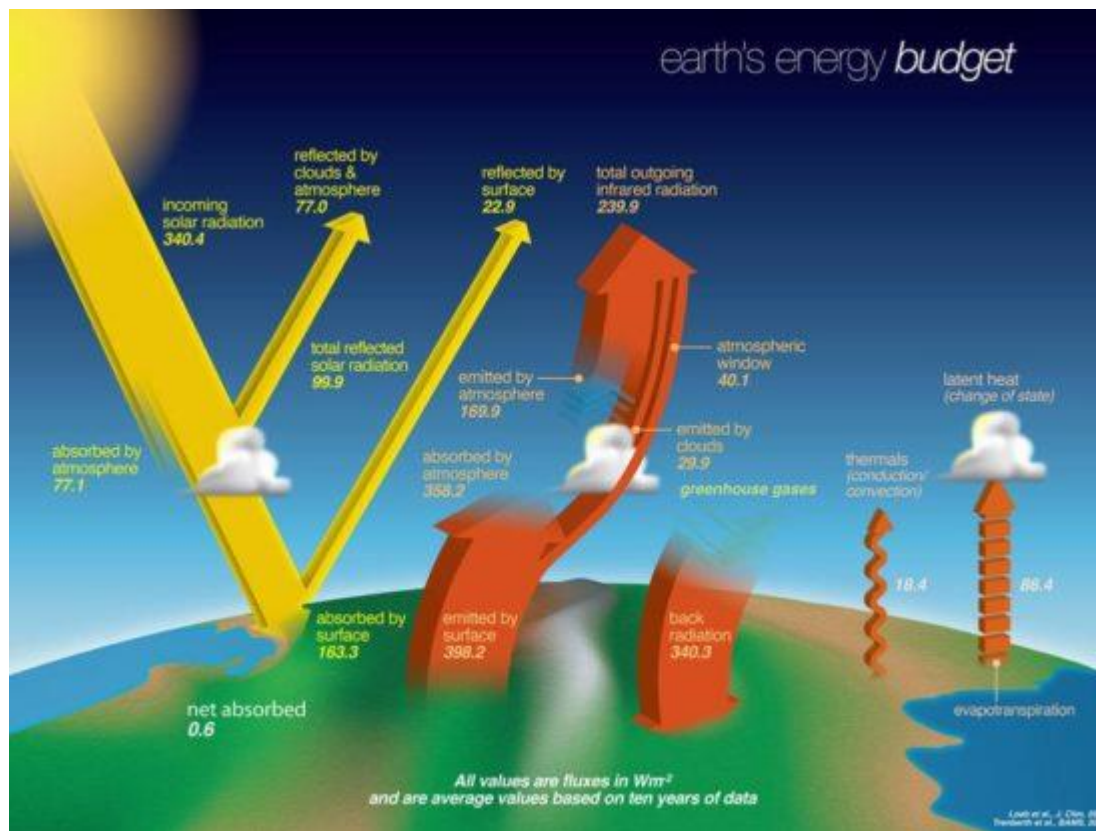
Characteristics of the Earth and its Atmosphere

Albedo

Albedo refers to the reflection coefficient of the earth and its atmosphere, or the fraction of the solar radiation striking the earth and its atmosphere which is scattered back to space. A [recent paper](#), summarized on [Dr. Judith Curry's blog](#), provides current insights into the significance of albedo variations for climate change.

Atmospheric Absorption

The constituents of the earth's atmosphere absorb [electromagnetic radiation](#) in certain wavelength bands, while appearing as “windows” in certain other wavelength bands. The principal absorption mechanisms are described graphically [here](#).



Note that, while water vapor is the principal absorber of radiation, clouds (liquid and solid water) are near perfect reflectors of radiation.

Cosmic Radiation

Some scientists believe that changes in [cosmic radiation](#) resulting from deep space events have an impact on cloud formation in the earth's atmosphere. The presence of such clouds would affect the quantity of solar radiation reaching the surface of the earth. This effect has recently been demonstrated experimentally at CERN in their [CLOUD](#) program.

Natural Influences on Weather and Climate

Pacific Decadal Oscillation

The [Pacific Decadal Oscillation](#) (PDO) is a natural climate phenomenon, based strictly on its duration. The approximately 60-year cycle consists of a roughly 30 year warm phase and a roughly 30 year cool phase. The PDO manifests as a change in the sea surface temperatures in the northern and tropical Pacific Ocean. The change is large enough to manifest as changes in the climate of the western coast of North America, affecting temperatures and precipitation, as well as the extent of Arctic sea ice. While the PDO is relatively predictable, its cause is not understood.

El Nino Southern Oscillation

The [El Nino Southern Oscillation](#) (ENSO) is a natural weather phenomenon, based on its duration. The pattern generally oscillates between El Nino (warm event) and La Nina (cool event). The timing, duration and magnitude of these events are not predictable, though they are observed and recorded. Updates on the status of ENSO are available [here](#). El Nino events appear to be more frequent during the warm phase of the PDO, while La Nina events are more frequent during the cool phase.

Atlantic Multi-decadal Oscillation

The [Atlantic Multi-decadal Oscillation](#) (AMO) is also a natural climate phenomenon. It is a periodic change in the sea surface temperature in the North Atlantic Ocean. The period of the complete cycle varies from 60 to 80 years, so the changes are anticipatable, but not predictable. The difference in the sea surface temperatures between the warm and cool phases is sufficient to affect climate in both eastern North America and western Europe. The cause of the AMO is also not understood.

The Atlantic Heat Conveyor

The [Atlantic Heat Conveyor](#) refers to the continuous circulation of warm surface water in the Gulf Stream from the Caribbean and the tropical South Atlantic Ocean toward the western coast of Europe, greatly influencing the climate in Europe on a constant basis.

Human Influence on Climate

The potential for human influence on climate was hardly considered prior to the 20th century. However, the rapidly growing population of the earth has driven the conversion of ever-increasing land area to farming and the grazing of cattle, changing the albedo of the land. The construction of [cities and their suburbs](#) to house the growing population has also resulted in the conversion of forest, prairie grazing and farm land to masses of concrete, steel, aluminum, glass and blacktop, further altering the albedo of the land. Human consumption of fossil fuels, with the concomitant emission of carbon dioxide, also has the potential to influence climate. CO₂ and other gases such as methane, nitrous oxide and fluorinated gases are frequently referred to as “greenhouse gases” (GHGs) since their absorption of infrared energy leaving the earth’s atmosphere causes the atmosphere to retain heat.

Externalities – Positive and Negative

There has been extensive discussion of the issue of environmental externalities resulting from emissions of various gases and particulates. The only demonstrated environmental externality associated with CO₂ is its increasing concentration in the atmosphere. The climate science community believes that CO₂ is the principal cause of the recent atmospheric warming, though that has not been demonstrated; and, is increasingly being called into serious question as the result of [new research](#).

There are [other gases and particulates](#) released to the atmosphere as the result of the use of fossil fuels, including SO_x, NO_x, lead, mercury, ozone, volatile organic compounds and particulates such as coal ash, coal dust and black carbon. These emissions are currently limited by government regulation, but have not been eliminated.

CO₂ emissions are the purported basis for the concerns about the “social cost of carbon”, although much of the purported cost is actually the result, not of the CO₂ emissions, but rather the associated emissions resulting from fossil fuel combustion listed above.

Nearly the entire focus of the discussions regarding environmental externalities is on the perceived [negative externalities](#). The positive externalities, particularly of CO₂ emissions and the resulting increase in atmospheric CO₂ concentrations, are largely ignored, because they do not advance the catastrophic anthropogenic climate change narrative.

Several recent studies have focused on these positive environmental externalities. The [conclusions](#) of [one such study \(CARBON DIOXIDE: The Good News, Indur M. Goklany, PhD\)](#) are worth quoting here.

“Empirical data confirms that the biosphere’s productivity has increased by about 14% since 1982, in large part as a result of rising carbon dioxide levels.

· Thousands of scientific experiments indicate that increasing carbon dioxide concentrations in the air have contributed to increases in crop yields.

· Satellite evidence confirms that increasing carbon dioxide concentrations have also resulted in greater productivity of wild terrestrial ecosystems in all vegetation types.

· Increasing carbon dioxide concentrations have also increased the productivity of many marine ecosystems.

· In recent decades, trends in climate-sensitive indicators of human and environmental wellbeing have improved and continue to do so despite claims that they would deteriorate because of global warming.

- *Compared with the benefits from carbon dioxide on crop and biosphere productivity, the adverse impacts of carbon dioxide – on the frequency and intensity of extreme weather, on sea level, vector-borne disease prevalence and human health have been too small to measure or have been swamped by other factors.*
- *Models used to influence policy on climate change have overestimated the rate of warming, underestimated direct benefits of carbon dioxide, overestimated the harms from climate change and underestimated human capacity to adapt so as to capture the benefits while reducing the harm.*
- *It is very likely that the impact of rising carbon dioxide concentrations is currently net beneficial for both humanity and the biosphere generally. These benefits are real, whereas the costs of warming are uncertain. Halting the increase in carbon dioxide concentrations abruptly would deprive people and the planet of the benefits of carbon dioxide much sooner than they would reduce any costs of warming”*

Yet another [study](#) (Hawkesbury River Study, Belinda Medlin, PhD) observes that increased atmospheric CO₂ concentrations improve both tree growth and drought resistance.

[A third study](#) (Climate Change Reconsidered II, Biological Impacts) suggests that the environmental impact of increased CO₂ concentrations is now positive and will continue to be for decades.

A [recent study](#) by a multinational group of scientists has determined that: “From a quarter to half of Earth’s vegetated lands has shown significant greening over the last 35 years largely due to rising levels of atmospheric carbon dioxide”. The study results are based on analyses of data collected by NASA and NOAA satellites. The authors estimate that approximately 70% of the greening is the result of increased CO₂ fertilization.

The Players

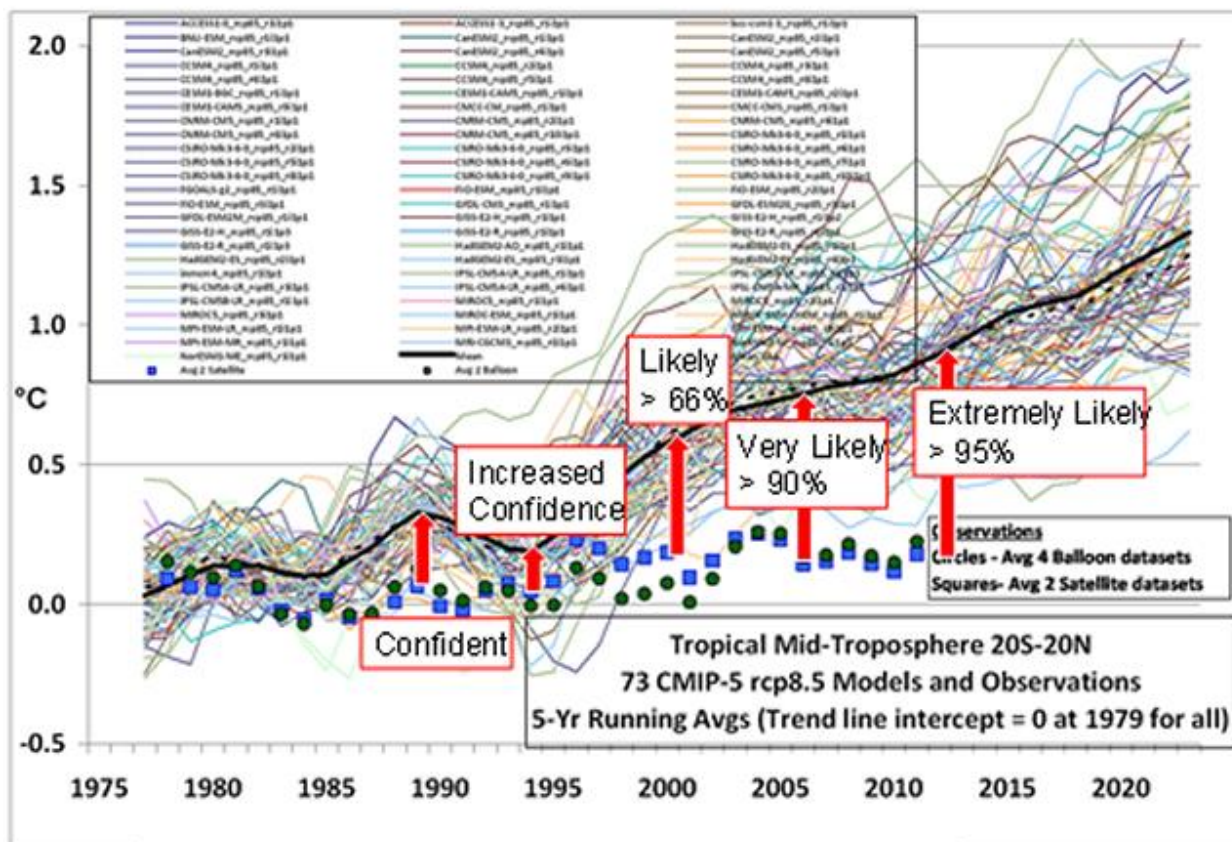
“Get your scorecard here. You can’t tell the players without your scorecard.”

IPCC

The [Intergovernmental Panel on Climate Change](#) was established by the United Nations Environmental Programme (UNEP) and the World Meteorological Organization in 1988. It is tasked to “provide the world with a clear scientific view on the current state of knowledge in

climate change and its potential environmental and socio-economic impacts.” The IPCC does not do research or monitor climate factors. Volunteer scientists review current scientific research and produce the technical documents which summarize that research. Those documents are then reduced to a final document, referred to as the Summary for Policymakers. It is this document which attracts virtually all the media coverage of the IPCC reports. This Summary, prepared by and for politicians, frequently ignores the uncertainties and qualifications expressed in the individual scientific Assessment reports, thus suggesting a degree of certainty not supported by the underlying research.

Certainty CHANNEL™



Arrows & CON statements (from IPCC) by H. Hayden;

Roy Spencer, 6/6/13

UN FCCC

"This is the first time in the history of mankind that we are setting ourselves the task of intentionally, within a defined period of time, to change the economic development model that has been reigning for at least 150 years, since the Industrial Revolution," , Christiana Figueres

The [United Nations Framework Convention on Climate Change](#) became effective in 1994. Its stated goal is not broadly focused on climate change, but rather very narrowly focused on human greenhouse gas emissions.

"The ultimate objective of the Convention is to stabilize greenhouse gas concentrations "at a level that would prevent dangerous anthropogenic (human induced) interference with the climate system." It states that "such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened, and to enable economic development to proceed in a sustainable manner."

The Convention is very focused on the perceived responsibility of the developed nations for anthropogenic climate change; and, their responsibility to the developing and less developed nations. This responsibility includes the developed nations taking more dramatic control actions before other nations do so; and, providing funding to assist other nations to develop, while reducing the impact of that development on the global climate.

US Environmental Protection Agency

"Bureaucracy, the rule of no one, has become the modern form of despotism.", Mary McCarthy

The US EPA has largely relied on the work of the IPCC regarding climate change and its impacts, despite the requirement in the Clean Air Act (as amended) that EPA perform and/or fund its own research. EPA has also been extremely reluctant to share its research and computer code outside the Agency. The Agency has ignored numerous FOIA requests and has been repeatedly sued under that legislation. The EPA has also collaborated with several large environmental groups, assisting them in [suing](#) the Agency under the Clean Air Act (CAA) and then settling out of court to achieve its goals. This "sue and settle" collaboration was terminated by former EPA Administrator Pruitt but is being restored under the Biden Administration.

The EPA has extended its "mandate" under the CAA to include CO₂, aided and abetted by the US Supreme Court, despite the fact that the US Congress considered CO₂ in the development of the

CAA, but chose not to include it under the provisions of the Act. The [Supreme Court](#) has recently limited the ability of the EPA to expand its mandate.

EPA has been very aggressive in expanding its authority under the CAA, while also avoiding its responsibilities under the Act. EPA issued an Endangerment Finding regarding CO₂ in 2009. However, EPA has yet to produce the National Ambient Air Quality Standard (NAAQS) explicitly required by the CAA as the result of such an Endangerment Finding; and there seem to be no references in the open literature that the EPA is developing an NAAQS for CO₂. EPA Administrator Wheeler planned to revise or vacate the Endangerment Finding based in part on [recent research](#) which demonstrates that the Finding is no longer appropriate. However, those plans have been abandoned by the current Administrator. The Endangerment finding is now being challenged in the courts.

EPA was also moving to reduce or eliminate the use of “secret science” in development of its rulemakings. There is very vocal concern regarding protection of the medical histories and conditions of study participants, but these concerns should be easily resolvable. However, that movement now appears to be being reversed.

EPA is now considering indirectly restricting CO₂ emissions by promulgating and much more stringent NAAQS for Ozone, which would require significant reductions in fossil fuel consumption.

NIPCC

The Nongovernmental International Panel on Climate Change is a private body composed of more than 50 [climate scientists and other scholars](#) from 14 countries working to understand the possible causes and consequences of climate change.

“Because we are not predisposed to believe climate change is caused by human greenhouse gas emissions, we are able to look at evidence the Intergovernmental Panel on Climate Change (IPCC) ignores. Because we do not work for any governments, we are not biased toward the assumption that greater government activity is necessary.”

NIPCC has published several [reports](#) critiquing the Assessment Reports produced by the IPCC and analyzing the research of skeptical scientists whose research has not been included in the IPCC reports.

Climategate

Shortly before the beginning of the Conference of the Parties (COP15) in Copenhagen in 2009, an anonymous party using the pen name “FOIA” released copies of numerous e-mails between and among selected climate change scientists participating in and promoting the work of the

IPCC. These [e-mails](#) demonstrated activities by these scientists intended to: resist release of data and computer code to other scientists interested in attempting to duplicate or falsify their research; inhibit publication of skeptical research in peer reviewed journals; exclude skeptic research from inclusion in IPCC assessment reports; and, destroy the careers of skeptical scientists. In these e-mails, the IPCC scientists acknowledged the use of tainted data, data tampering and the use of invalid statistical analysis techniques. There were also attempts to “scrub” the e-mail records to avoid disclosure of their subversive activities.

There were numerous critiques of the e-mail disclosure, particularly the claim of lack of context for the e-mails. The following year, “FOIA” released thousands of additional e-mails, providing the supposedly missing context. The release of the security key to the remainder of the e-mails occurred in 2013, providing a complete contextual record.

Several investigations found no illegal activities on the part of the IPCC scientists, though much of the activity revealed by the Climategate e-mails was clearly unethical and inconsistent with established scientific process.

“I had hoped, not very confidently, that the various Climategate inquiries would be severe. This would have been a first step towards restoring confidence in the scientific consensus. But no, the reports make things worse. At best they are mealy-mouthed apologies; at worst they are patently incompetent and even willfully wrong. The climate-science establishment, of which these inquiries have chosen to make themselves a part, seems entirely incapable of understanding, let alone repairing, the harm it has done to its own cause.”.

Clive Crook, Senior Editor, The Atlantic

Skeptical scientists have pursued FOIA requests for data and computer codes for years, with very limited success. Some have sued to force access, again with limited success.

The Data

"Data is immutable; "adjusted" temperature records, not so much."

Emissions

[Global anthropogenic CO₂](#) emissions in 2021 were approximately 36.3 billion metric tons, of which approximately 90% was the result of fossil fuel use (for all end uses) and the calcining of limestone to produce cement. The remainder was the result of land use changes. Of the emissions total, approximately 50% remained in the atmosphere, while approximately 26% was absorbed by vegetation and approximately 24% was absorbed into the world's oceans. Global anthropogenic CO₂ emissions remained relatively constant in 2015 and 2016 but began increasing again in 2017. Emissions declined again in 2020, largely as the result of the COVID19 lockdowns, but increased again in 2021.

Carbon dioxide represents approximately 77% of "greenhouse gas" emissions, methane approximately 14%, and nitrous oxide approximately 8%. The remaining 1% is made up of various fluorinated gases, such as fluorinated refrigerants and sulfur hexafluoride.

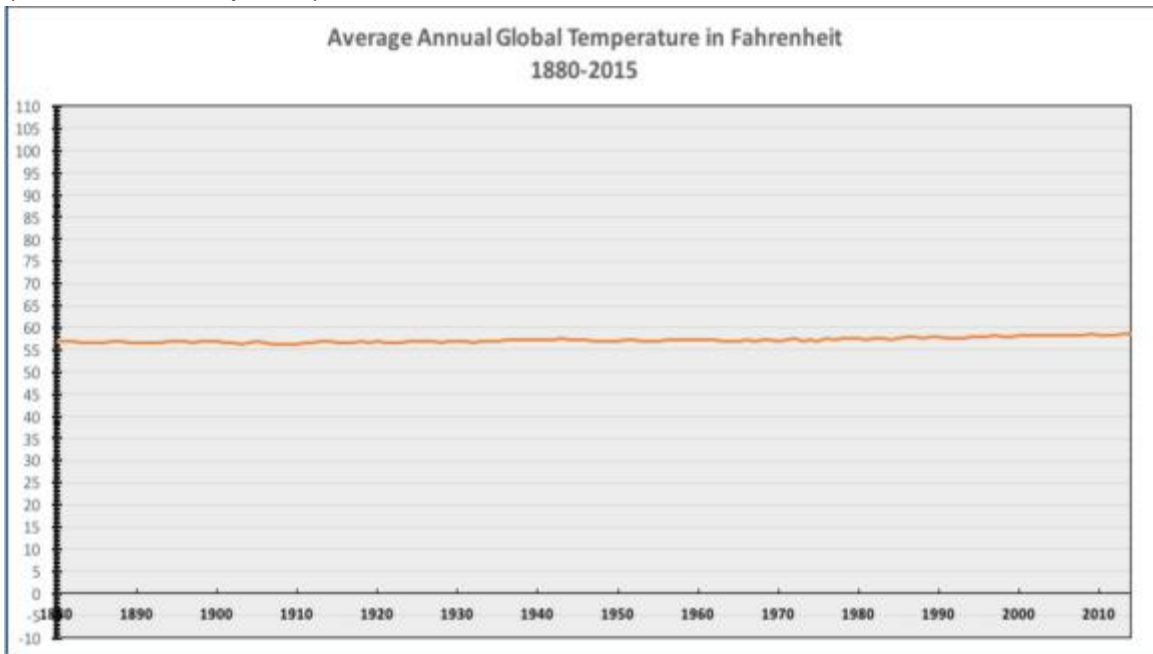
Atmospheric Concentrations

The concentration of CO₂ in the global atmosphere exceeded 417 parts per million by volume (ppmv) in 2022. This is an increase of approximately 147 ppmv from pre-industrial levels, or more than 50%. The [official measurements](#) of atmospheric CO₂ concentrations are recorded at Mauna Loa, Hawaii measuring station, activated in 1958. Earlier measurements are available from a number of sources. Some of these sources suggest that CO₂ concentrations have been higher than the current levels during the period when the measurements were taken. Others question the accuracy of these earlier measurements.

Temperatures

The globe has generally warmed since the trough of the Little Ice Age in the mid-1600s, interspersed with periods of "hiatus" and cooling. Most of that warming has been the result of natural variations, as was the cooling which produced the Little Ice Age (LIA). Our ability to instrumentally measure the extent of temperature variations began with the Central England

Temperature record, in the mid-1600s, coincidentally near the trough of the LIA. Our ability to measure global surface temperatures, such as it is, extends from the mid-1800s. Prior to those instrumental records, our understanding of global surface temperature history is based on the analysis of several proxy records. This [chart](#) puts the recent global warming in perspective by plotting the approximate “adjusted” global average near-surface temperature on a scale of the range of temperatures typical of [mid-latitude locations](#). The satellite temperature record would be virtually indistinguishable from the near-surface temperature record at this scale. This graph suggests that current concerns regarding global warming might be “Much Ado About Nothing”. (HT: W. Shakespeare)



The current concern regarding anthropogenic warming focuses on the period since the industrial revolution, with primary focus on the period since the 1950s. Man is believed to influence climate through two primary mechanisms: the emissions of “greenhouse gases”, particulates and aerosols; and, land use changes, including deforestation, agricultural expansion and the effects of structures on cities. The individual effects of each of these factors are very difficult to assess. That assessment has been made more difficult by the poor quality of the surface temperature data, much of which is the result of land use changes in proximity to the sensors, poor sensor siting and inadequate maintenance. The “adjustments” made to the surface temperature data represent a third apparent potential anthropogenic influence on our perception of climate change.

Climate science focuses on temperature anomalies, in part in recognition of the poor quality of the surface temperature data. However, the surface temperature anomalies are calculated from “adjusted” temperatures, rather than from the actual data, again in recognition of the poor quality of the data. Reliance on the calculated surface temperature anomalies must be based on one of

two assumptions: the accuracy of the temperature measurement at any site does not vary over the period of the anomaly calculation, as the result of either sensor degradation or changes in the environment surrounding the sensor location; or, the "adjustments" completely correct for any such variations. Both assumptions are questionable, particularly in light of the [repeated "reanalysis" and revision](#) of the historical anomalies over time.

As a result, we find ourselves concerned about annual global surface temperature variations of one or two hundredths of a degree Centigrade, based on "adjusted" temperature measurements made predominantly to one tenth degree Centigrade, using sensors which are [estimated](#) to be in error, on average, by two or more degrees Centigrade, compounded by "infilling" of estimates where data do not exist. Further, decadal trends based on these adjusted temperatures are reported to thousandths of a degree Centigrade. The mind boggles! Any validity of temperature anomalies reported to greater precision than the precision of the underlying measurements relies on the [law of large numbers](#) and the assumption that all of the measurement errors and "adjustment" errors are random and tend to offset each other. These assumptions are also questionable.

Each day, thousands of temperature readings are taken from thousands of temperature measurement stations distributed around the globe. A growing percentage of these readings are taken electronically. However, the longer term global temperature record consists predominantly of readings taken manually from inclined mercury-in-glass thermometers and horizontal alcohol-in-glass thermometers, installed in protective enclosures known as Stevenson [Screens or Cotton Region Shelters](#). These stations are being replaced by [Max-Min Temperature Stations](#) (MMTS), which use a thermistor installed in a Gill radiation shield to measure both the maximum and minimum temperatures. [Automatic Surface Observation Stations](#) (ASOS) and Automatic [Weather Observation Stations](#) (AWOS), installed primarily at airports to monitor flight conditions, are also used to provide near-surface temperature readings. The ASOS and AWOS stations, unlike the Stevenson Screen and MMTS stations, record minute-by-minute data, rather than merely the daily maximum and minimum temperatures.

These several weather station types are affected by a series of issues which accumulate over time. Many of the Stevenson Screens have not been [well maintained](#), resulting in changes in the surface characteristics of the whitewash or paint applied to the outside surfaces of the enclosures to reflect solar radiation. Many of the thermometers have not been recalibrated since they were installed, decades ago, even though there is known long term degradation of the thermometers. In addition, many of the stations have been encroached upon by urban and suburban sprawl, changing the characteristics of their surroundings. Many stations have been moved to avoid or minimize the effects of their surroundings. However, many of these station moves are of questionable provenance. The growing use of [ASOS and AWOS stations](#) also introduces questions regarding the representativeness of the data, since the stations are typically located between the main runway and the main taxiway at the airport, where they are influenced by

concrete, blacktop, buildings, and jet exhaust heat. Also, their primary function is to measure the temperature of the air entering the jet engines and providing the lift under the wings of the aircraft, used in calculating the available thrust and lift under hot weather conditions. Thus, their preferred installation incurs an intentional warming bias.

The changes in sensors, enclosures, station surroundings and locations and the aging of the sensors have introduced [errors](#) into the near-surface temperature records which are [not well documented](#).

The US has recently installed the [Climate Reference Network](#). Each of the 100+ stations in this network consists of three separate platinum resistance thermometers, located in near-ideal surroundings. These stations represent the [state-of-the-art](#) in near-surface temperature measurement. These stations are all in their original locations, remote from confounding influences with the exception of the site on the University of Rhode Island campus. As limited as our ability to measure temperatures is, particularly on a global scale, our ability to accurately measure near-surface temperatures using sets of highly accurate instruments in "ideal" sites (CRN) is even more limited. Several members of the consensed climate science community have recently identified the need to develop a [system](#) such as the US CRN with global coverage.

The most complete temperature coverage of the globe is accomplished by satellite. These measurements are referenced against the temperature of deep space, as well as against readings taken from weather balloons. The satellite data is analyzed and reported by two organizations: [University of Alabama, Huntsville \(UAH\)](#); and, [Remote Sensing Systems \(RSS\)](#). The satellite record began in the late 1970s.

Proxy Records

Estimates of global temperatures in the period prior to the start of the instrumental temperature record are made by studying a number of artifacts as [proxies](#) for climate conditions. These include: coral growth; fossil pollen; tree rings; ice cores; and, ocean and lake sediments. These proxies are difficult to analyze because there are typically multiple factors which contribute to the existence of the artifact. For example, tree rings are influenced by both temperature and water availability.

Significance

"It is the mark of an instructed mind to rest satisfied with the degree of precision which the nature of the subject permits and not to seek an exactness where only an approximation of the truth is possible." – Aristotle

The global instrumental temperature record is a record of estimates of temperatures based on readings which are known to be flawed. Pronouncements of ["hottest year ever"](#) (in the instrumental era) are based on increases of one or two hundredths of a degree centigrade in the mean global "adjusted" temperature set, which consists of readings taken to 0.1°C from instruments estimated to be in error, on average, by more than 2°C (3.6°F). This mathematical construct is only valid if all of the errors "adjusted" out of the data are random errors. The difference between the anomaly changes reported for December, 2014 by the three primary producers of near-surface temperature anomaly products was 0.09°C, or approximately 10% of the total reported anomaly since 1880. [This suggests, conservatively, that no anomaly change of less than 0.1°C could reasonably be labelled significant.](#)

There was no statistically significant (95% confidence level) global warming for between 11 and 22 years, depending on which temperature anomaly product is being [analyzed, prior to the 2015/2016 super El Nino.](#)

For University of Alabama Huntsville 6.0: Since December 1992: This is 22 years and 10 months.

For Remote Sensing Systems: Since March 1993:

This is 22 years and 7 months.

For Hadley Center sea surface temperature 3: Since July 1995: This is 20 years and 3 months.

For Hadley Climate Research Unit 4.4: Since January 2001: This is 14 years and 9 months.

For Goddard Institute of Space Studies: Since September 2004: This is 11 years and 1 month.

The 2015/2016 super El Nino raised global near-surface temperature anomalies and the mid-tropospheric temperature anomalies significantly, as reflected in the [updated comparisons](#) below.

For UAH6.0: Since November 1993: CI from -0.009 to 1.784

This is 23 years and 2 months.

For RSS: Since July 1994: CI from -0.005 to 1.768 This is 22 years and 6 months.

For Hadcrut4.5: The warming is statistically significant for all periods above four years.

For Hadsst3: Since March 1997: CI from -0.003 to 2.102 This is 19 years and 9 months.

For GISS: The warming is statistically significant for all periods above three years.

Note that each of these estimates relates to the same earth, looking back from the same date. Note also that the pause still exists in the satellite records, though “adjustments” have dramatically shortened the pause in the near-surface temperature data.

Scientists have recently noted a new warming “hiatus”, which now exceeds 8 years in duration.

Land Use

Land use changes contribute to climate change in [several ways](#). Conversion from forest land to crop land removes the felled trees from the forest carbon sink. It also changes the albedo of the cleared land. [Conversion to rural, suburban and urban mixed use](#) further changes the albedo of the land, and adds a mass of blacktop, concrete, aluminum, steel and glass which absorb heat during the day and release most or all of it through the night. The principal changes in ambient temperature, especially in cities, are not increases in daytime maximum temperatures, but rather increases in nighttime temperatures resulting from the slow release of the heat stored in roads and buildings. This effect is frequently exacerbated by the wind-blocking effects of the buildings, which slows convective cooling.

Observations

Precipitation Change

Rainfall and snowfall are obvious and easily measured forms of precipitation. They become a concern when there is too much of either in a short period of time (flood) or too little of either over a long period of time (drought). Flood and drought are both normal conditions of weather. However, a long term change in annual precipitation (15 years) is an indication of a potential change in climate; and, a change over 30+ years is a climate change. Such changes, alone or in combination with temperature changes, can affect the ability to grow crops and feed animals over large areas. There is a tendency to attribute excessive rainfall and prolonged droughts to climate change, despite the fact that there is no evidence of any causal relationship.

There is no [national](#), continental or [global](#) trend in annual precipitation which would represent a change in that aspect of climate.

Storm Frequency and Severity

Storms, including hurricanes and typhoons, tornadoes and “polar vortices” are easy to count. Systems exist to categorize these storms by their intensity, such as the [Saffir-Simpson Hurricane Wind Scale](#) and the [Fujita Tornado Intensity Scale](#). Therefore, the relative frequency and intensity of these storms is known precisely and easy to analyze over time. However, caution must be exercised in comparing the number of less intense storms, since the satellite era has made it possible to detect low intensity or small area storms which might not have been detected previously.

Some groups, such as property insurance carriers and reinsurers, analyze the relative economic costs of such storms. However, again, caution must be exercised in comparing the economic impacts over time, because of the increased number and value of the properties built in seashore and semi-tropical areas impacted by such storms. The vigorous development of high value properties along the US East and Gulf coasts, for example, increases the potential exposure to property damage.

These issues are discussed in the recent [book](#), *[IMPACTS OF CLIMATE CHANGE, PERCEPTION AND REALITY](#)*, by Dr. Indur M. Goklany.

Sea Level Change

Global sea levels are rising at a rate of approximately 1.4 millimeters (about one-sixteenth of an inch) per year. There is [no indication of any significant increase](#) in the rate of sea level change over the past 145 years, as measured in tectonically stable coastal areas. The satellite measurements, beginning in 1993, show sea levels rising at a rate of 3.0 millimeters per year, more than twice the rate over the past 145 years measured by instruments actually in contact with the coastal ocean surface. There is no explanation offered for the apparent instantaneous doubling of the rate of sea level rise. Thomas Wismuller identified an error in the processing of the satellite data responsible for this difference, but the issue has yet to be resolved. However, actually [measuring sea level](#) is a very difficult and questionable [process, since the sea is never truly motionless](#).

The Models

"95% of Climate Models Agree: The Observations Must be Wrong", Roy Spencer, PhD

"It doesn't matter how beautiful your theory is, it doesn't matter how smart you are. If it doesn't agree with experiment, it's wrong.", Richard Feynman

In 1988, [Dr. James Hansen](#), then Director of the NASA Goddard Institute of Space Studies made a presentation to Congress on climate change at the request of then Senator Timothy Wirth (D, CO). (This was the site of the now (in)famous "[Wirth's Warm Hearing Room Trick](#)".) Hansen presented a [graph](#) showing three potential future global temperature scenarios, based on: continued exponential increase in atmospheric CO₂ concentrations; continued linear increase in global atmospheric CO₂ concentrations; and, rapid cessation of global CO₂ emissions and stabilization of global atmospheric CO₂ concentrations. Actual "adjusted" temperature observations over the intervening 30 years are lower than even the lowest temperature scenario presented by [Hansen](#), despite a continued exponential increase in global annual CO₂ emissions.

[Dr. Roy Spencer](#), a Principal Research Scientist at the University of Alabama (Huntsville) and U.S. Science Team leader for the Advanced Microwave Scanning Radiometer flying on NASA's Aqua satellite has recently [compared the scenarios](#) generated by 90 climate models with the "adjusted" HadCRUT4 near surface temperature record and the UAH satellite temperature record. The modeled scenarios of future temperature increase continue to progressively increase the divergence from the observations, thereby [progressively falsifying the models](#).

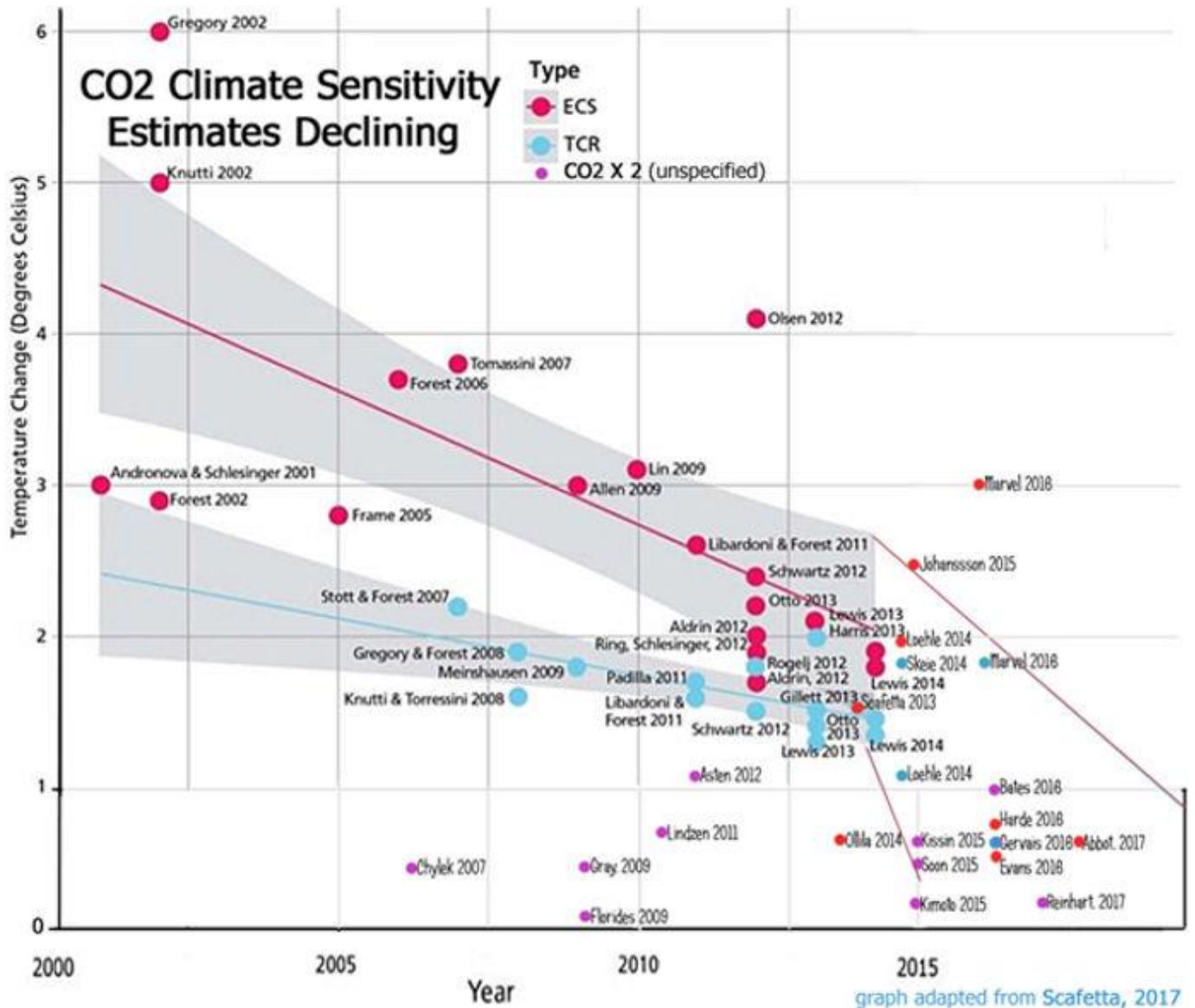
Dr. Richard Lindzen, in testimony before the US Congress, summarized the situation with the IPCC models as follows: "the models used to predict or project temperatures are flawed; thus, the models used to predict future economics are also flawed; there is no indication that earth's climate is changing, other than what is natural; the IPCC's estimate of the sensitivity to a doubling of CO₂ is done incorrectly; and, [recent studies](#) suggest that the effects of a doubling of CO₂ would be minor."

[Dr. Patrick J. Michaels](#), director of the Center for the Study of Science at the Cato Institute, past president of the American Association of State Climatologists, research professor of Environmental Sciences at University of Virginia and former IPCC reviewer, noted:

"Since 2011, the refereed literature contains at least 14 studies detailing 20 experiments by 45 scientists, all demonstrating that the sensitivity of temperature to a doubling of

carbon dioxide is considerably less than what is in the ensemble of the UN's climate models.

A [review](#) of recent studies of climate sensitivity to a doubling of the atmospheric CO₂ concentration documents progressive reduction of the central estimate of climate sensitivity, as shown below.



There are dozens of GCMs in the [IPCC CMIP-5](#) and CMIP-6 ensembles. Were the science “settled”, wouldn’t there be one model which produced a single projection of the temperature

effects of a given CO₂ emissions path over time? The existence of this number of models establishes the degree of uncertainty in the science. These models have been “tweaked” to fit the “adjusted” data over the past period, then extended into the future, as “tweaked”. This process currently models [scenarios](#) which average about twice the warming shown in the actual “adjusted” temperature anomaly record to date. Based on the expanding divergence of the models from “adjusted” temperature anomalies, the modeled anomalies would be four times the “adjusted” anomalies.

The [models](#) are driven by: the rate of increase of atmospheric CO₂ concentration; the assumed climate sensitivity to increasing CO₂ concentrations; and, estimates of various feedbacks, including water vapor and clouds. The models essentially ignore: changes in the constantly changing output of the sun; ocean oscillations; ocean currents; winds; the water cycle; and, galactic cosmic rays.

The CMIP-5 models did not predict or project the recent 18+ year “hiatus” in the global near-surface temperature anomalies. Some argue that there has been no “hiatus”, despite the 65+ published explanations of the “hiatus” which have been offered by members of the consensed climate science community. A [recent study](#) by the National Center for Environmental Information (NCEI) suggests that there has been no “hiatus”, based on “adjustments” to the sea surface temperature collected by purpose-built temperature measuring stations to make them more consistent with the sea surface temperature record compiled by seagoing ships using various techniques. NCEI has resisted congressional requests for information related to the conduct and publication of this study. However, the results of this study have been superseded by two more recent reanalysis by other NCEI researchers.

Dr. John Bates, a retired NOAA climate scientist, has recently [refocused attention](#) on the Karl et al “pause buster” sea surface temperature adjustments; and, NOAA has agreed to conduct an investigation of Dr. Bates charges.

A very [simple climate model](#) has recently been developed by Monckton, Soon, Legates and Briggs. This model appears to provide a better match to the “adjusted” data than most of the CMIP-5 ensemble models and the more recent CMIP-6 ensemble models. This model has been roundly criticized by those [invested](#) in the CMIP-5 models and defended by those [critical](#) of those models.

Roy Spencer has also recently developed a [1D model](#) which also provides a close match to the UAH satellite data and to the HadCRUT4 temperature anomaly product.

Verification and Falsification

The Global Climate Models in the CMIP-5 and CMIP-6 ensembles have not been verified, as they certainly should be if they are to be used to support policies which would impose trillions of dollars of required investment and incremental costs on the US and global economies. The ever-growing difference between even the least threatening of the CMIP-5 and CMIP-6 model scenarios and the “adjusted” near-surface temperature anomalies is progressively falsifying the models. The CMIP-6 models show even greater differences from the “adjusted” near-surface temperatures. This evolution appears to make absolutely no sense.

The Politics

"Science is the belief in the ignorance of the experts" – Richard Feynman

Government Growth

"The whole aim of practical politics is to keep the populace alarmed (and hence clamorous to be led to safety) by menacing it with an endless series of hobgoblins, all of them imaginary.", H. L. Mencken

Politics is the art of looking for trouble, finding it everywhere, diagnosing it incorrectly and applying the wrong remedies., Groucho Marx

Achieving global de-carbonization would require new legislation, new regulation, new bureaucracies and new sources of revenue on an unprecedented scale. One need only look at the Waxman-Markey, Kerry-Lieberman or Kerry-Boxer climate bills to begin to comprehend the massive new government intrusions envisioned by the US government in pursuit of climate change action. All three bills were laden with cap and tax and spend and redistribute and pick winners and losers components. Fortunately, none of these bills became law.

There is also continuing interest in the imposition of a [carbon tax](#), in the US and elsewhere, although recent uprisings in France in response to such a tax have dimmed the ardor of many of its supporters.

The most recent fascination of the progressive left in the US is the “Green New Deal”, which currently exists only as a non-binding [Sense of Congress Resolution](#) introduced in both the House and the Senate. The scope and intent of the [Green New Deal](#) far exceeds the scope of the previous climate bills discussed above. Much of the Green New Deal is embodied in the Biden Administration’s Build Back Better initiative.

However, the growth of government would hardly be limited to the national level. The UN envisions enforceable agreements, which obviously imply the need for both monitoring and enforcement mechanisms. Therefore, a “side benefit” of climate change avoidance and mitigation efforts would be some level of [global governance](#). The \$100 billion per year transfer payments demanded by the developing nations, which are projected to increase to \$450 billion by 2030, would also require a collection and redistribution bureaucracy at the UN. Further funding on a similar scale is proposed for adaptation to anticipated future climate change and for compensation for “loss and damage”. These are roles the UN has clearly demonstrated it is incompetent to perform.

The U.N. adopted a humanitarian program during the first Gulf War labeled '[Oil for Food](#),' which was intended to import food for civilians by allowing the export sale of oil by Saddam Hussein’s government. Under U.N. management, much of the food ended up being sold by government officials on the Black Market. Foreign currency (U.S. dollars) collected for the exported oil was also fraudulently diverted in huge amounts.

Government Repression

“How I learned to love Big Brother”, subtitle to 1984, George Orwell

One of the most disturbing aspects of the politics of climate change is the current interest in [punishing those who do not agree with the consensus](#). These efforts have included denying them Federal research grants; the attempt by representative Raúl M. Grijalva, (D,,AZ) to force universities to disclose the funding sources of their scientists who testify before Congress; the comments from Senator Sheldon Whitehouse (D, RI) proposing a [RICO investigation of climate skeptics](#); and, the letter from 20 climate scientists to former President Obama and Attorney General Loretta Lynch requesting RICO prosecutions of skeptical scientists.

Wealth and Income Redistribution

“Since this is an era when many people are concerned about 'fairness' and 'social justice,' what is your 'fair share' of what someone else has worked for?” — [Thomas Sowell](#)

The undeveloped nations of the world and low lying coastal and island nations are very focused on the potential to use climate agreements to extract transfer payments from the developed nations, both as reparations for supposed present and potential future adverse impacts of climate change and for use in mitigation efforts to minimize potential future damage.

“Climate policy has almost nothing to do anymore with environmental protection, says the German economist and IPCC official Ottmar Edenhofer. **The next world climate summit in Cancun is actually an economy summit during which the distribution of the world’s resources will be negotiated.**” –

Ottmar Edenhofer was the co-chair of the IPCC Working Group III

This situation has been apparent since at least COP 15 in Copenhagen; and, was a primary concern in the preparations for COP 21 in Paris in 2015.

The Group of 77 + China are lobbying for open ended annual transfer payments of \$100 billion. China’s participation in this group is particularly ironic, as China is currently the largest CO₂ emitter in the world, by a factor of approximately two. While China is demanding immediate, substantial reductions in emissions by the developed nations, it has indicated that it plans to reach its peak annual emissions by approximately 2030, but is rapidly increasing that peak

President Trump halted US funds transfers to the UN Green Climate Fund, which was to be the vehicle for fund transfers from the developed nations to the developing nations. President Biden has committed to restoring and increasing US funding.

Green Clergy Morality – Recruitment of Religious Leaders

“It’s not easy being green.”, Kermit the Frog

The environmental movement has made a concerted effort over many years to enlist the support of the world leaders of the major religions for their climate change efforts, frequently under the banner of [climate justice and responsible stewardship of the earth](#).

This initiative resulted from a proposal in 1990 by HRH Prince Philip, the Duke of Edinburgh, as the Chairman of the World Wildlife Federation, to recruit the religious leaders of the world to make climate stewardship an ethical or moral obligation for the reason that in many countries, especially developing ones, religious leaders are the most influential spokesman. Actually, poor countries and poor people everywhere would be harmed disproportionately by the increased energy costs caused by immoral policies triggered by climate change hysteria.

[King Charles](#), also has been an early and enthusiastic advocate for climate action; and, has recently become a [strident promoter](#) of climate alarmism. Former US President Barack Obama is a more recent, but no less ardent, advocate. President Biden has proposed efforts far beyond those initiated by President Obama.

Most of the world's [major religions](#) support climate action as well. The most recent adherent is Pope Francis. In his Encyclical, [Laudato Si](#), the Pope adopts the consensus view of climate science, rather than the encouragement of dialogue which characterizes the remainder of the Encyclical. This is not surprising, based on the group of advisors (Hans Joachim Schellnhuber, Naomi Oreskes, Naomi Klein, Peter Waddams and Jeffrey Sachs) the Pope selected for this effort; and, on the specific exclusion of skeptical scientists from his meetings on the subject prior to the publication of Encyclical. It is hardly surprising that the world's [Catholic Bishops](#) have since called for total de-carbonization of the globe by 2050. While this [position](#) is consistent with the Pope's position, though more explicit, it is likely implausible, impractical, uneconomic and unnecessary; and might eventually embarrass the Catholic Church much more than its condemnation of Galileo. Both the Pope and the American Bishops completely ignore the harmful effect that green policies have by increasing energy costs to the detriment of the poor in developed countries and everyone in developing countries. The Pope has recently described climate skeptics as "[perverse](#)".

Economic Effects

"Instead of trying to make fossil fuels so expensive that no one wants them – which will never work – we should make green energy so cheap everybody will shift to it.", Bjorn Lomborg

Decarbonizing the globe to avoid or minimize climate change would involve replacing all of the existing fossil energy end uses with non-fossil end uses. This would include: coal, oil and natural gas power plants; all direct-fired industrial processes, including the production of coke and its use in iron and steel production; the calcining of limestone to produce cement; all direct-fired commercial equipment, including food service equipment; all industrial, commercial, institutional and residential direct-fired space heating and water heating equipment; all gasoline, diesel and hybrid vehicles, unless redesigned to operate exclusively on biofuels. These processes and equipment would be required to be replaced, where possible, with processes and equipment fueled by renewable fuels or electricity produced by renewable sources and perhaps nuclear generation – although the Green movement is strangely unenthusiastic regarding nuclear plants.

I have estimated the investment required in the US to achieve this de-carbonization, using currently available technology, at approximately \$30 trillion. The required returns on that

investment alone would add approximately \$3 trillion per year to the cost of goods and services in the US economy. Depreciation cost for those assets would add trillions of dollars of additional annual cost to the economy, depending on the depreciation periods used for the various assets, which are estimated to be far shorter than the depreciation periods for conventional generation assets..

It is particularly difficult to estimate the economic effects on manufacturers, especially in the process industries, which rely on large supplies of reliable energy to operate their facilities without interruption. The principal replacement sources of energy currently being incentivized by governments are intermittent and non-dispatchable, suggesting reduced reliability of the electric system. Several potential sources of continuous, reliable renewable energy (dry hot rock geothermal, wave energy and ocean thermal energy conversion) have been identified and are the subjects of ongoing research efforts. However, there is no clear time horizon for their economical, large scale introduction to the energy market.

The increased investments and costs associated with de-carbonization, combined with the uncertain reliability of renewable sources to generate electricity, would pose hardships for all, but especially for the most vulnerable. Government would almost certainly attempt to moderate these hardships, as it has in the past, with transfer payments, though there is no reasonable prospect that government would be any more successful in doing so than it has been in the past.

Economic Dead Loss

One obvious result of total de-carbonization is abandonment of the enormous asset value of the fossil fuels which would be left undeveloped and unproduced as a result. This [dead loss](#) is extremely difficult to estimate because the total extent of each resource has not been determined. In the US, the loss would be approximately \$100 trillion. However, there is no doubt that the dead loss would be several hundreds of trillions of dollars globally – several years of total current GDP of the entire world.

The Technology

What's old is new again.

Renewable sources of energy, including hydro and biomass, supplied approximately 30% of [global energy](#) in 2021.

Hydro

Hydropower is one of the oldest and best established sources of renewable energy. Most modern applications combine water storage for irrigation and flood control with hydroelectric generation. Hydroelectric projects are typically government-funded, because of the massive investments required to construct the dams and install the turbine generators.

Hydropower facilities are generally considered to be dispatchable. However, variations in precipitation in the areas which feed the dams impact the water available for both irrigation and power generation. Therefore, it is important to distinguish between the portion of the power generation capacity which is reliable and dispatchable; and, the portion which is “source of opportunity” power, available when stored water volumes are above the minimum reliable level.

Hydroelectric projects are not popular with environmentalists. It is questionable whether any new large dams will ever be built in the United States. The basic objection is that the existence of the new reservoir would destroy irreplaceable pristine areas inundated. This is coupled with downstream safety concerns that the dam could be breached by an earthquake. Although there is no solution, there is considerable concern that some dams have been located on tectonic fault lines. Variations of these arguments are also used against new small dams, which do not create flooding risks.

Hydropower development is very active in developing nations, particularly [China](#) and [India](#).

Solar

Currently governments are incentivizing solar installations in many countries to increase the penetration of renewables into their energy markets. Solar includes: solar thermal electric generation; solar photovoltaic electric generation; and, solar thermal collection for heating applications.

The most common utility scale solar installations were [solar power towers, though they are being displaced by fields of ground-mounted PV collectors](#). The power tower installations (rapid raptor roasters) consist of a field of sun-tracking mirrors which focus reflected solar energy onto a centrally located solar boiler mounted on a tower. The concentrated solar energy produces steam, which is fed to a steam turbine generator to produce electricity. Newer designs are experimenting with molten salt as the heat transfer fluid, which is used to generate steam for the turbine generator. Research is also underway to use molten salt storage to allow the plant to generate electricity when the sun is not shining.

Numerous smaller scale systems use fields of solar photovoltaic collectors to generate electricity for delivery to the electric grid. These systems are similar to, though far larger than, the solar photovoltaic collector systems installed on the roofs of businesses and residences. The commercial and residential systems may be equipped with some level of battery storage, to provide power when the sun is not shining. However, most of the commercial and residential systems remain connected to the utility grid, so that grid power may be used when the sun is not shining.

Many residential solar photovoltaic systems take advantage of net metering policies of the serving utilities, obviating the need for on-site storage and allowing the generator to sell surplus power to the grid. Net metering is now being questioned in many jurisdictions, because the on-site generator is compensated not only for the utility's avoided cost of alternative sources of power, but also for a portion of the utility's fixed costs, thus transferring those costs to non-generating customers. Net metering is not sustainable long term as the installed capacity of on-site generation increases.

Many residential users and some commercial users also apply solar thermal collectors for pool heating, domestic water heating and space heating. There are also numerous approaches to passive solar thermal collection, for both residential and commercial applications.

Wind

The most common form of utility scale wind generation is the [industrial wind farm](#) (rapid raptor chopper). These wind farms typically consist of 100 or more 1.5–2 megawatt wind turbines, standing 300 – 400 feet in the air. These wind turbines may be located either onshore or offshore, in areas with historically documented wind availability in the speed range necessary to operate the turbines.

There is significant and growing resistance to on-shore industrial wind in the US and in parts of Europe. Neighbors are concerned about the low frequency noise generated as the turbine blades pass the tower. There is also a growing awareness of the preferences these generators receive

from regulators and the resulting increases in utility electricity costs. This has been particularly true in Europe, where the percentage of wind energy is quite high in several countries.

The subcategory of environmentalists focused on animal life is vigorously objecting to the bird kill of wind turbines, pointing out that this killing violates the migratory bird treaty with Canada and Federal and State statutes. They ask why treaty obligations are not enforced – for example, if oil drilling resulted in this bird kill, the oil company executives would all be in prison.

Geothermal

[Geothermal energy systems](#) typically rely on the availability of areas where geothermal steam can be accessed by drilling wells into an underground formation. These areas are quite limited in scope, thus limiting the potential of geothermal steam systems.

Research has been underway for some time on an alternative referred to as [“dry hot rock”](#) geothermal. This approach requires drilling into the earth’s mantle to a depth at which the rock is hot enough to generate steam and heat can be transferred to the rock rapidly enough to replenish the heat removed by the steam generation process. There are some similarities to the fracking process, in that the rock must be fractured to increase the surface area available to boil the water injected into the well. This approach has been the subject of experiments in Switzerland, which have since been terminated as the result of earthquakes generated by the process.

Wave Energy

[Wave energy](#) production is still in the R&D phase. The generation potential of wave energy on the US continental shelf is approximately 1200 TWhr/year, or about 30% of current US electric consumption. Several technologies are being designed and tested, but there is no technology which has demonstrated competitive potential at this time.

Ocean Thermal Energy Conversion

[Ocean Thermal Energy Conversion](#) is another technology still in the R&D phase. This technology relies on the temperature gradient between the deep ocean and the surface. A [prototype plant](#) is currently operating in Hawaii.

Biomass

[Biomass](#) refers to field crops grown for that specific purpose, as well as to field crop waste materials. Biomass can be burned directly to generate heat, or to generate steam for power generation. In this application, biomass is essentially very immature (not yet fossilized) coal, acceptable because the carbon it contains is of contemporary origin.

Biomass can also be processed into biofuels suitable for vehicle applications. However, these processes are not yet commercially or economically viable. The current production of bio-ethanol from corn in the US, while easier and less costly from a process standpoint, is still not economically viable; and, relies on both federal subsidies and federal mandates for its continued use.

Nuclear

[Nuclear electricity production](#) is a commercial technology which is currently in use in many countries around the world. However, there is an inexplicable resistance to the construction of new nuclear generators, ostensibly as the result of the safety issues raised by Three Mile Island, Chernobyl and Fukushima. Comparable containment risks do not apply to newly-designed “small” nuclear reactors. This resistance is not unique to the United States. It is much stronger in Germany where existing nuclear plants -- with many years of scheduled life remaining -- have been being decommissioned, though decommissioning is now being delayed as the result of Russian natural gas delivery reduction and renewable generation under-performance.

Nuclear electric generation could make a major contribution to a decarbonized world as a reliable source of base load power. Nuclear can also be used for load following applications, but they are not its best application. Nuclear generation currently represents approximately 20% of US power generation. It accounts for approximately 2400 TWh/year of power generation globally.

Transmission

Most actual and potential sources of renewable energy -- wind, solar, hydro, wave, OTEC -- are not located close to commercial or residential consumers. This requires a huge investment in new transmission lines extending in many cases hundreds of miles. A [rough estimate](#) of the cost for the U.S. only would be \$1.5- 2 trillion by 2030; and, perhaps \$5-10 trillion for complete decarbonization.

Mandated Efficiency

[Efficiency](#) of energy use is, in general, very wise policy. However, current efforts to increase energy utilization efficiency in the US are based on Federal regulations requiring specific

minimum efficiencies, frequently with only modest concern for the cost of the more efficient devices. The EPA has set minimum efficiency standards for residential and commercial space heating, water heating, cooking and laundry equipment, dishwashers, refrigerators and freezers for about three decades. The same is true for vehicles, which have been subject to CAFÉ standards for decades as well.

However, the new CAFÉ standards established by [US DOT / NHTSA](#) at the behest of the Obama Administration would have required a 60% increase in the fuel efficiency of light duty vehicles by 2025. Standards are under development for medium duty and heavy duty vehicles as well. These standards are significantly technology forcing, since the technology to achieve these standards is either non-existent or not commercially feasible. The Trump Administration began the process of halting or massively revising these more stringent standards, though these revision efforts are being halted by the Biden Administration.

These standards, which intrude on everyday living of consumers and businesses, can be put in context by realizing that the government claims that they have saved more than 110 billion of gallons of gasoline and diesel fuel since their inception, or the equivalent of more than 1300 large tanker imports of crude oil – fewer than one tanker per week.

The adoption of more efficient equipment does not always result in the expected reduction in energy consumption. Rather, [Jevons' Paradox](#) frequently comes into play, such as when the consumer who has installed a new, more efficient furnace then adjusts the thermostat up to a more comfortable temperature, since the cost of doing so is now lower; or, the consumer uses the savings from energy to partake in activities which use additional energy, thus reducing the potential energy savings from the energy efficiency improvements.

Conservation

[Conservation](#) is the action of doing without certain things to reduce energy use. Conservation has the disadvantage of not being durable, in that the energy user can and frequently does decide to stop doing without those certain things at a later date. For example, former President Carter's call to set thermostats down in winter and wear sweaters to keep warm worked for a while. However, how many people have kept their thermostats set down and continued to wear sweaters around the house or office to keep warm?

The Human Impacts

Beatings will continue until morale improves.

Higher Energy Costs

The [costs](#) of solar and wind energy are competitive with commercial power in certain parts of the globe. However, these comparisons are based on this intermittent, renewable power as “source of opportunity” power, used when it is available and substituted for when it is not available. Neither solar nor wind power, generated in sufficient quantities both to meet current demand and to provide additional power to be stored for use in periods when generation is unavailable, combined with the storage capacity required to store excess power for later use, is cost competitive with commercial power. Reliance on these higher cost power sources would strain customer budgets, perhaps to the point of forcing unwanted conservation, which would disproportionately impact the poor and minorities in the developed countries and almost everyone in developing countries.

Reduced Energy Reliability

While intermittent sources of power are relatively predictable, they are still neither [reliable](#) nor dispatchable. This means that an electric system dependent on them is more likely to suffer power instability, brownouts and blackouts than a system based on high availability, reliable and dispatchable generators. Unreliable power would interfere with the normal lives of customers and the business activities of commercial users.

Reduced Energy Availability

Solar and wind resources would likely be inadequate in many locations, restricting energy availability. The situation with natural gas availability in the US Northeast is an example of such a constraint. Removing such constraints frequently is very difficult, expensive and contentious.

Reduced Freedom

There are already discussions within government regarding restricting access to suburban living and forcing more of the population to live in cities, thus reducing use of personal vehicles and

forcing more of the population to public transportation. Some cities, such as London, England, charge fees to drive within the city limits.

Reduced Quality of Life

While many enjoy the quality of life available in cities, others prefer [suburban](#) or even rural lifestyles. Forcing more people to live in cities would almost certainly decrease the quality of life in those cities, as the result of crowding, as well as decreasing the quality of life for those who prefer to live outside the city.

Shared Misery

"All animals are equal, but some animals are more equal than others." George Orwell, Animal Farm

The transfer of wealth and income from those who produce it to those who only consume it, while it creates misery for those from whom the wealth is being transferred, has never been sufficient to end the misery of those who only consume. The world's remaining communist countries are a continuing demonstration of that reality. The ruling classes, however, manage to insulate themselves from those realities, at least for a time.

The Ultimate Goal

"The environmental movement has evolved into the strongest force there is for preventing development in the developing countries.", Patrick Moore, Greenpeace co-founder

Complete De-carbonization

[UNFCCC](#)

[IPCC](#)

[World Bank](#)

[G7](#)

[Catholic Church](#)

Elimination of Animal Husbandry

[UNFAO](#)

[IPCC](#)

Population Control

[Paul Ehrlich](#)

[Hans Joachim Shellnhuber](#)

Wealth and Income Redistribution

[UN FCCC](#)

[IPCC](#)

Global Governance

[UN](#)

[Climate scientists](#)

A fossil-fuel-free, global [vegan commune](#) of approximately 1 billion souls, run by some subset of the tinpot despots represented in the UN General Assembly.

Recommended Websites

Aligned

<https://climateaudit.org/>
<http://www.drroyspencer.com/>
<https://judithcurry.com/>
<https://wattsupwiththat.com/>
<http://surfacestations.org/>
<https://climatechangedispatch.com/>
<http://www.climatedepot.com/>
<http://www.climate4you.com/>

Non-aligned (Mis-aligned?)

<http://www.realclimate.org/>
<https://www.desmogblog.com/>
<https://skepticalscience.com/>
<https://thinkprogress.org/>
<https://www.epa.gov/>
<https://www.climate.gov/>
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https://www.youtube.com/playlist?list=PLbNuSaC4e1XHnISI_H0LDUbOBJbDhNOvK

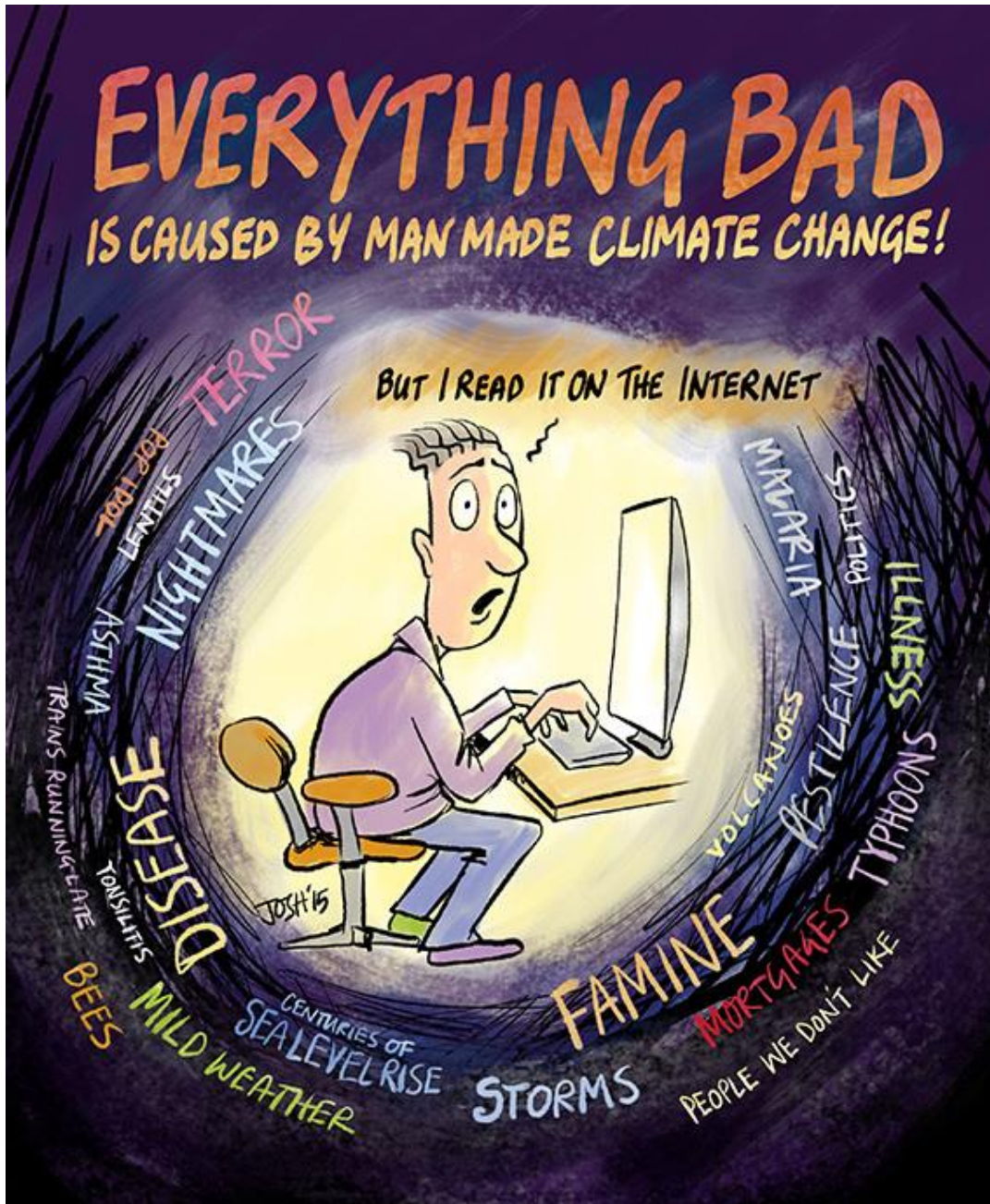


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