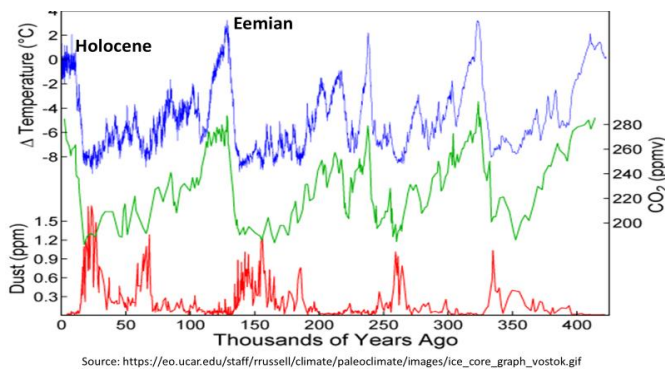


Tackling Climate Change

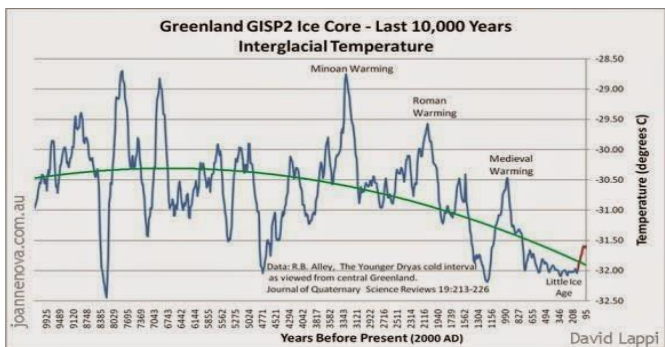
Dr D Weston Allen (MBBS, FRACGP) Aug 2019

[Earth's complex climate](#) is always changing, sometimes rapidly. Greenland's temperature rose ten degrees Celsius (10°C) in [a single decade](#) 11,500 years ago. Earth has been [warmer than now](#) and the [atmospheric carbon dioxide](#) (CO₂) level much higher than now for most of its 4.5 billion years. [Natural sequestration](#) over 200 million years reduced it ten-fold from [2,000 parts per million](#) (ppm) to just 200ppm 2.58 million years ago when Earth entered the cold [Quaternary ice-age](#).

[Milankovitch orbital cycles](#) trigger interglacial warm periods such as our present [Holocene](#). The [Eemian](#) interglacial was [several degrees warmer](#) than now. Warming oceans [release](#) CO₂, helping plants thrive in a warmer and wetter world. Antarctic's [Vostok ice cores](#) show CO₂ levels rising with temperature and then falling as plants sequester it and Earth becomes colder, [drier and dustier](#).

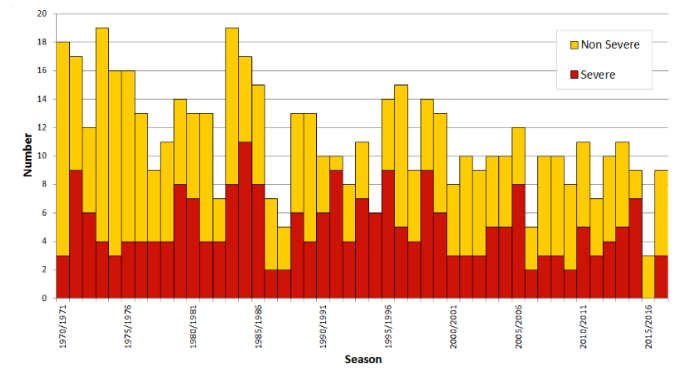
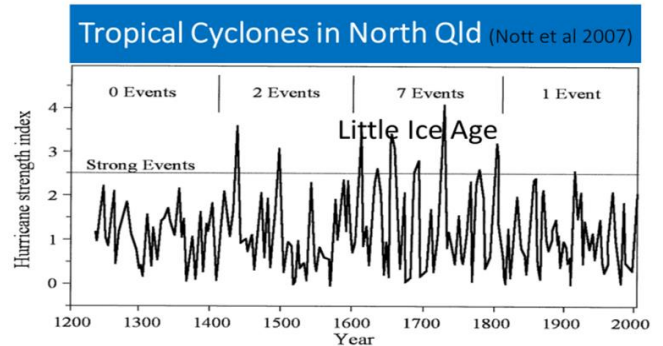


Civilisation began during the warm [Holocene Climatic Optimum](#) around 7,000 years ago, after which Earth began to slowly cool. Greenland's ice-cores (GISP2) show the Minoan, Roman and Medieval warm periods interrupting this gradual cooling.



Europe flourished during the [Medieval Warm Period](#) (900-1300 AD) but was [plagued](#) by famine and disease during the subsequent [Little Ice Age](#) (LIA), especially during the [Maunder Minimum](#) of solar activity (1645-1715 AD) when rivers froze in winter and [advancing](#)

[glaciers](#) wiped out alpine farms and villages. [Cyclones](#) were more severe in North Queensland during that cold preindustrial period. They are not increasing now.



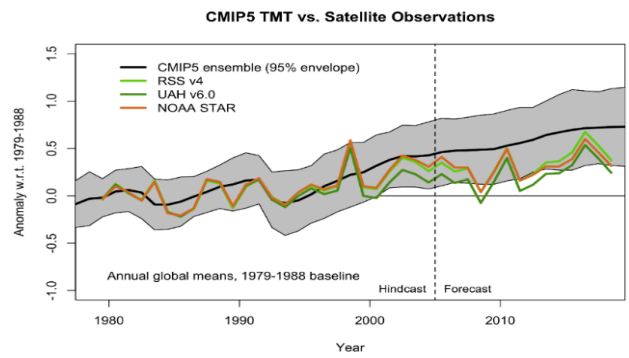
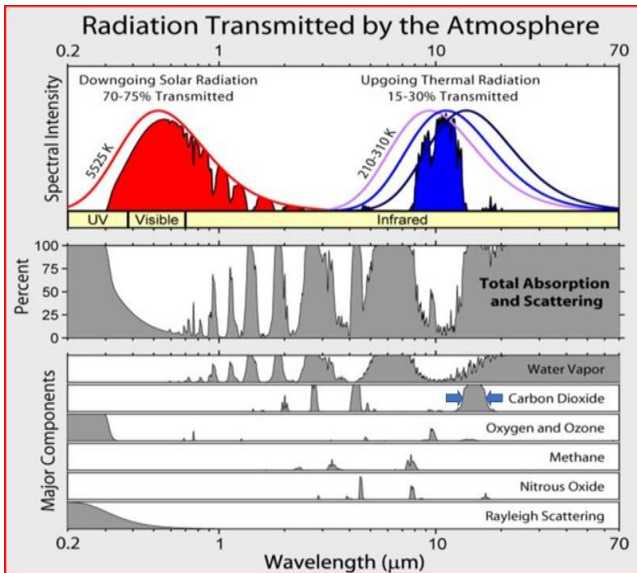
Number of **Tropical Cyclones in Australia, 1970-2017**

Source: [Bureau of Meteorology](#)

Northern Victoria experienced a [mega-drought](#) during the LIA. The [IPCC AR5](#) states: "There is low confidence in attributing changes in drought over global land areas since the mid-20th century to human influence." Neither [extreme weather events](#) nor wildfires in [the U.S.](#) or [globally](#) are [increasing](#) in frequency or intensity.

The atmospheric CO₂ level has increased by 46 percent (%) to [410ppm](#) (0.041%) and the average surface temperature by [about 1°C](#) since the LIA. How much of that warming was due to fossil fuel emissions remains [uncertain](#). [Some scientists](#) attribute 0.5°C or more to increased solar activity and [others](#) attribute 0.27°C to altered land use and increasing [urban heat](#).

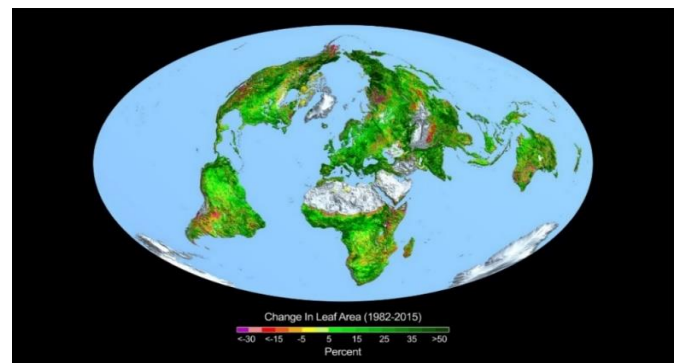
Fluctuations in atmospheric CO₂ [follow](#) changes in sea surface temperature, so the relationship is complex. It is also [logarithmic](#), which means that every doubling of the CO₂ level produces the same temperature effect ([about 1°C](#) without feedbacks) because its main infrared absorption band (15µm wavelength) is saturated. Further absorption of outgoing radiation occurs only at the edges of that band - blue arrows in following [figure](#).



Climate model projections (grey band) and their average (solid black line) with three satellite-based temperature records (coloured lines). Source: [Real Climate](#)

Climate models recently failed a [fundamental test](#). [Cosmic rays, sunspots and clouds](#), [aerosols](#), [ocean oscillations](#) and [vegetation](#) are difficult to model.

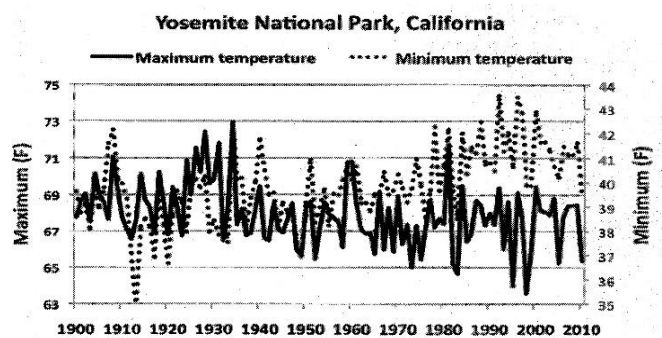
Since the car replaced the [horse in the U.S.](#), there are [more trees](#) and they are growing faster. By stimulating [plant growth](#) and improving their water use efficiency, CO2 emissions have been [greening](#) the planet.



Greening of Earth from 1982 to 2015

Human emissions have also increased [food production](#) globally by at least 15%. Future [food security](#) depends on them. Horticulturalists greatly boost production with CO2 at up to 1,300ppm in their [greenhouses](#).

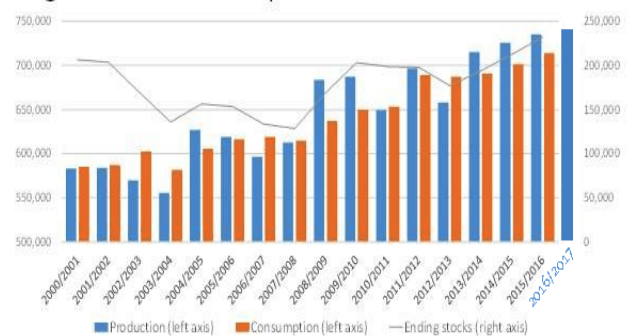
Greenhouse warming is mainly at night, increasing the [minimum](#) rather than maximum temperatures.



It thereby reduces [temperature variability](#) and the [diurnal temperature range](#), and this is associated with reduced [mortality and morbidity](#), particularly from cardiovascular and respiratory diseases. Urban heat increases both minimums and maximums, [intensifying](#) heatwaves in cities, which can be [over ten degrees](#) hotter than the surrounding countryside. Exposure to cold nevertheless kills [twenty times](#) more people than heat exposure globally. Cold weather is [likely](#) to remain more lethal than heat in most regions this century, even without mitigation or adaptation to climate change.

The increase in the average global surface temperature long after the CO₂ level has doubled and stabilised is called the [equilibrium climate sensitivity](#). The latest [scientific report](#) of the Intergovernmental Panel on Climate Change (IPCC) says it is "likely between 1.5°C and 4.5°C" – it's that uncertain! And [recent studies](#) indicate that it is [most likely](#) near the [lower](#) end of that range. Warming this century is therefore likely to be [modest](#). There is no [scientific consensus](#) on [dangerous](#) warming. Catastrophic [predictions](#) are based on climate models but they [greatly overestimate](#) recent warming.

Fig 4--Global wheat production and use

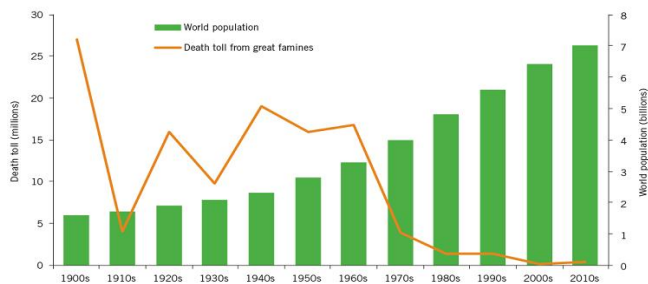


Graph from Food Security Portal, with latest USDA figure estimated added. (joannenova.com.au)

Source: [Lyddon \(2018\)](#)

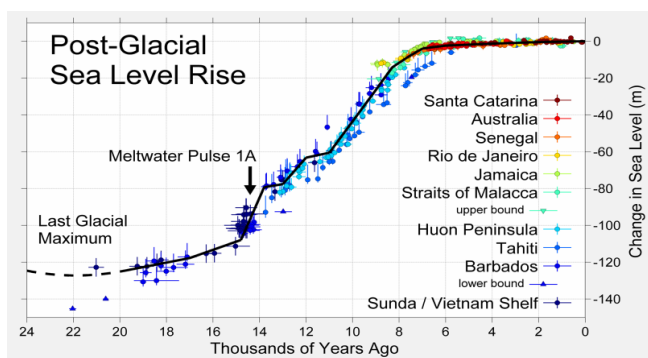
By lifting living standards, [mechanising agriculture](#) and food distribution, fossil fuels help reduce global famine, infant mortality and birth rates, and increase longevity.

FIGURE 3.3 WORLD POPULATION GROWTH AND DEATH TOLL FROM GREAT FAMINES, 1900–2015



Note: Each great famine killed more than 100,000 people. Source: US Census Bureau (2013a, 2013b); World Peace Foundation (2015).

Global warming is [not accelerating](#). [Polar bears](#) are thriving and [Walruses](#) are not falling off cliffs due to climate change. Anyone worried about [extinctions](#) due to climate change should read [Landscapes & Cycles](#). The Great Barrier Reef is recovering from ([exaggerated](#)) bleaching during the 2016 El Nino. It can exist only during warm interglacial periods when the Pacific Ocean rises 120 metres or more.



Tide gauges around Australia show a steady rise of around [1.7mm a year](#) (17cm per century) with [minimal acceleration](#). Global warming makes more sub-Arctic land habitable and [productive](#), compensating for low-lying land lost to sea level rise. Some need not be: 27% of the [Netherlands](#) is below sea level.

Climate Action

Rather than rushing to remedy a contrived emergency, we need to carefully consider the costs and benefits of climate mitigation, keeping in mind that nearly [six million](#) of the world's poorest people die every year from burning wood, dung, crop waste and charcoal.

The IPCC [2018 Special Report](#) proposed converting six million square kilometres ([about 12%](#)) of Earth's agricultural and pastoral land to growing energy crops instead of food, but turning corn into biofuel only increases [emissions](#) and [food costs](#). Making biodiesel

from palm oil, and burning wood pellets instead of coal – both promoted in Europe after Kyoto – only increase [deforestation](#), [energy insecurity](#), [emissions](#) and [real air pollution](#). Every year, wind farms kill millions of [bats](#) and [birds](#), including [endangered raptors](#).

Renewables are very [resource hungry](#). The mining and refining of [rare earths](#) for wind turbines and electric vehicles (EVs) is [polluting](#) Inner Mongolia with large quantities of [radioactive waste](#). Mining the lithium and cobalt for Lithium-ion batteries poses [environmental](#) and [humanitarian concerns](#). EVs are [25% heavier](#) than their equivalents, about [70% more](#) energy intensive to manufacture, and every metric ton of carbon saved during use costs around [US\\$980](#)! The photovoltaic (PV) solar industry is a [leading emitter](#) of potent greenhouse gases. The short [life expectancy](#) of solar panels poses a [waste disposal problem](#).

Nature pays a heavy price for vast arrays of panels, fields of turbines and monoculture energy crops. [This](#) coal-fired power station produces 17.6 times more energy day and night than [this](#) PV solar farm, Australia's largest, in full sunlight. The overall [environmental cost](#) per unit of energy produced is greater for renewables than for fossil fuels.

The [social cost of carbon](#) is nebulous as shown [here](#). Australia produces [just over one percent](#) of global emissions, and our per capita emissions are [falling](#) while [China's](#) are rapidly rising. Halving ours would greatly impact our [economy](#) but make no measurable impact on climate.

The CSIRO recently published its [Australian National Outlook 2019](#), an ambitious and optimistic vision for net-zero emissions by 2050. It proposes increasing the density of major cities by 60-88% and EVs to 80%, achieving 95% renewable electricity (5% gas), allocating 30 million hectares to plantings for carbon credits, and over two million hectares for wind and solar farms. Thanks to [taxpayer and user subsidies](#), these now provide [about 14%](#) of our electricity. Wind power is [unviable](#) in the U.S. without subsidies. Remote sources can also have a [transmission loss of 10-22%](#).

The expensive infrastructure required to maintain supply using intermittent sources greatly [increases the cost](#) of electricity. South Australia has about 50% renewables and the [highest](#) power prices in the world. When the wind stops, its wholesale price of \$98/MWh spikes to [\\$14,500/MWh](#). After a long state-wide

[blackout](#), SA installed the world's [largest battery](#), a [\\$90 million 100-megawatt](#) Tesla capable of storing as much power as the state uses in 5-10 minutes. [Using the batteries in electric vehicles](#) would mean charging them by day (while at work) and feeding the grid by night using expensive infrastructure. To achieve zero transport emissions by 2050 would require [3-4 times](#) the world's lithium and cobalt reserves unless recycling becomes feasible. The lithium price is already [soaring](#).

Pumped hydro has a lower [energy efficiency](#) than batteries and is vulnerable to drought. [Snowy 2.0](#) could provide one week of storage at 2,000 megawatts for [twice the cost](#) of an [equivalent coal-fired](#) power plant.

The vagaries of wind and weather render renewables [unreliable](#) or unaffordable, pushing industry, jobs and emissions offshore. Building a [strong economy](#) requires reliable energy using high efficiency low emissions ([HELE](#)) coal-fired power plants or cleaner and [more efficient](#) combined-cycle gas-fired plants or zero-emissions [Allam Cycle](#) plants.

The [safest energy source](#) with the smallest footprint and lowest lifetime emissions is [nuclear](#) power. France has half [Germany's](#) emissions per capita and much cheaper electricity using [over 70%](#) nuclear. The U.S. produces [nearly a third](#) of the world's nuclear power with far fewer deaths per unit of energy produced than with renewables.

Mortality rate per unit of power produced by energy source

Energy Source	Deaths/PetaWh
Coal – global average	100,000
– China	170,000
– U.S.	10,000
Oil	36,000
Natural Gas	4,000
Biofuel and Biomass	24,000
Solar - rooftop	440
Wind	150
Hydro – global	1,400
– U.S.	5
Nuclear – global	90
– U.S.	0.1

Source: [James Conca](#) in Forbes (2012)

[Advanced](#) nuclear power plants are even safer, smaller, cheaper and faster to build, more efficient, produce less waste, [compete economically](#) with unsubsidised renewables, have two to three times the lifespan, are better for the environment and more [sustainable](#).

Australia is geologically stable, has the world's largest [uranium reserves](#), the best [technology](#) for enriching it and space to store radioactive waste. EVs make most sense in cities supplied by either nuclear power (e.g. France) or hydropower (e.g. Norway).

While development banks have scaled back or halted investment in coal-based energy projects, [China](#) is [building hundreds](#) of new plants to assist developing nations climb the traditional [energy ladder](#). Their rapidly changing status may look [very different](#) in 2050.

TEN LARGEST ECONOMIES IN THE WORLD 2010-2050

Rank	2010	2020	2030	2040	2050
1	US	China	China	China	India
2	China	US	US	India	China
3	Japan	India	India	US	US
4	India	Japan	Japan	Indonesia	Indonesia
5	Germany	Germany	Brazil	Brazil	Brazil
6	Russia	Brazil	Russia	Russia	Nigeria
7	Brazil	Russia	Indonesia	Japan	Russia
8	UK	UK	Germany	Nigeria	Mexico
9	France	France	UK	Germany	Japan
10	Italy	Korea	Mexico	Mexico	Egypt

In conclusion, misguided mitigation could do more damage to the global environment and economy, and impact the poor more than climate change itself.

About the Author: Dr Allen is a GP in [northern](#) NSW, a member of [The Saltbush Club](#) and the [CO2 Coalition](#). He has published papers in the *Medical Journal of Australia* and *Australian Family Physician*, letters in [The Lancet](#), and has critiqued publications on both sides of the climate debate, including [The Weather Makers](#) and [Slaying the Sky Dragon](#). He produced a White Paper on [Climate Change and Health](#) for the CO2 Coalition. He has both PV solar and solar HWS on his home and no vested interests in any energy-related companies. He cycles to work and elsewhere but has no illusions about saving the planet with a low carbon footprint.