

PERMANENT CLIMATE CHANGE

UPDATE – OCTOBER 2023

Introduction

In September 2023, the Intergovernmental Panel on Climate Change (IPCC) issued its Working Group II (WGII) contribution to the Sixth Assessment Report (AR6), 2022. [Bib1]. In general, according to the report, the world is not coping well in curbing greenhouse gas emissions or reducing global temperatures. Following the report, the Secretary-General of the United Nations, António Guterres, a former socialist prime minister of Portugal, in an alarming speech to the Press in New York, has been reported to have called for immediate climate action and referred to the present situation as “the era of global boiling.”

Consequently, this paper is partly an update of the research paper “A view on permanent climate change – how the world needs to keep the threat in perspective,” 24 July 2020 [Bib2]. As said in the IPCC report, there has been little effect on the main parameters of greenhouse gas concentrations and the Global Average Temperature Change (GATC),¹ which continues to rise (slowly) as the implied cause of permanent climate change.²

This paper addresses the basic drivers of the observed, continuing, gradual increase in the both the concentration of greenhouse gases in the atmosphere and the GATC. Why is this so?

The fundamental science

In essence, climatologists claim that the consumption of fossil fuels (especially coal, gas and petroleum products) produces carbon dioxide (CO₂), some 46 per cent of which is absorbed by the atmosphere, with the major part absorbed by the oceans. CO₂ is one and the most abundant of the three main non-vapour greenhouse gases.^{3 4} Water vapour is also a greenhouse gas, is more potent than CO₂ and many times more abundant⁵ in the atmosphere than CO₂.⁶ Table 1 shows the current (2023) status.

Table 1				
Greenhouse gases - CO Equivalent				
2023				
Gas	Atmospheric Concentration			
	parts	Unit	%	Power [1]
CO ₂	419.5	ppm	0.0400000	1
NH ₄	1800	ppb	0.0001800	25
NO ₂	334	ppb	0.0000334	298
CO ₂ e [2]	564	ppm		
Water Vapour [3] [4] [5]			4.28	
Notes:				
1. Power = times CO ₂ as a greenhouse gas				
2. CO ₂ e = CO ₂ + NH ₄ /1000*25 + NO ₂ /1000*298				
3. Water vapour is more powerful than CO ₂ as a greenhouse gas but treated as a positive feedback agent rather than as an insulating medium				
4. Water vapour concentration varies up to as much as 4.28 %				
5. en.wikipedia.org/wiki/Water_vapor#/media/				

The Earth’s atmosphere acts as a protective shield against solar radiation and as a hot house that has permitted and sustains all life on Earth. The scientific claim is that an increasing concentration of greenhouse gases in the atmosphere, especially CO₂, is causing a greater hot-house effect and, so, increasing the GATC.

The science then claims that an increasing GATC is causing climate change around the globe through changed catastrophic weather patterns – frequency and intensity – of events like storms, hurricanes/cyclones, precipitation, floods, drought, increase in sea levels and melting glaciers and ice caps.⁷ However, one must note that, contrary to what

¹ Note that the GATC refers to the surface air temperature, that changes vary considerably around the globe, according to regional topography. Its reference base date is normally taken as the start of the industrial revolution, nominally 1800.

² Permanent climate change is referred to here in contrast to prevailing climate change, i.e., the weather. Science should be addressing only ‘permanent’ climate change due to global warming.

³ The other two are methane (NH₄) and Nitrous Oxide (NO₂).

⁴ For the rest of this paper, the term greenhouse gases will refer only to non-vapour greenhouse gases, i.e., excluding water vapour.

⁵ Water vapour varies up to 4.28% of the atmosphere

⁶ Concentration of CO₂ in the atmosphere is currently (2023) 419.5 parts per million (ppm) or 0.0419%

⁷ Note that there are several other ill-effects of a permanent climate change, e.g., Thawing of tundras and the release of masses of erstwhile frozen methane and disruption of national societies causing massive illegal migration.

scientists may say, the relationship between increasing greenhouse gas concentrations in the atmosphere and an increase in the GATC is but a correlation and not a verified cause-and-effect relationship expressible by a formula. However, computer algorithms have been formulated to drive complex simulations of atmospheric behaviour (with mixed results).

Climatologists also claim that the much more abundant water vapour, although a strong greenhouse gas in its own right, does not control global warming, it being rather an agent for positive feedback in the equation. This claim is hotly contested in some quarters. One must note that the Earth's atmosphere is the epitome of a chaos system, vastly complex in its immensity and still defying accurate simulation by even the most advanced super-computers.

Causes

So, what is causing the gradual increase in greenhouse gases? The short answer is the demand for energy by the world's population. This in turn is due to the combination of an ever-increasing population, in number but also in consumption per capita as better standards of living are pursued. While industrialised nations, including China, have largely stabilised in their consumption and demand for energy, the rapidly increasing populations and demand of developing nations, especially India, with its massive population of 1.433 billion, and the sub-Saharan African nations accounting for some 0.685 billion. Consumption demands industrialisation, transportation, infrastructure, intensive agriculture, and domestic accommodation, all of which require lots of energy in the form of electricity or fossil fuels. Electricity, is provided by a combination of renewable sources of wind, solar, nuclear and hydro, but still largely dependent on burning fossil fuels.

So, continued population growth (number and consumption) demands increased energy, which is provided by electricity and fossil fuels, which produce greenhouse gas concentrations in the atmosphere, which increases the hot-house effect, which increases GATC, which is claimed to cause climate change.

Essential variables and how they vary in time are the concentration of CO₂ in the atmosphere (CO₂ppm), GATC, world population (number) and consumption (presumed to be well represented by Gross National Product (GNP) as is proxy.

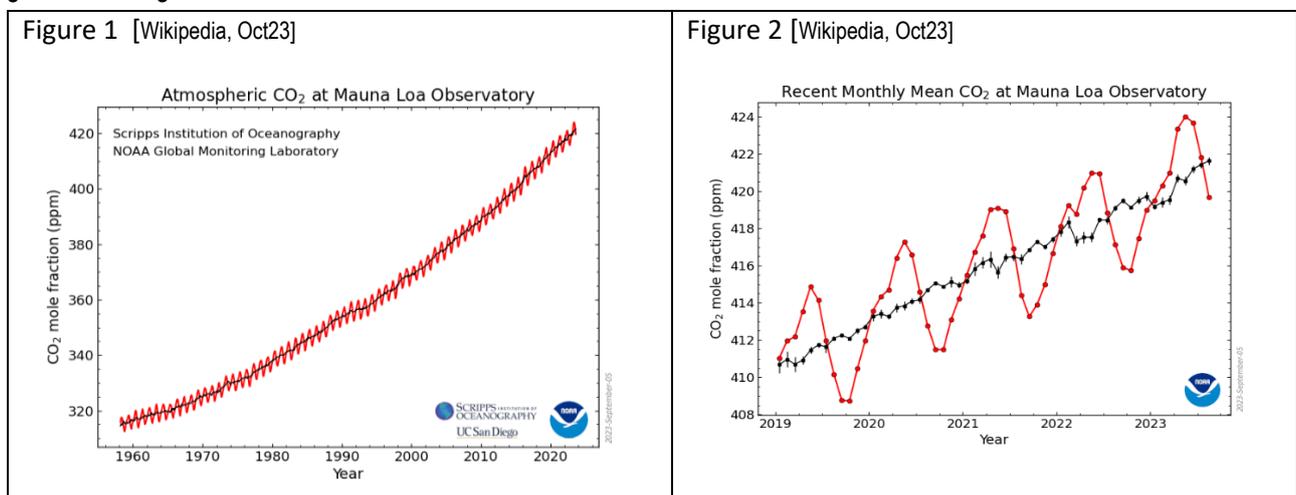
CO₂ Concentration

Figures 1 and 2 and Tables 2 and 3 show the progressive concentration of CO₂ in the atmosphere, as measured at Mauna Loa, Hawaii. This site is considered as the most trusted of such measurement sites in giving the true state of CO₂ in the atmosphere.

In figure 1, concentrations look as though they have been increasing slightly exponentially in the period 1960-2020. However, an approximation is to split the curve into two sets, from 1960 to 2000 and from 2000 to 2023. In the latter 23 years the rate has increased by about 77% and in the last four years (from Figure 2) the increase is virtually linear at an increase of 2.25 ppm pa.

The 77% increase since 2000, over the previous period, is most probably due to China's massive industrialisation over the past 25 years, despite considerable efforts by western nations to reduce their greenhouse gas emissions. Although China's industrialisation and emissions are said to be moderating, the world cannot expect the rate of emissions to decrease much if at all, mainly because of the now industrialisation of India's 1.4 billion people and their increased consumption of resources, all of which produce emissions, largely to be met by fossil fuels well into the future. Then there are the billions of Africans and south-east Asians also wanting their place in the sun at the cost of greenhouse gas emissions.

The ever gradually increasing concentration of greenhouse gases in the atmosphere is a fact, but what does it mean for global warming?



<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="3">Table 2</th> </tr> <tr> <th colspan="3">CO2 Concentraion in atmosphere</th> </tr> <tr> <th colspan="3">Mauna Loa Oct23</th> </tr> <tr> <th>Year</th> <th>ppm</th> <th>ppm pa</th> </tr> <tr> <td>1960</td> <td>317</td> <td></td> </tr> <tr> <td>1970</td> <td></td> <td></td> </tr> <tr> <td>1980</td> <td>343</td> <td></td> </tr> <tr> <td>1990</td> <td></td> <td></td> </tr> <tr> <td>2000</td> <td>368</td> <td></td> </tr> <tr> <td colspan="2">Average</td> <td>1.28</td> </tr> <tr> <td>2010</td> <td>390</td> <td></td> </tr> <tr> <td>2020</td> <td>413</td> <td></td> </tr> <tr> <td>2023</td> <td>420</td> <td></td> </tr> <tr> <td colspan="2">Average pa</td> <td>2.26</td> </tr> <tr> <td colspan="2">Ratio Set 2/Set1</td> <td>1.77</td> </tr> <tr> <td colspan="3">Comments:</td> </tr> <tr> <td colspan="3">Rate since 2000, 77% higher than earlier period.</td> </tr> <tr> <td colspan="3">Most likely due to china's industrialisation since 2000</td> </tr> </table>	Table 2			CO2 Concentraion in atmosphere			Mauna Loa Oct23			Year	ppm	ppm pa	1960	317		1970			1980	343		1990			2000	368		Average		1.28	2010	390		2020	413		2023	420		Average pa		2.26	Ratio Set 2/Set1		1.77	Comments:			Rate since 2000, 77% higher than earlier period.			Most likely due to china's industrialisation since 2000			<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="3">Table 3</th> </tr> <tr> <th colspan="3">CO2 Concentraion in atmosphere</th> </tr> <tr> <th colspan="3">Mauna Loa Oct23</th> </tr> <tr> <th>Year</th> <th>ppm</th> <th>ppm pa</th> </tr> <tr> <td>2019</td> <td>410.50</td> <td></td> </tr> <tr> <td>2020</td> <td>413.00</td> <td>2.50</td> </tr> <tr> <td>2021</td> <td>415.00</td> <td>2.00</td> </tr> <tr> <td>2022</td> <td>417.50</td> <td>2.50</td> </tr> <tr> <td>2023</td> <td>419.50</td> <td>2.00</td> </tr> <tr> <td colspan="2">Average pa</td> <td>2.25</td> </tr> <tr> <td colspan="3">Comment:</td> </tr> <tr> <td colspan="3">Increasing at linear rate</td> </tr> </table>	Table 3			CO2 Concentraion in atmosphere			Mauna Loa Oct23			Year	ppm	ppm pa	2019	410.50		2020	413.00	2.50	2021	415.00	2.00	2022	417.50	2.50	2023	419.50	2.00	Average pa		2.25	Comment:			Increasing at linear rate		
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GATC

Climatologists, since the 1980s, have constantly blamed increased emissions and atmospheric concentrations of non-vapour greenhouse gases for global warming and by inference, climate change. However, while the theory is logical, the relationship between concentrations and surface temperature (GATC) is but a correlation and not a proved cause-and-effect relationship. Likewise, the relationship between global warming and climate change is also logical but not a proved, predictable one.

The major problem with temperature measurement figures is their reliability. First, the figure is an average surface air temperature and, so, says nothing about dynamic temperature changes around the planet, which can vary quite considerably depending on location and topography, or at heights throughout the atmosphere. Second, temperatures measured are predominantly in the industrialised northern hemisphere, industrialised countries of America and Europe. In more recent times, temperature measurement by satellites have been able to bring better accuracy to the measurement.

Table 4 shows the GATC recorded through to 2023 and projected then through to 2121. The current GATC is 1.1°C⁸.

According to the IPCC reports, critical temperatures are 1.5°C (tolerable), 2°C (tolerable but at significant climate change effects) and 3°C (unsustainable). At current rates of world greenhouse gases emissions, 1.5°C would be reached by 2045, 2°C by 2071 and 3°C by 2121 (given error bands). Given current rates of planned emission reductions by various nations, 1.5°C and 2°C will still occur but delayed a few years, and, hopefully, 3°C would never be reached.

Table 4			
Global Average Temperature Change (GATC)			
P	Ae ^(bT) -A		
A	15	°C	GATC 1880 base
b	0.00113		Annual increase decade
C°	Decade	Year	Comment
-	0	1960	
0.17	10	1970	
0.34	20	1980	
0.52	30	1990	
0.69	40	2000	
0.87	50	2010	
1.05	60	2020	Actual in 2020 (1)
1.10		2023	Actual for 2023
1.23	70	2030	
1.42	80	2040	
1.51		2045	Predicted
1.60	90	2050	
1.79	100	2060	
1.98	110	2070	
2.00		2071	Predicted
2.17	120	2080	
2.37	130	2090	
2.57	140	2100	
2.76	150	2110	
2.97	160	2120	
2.99		2121	Predicted
Notes:			
1. www.ncei/noaa.gov			

⁸ An actual average temperature of at 16.1°C, assuming a base daily average temperature of 15°C.

World population

Table 5 shows the world population⁹, known to the current year of 2023 at 8.1 billion and growing but levelling out at about 10.5 billion after 2080. The levelling out of population, rather than continuing at current rates (as shown in column 4 of Table 5) is said by experts to be due to an expected general increase in the wellbeing of third-world populations, leading to lesser birth rates.

World population can be seen as the fundamental driver of greenhouse gas emissions because it is people who demand and consume the energy that produces the emissions throughout the life cycles of the means of energy production, primarily electricity and fossil fuels. Without people, the planet would be left to its natural cycles as for the past 4.5 billion years.

There are huge blocs of population to consider in the production of emissions. China's population, at 1.425 billion,¹⁰ is said to be stabilising with a quite low birth rate and having essentially industrialisation over the past 25 years, but still with a relatively low per capita income. However, India, which at 1.433 billion now exceeds China and, as a developing country in early stages of general industrialisation, can be expected to grow and account for much of the further increase in world population to 10.5 billion plus.

There are also a few other large blocs of relatively underdeveloped countries that will continue to consume more and more energy to meet their growing demands for better standards of living. The Moslem nations, which together account for about 2.1 billion people, are not exactly known for population control. The African countries (excluding Moslem countries) account for another 685 million.

Given that world population is expected to increase yet by another 30 per cent by 2080, the chances of keeping emissions low enough to avoid a 1.5°C, let alone a 2°C increase in GATC are very slim. Whether we can even avoid reaching a 3°C increase, is problematical but most probably achievable (as demonstrated in Annexes D-G of *Bib2*).

As a general observation, the world has never been successful in voluntarily limiting its population growth nor its consumption of resources. The once most populous country, China, tried to do so through a draconian one-child policy but eventually abandoned it.

Another reason why population growth is a major problem is that, given a positive relation between the increase in temperatures and climate change which, among other things, is said to substantially alter precipitation around the globe, creating new regions of drought and flooding rains, which will cause massive illegal migration of starving millions. Unfortunately, such has been occurring for quite a few years now out of Africa and out of central America. The 173 million citizens of Bangladesh are particularly vulnerable to future flooding.

Table 5				
World Population				
Year	Pop (act) Billion [1]	Decade	Pop (Est) Billions [2]	Comments
1960	3.10	0	3.10	
1970	3.69	10	3.62	
1980	4.44	20	4.22	
1990	5.29	30	4.92	
2000	6.14	40	5.74	
2010	6.97	50	6.70	
2020	7.82	60	7.82	[3]
2030	8.55	70	9.12	[4]
2040	9.20	80	10.65	
2050	9.70	90	12.42	
2060	10.10	100	14.49	
2070	10.30	110	16.91	
2080	10.40	120	19.73	
Notes				
1	https://www.worldometers.info/world-population/world-population-projections/			
2	Estimation based on 196-2020 actuals			
3	2023 Actual: World		8.1 billion	
	2023 Actual: India		1.433 billion	
	2023 Actual: China		1.426 billion	
4	Projected estimates after 2020			
	Linear (approx) to 2030			
	Levelling off from 2030 - to approx 10.5 billion			
Ae^(bT)	0.0154214			

⁹ www.worldometers.info

¹⁰ <https://www.worldometers.info/world-population/population-by-country/>

Energy and Gross National Products (GNP);

The sleeper in the climate change equation is the future consumption of resources and, thus, energy by India and other developing countries, which have a lot of catching-up to do. Not only are these populations demanding better living standards, which consume more energy per person, but their populations are increasing also as the principal causes of world population increase.

GNPs are assumed here to be an acceptable proxy for a country's standard of living.

Table 6 gives a sample of GDP per capita for several countries, from the USA with the world's largest economy, through to a group of four developing countries, together accounting for 33 of the world's population.

One should be able to see from these figures that developing countries have a long way to go economically, which will require vast amounts of energy, in quantities that cannot hope to be met by renewable sources (except nuclear) and still needing a vast amount of fossil fuels well into this century, if not beyond.

It is rather a pipedream to think that the world can bring these billions of people to advanced living standards without continuing and increased greenhouse gas emissions.

Table 6		https://www.worldometers.info/gdp/gdp-by-country/	
Gross Domestic Products (GDP)		2023	
Country	Population	GDP/capita US\$	Comment
USA	339,996,563	75,269	[1]
Australia	26,439,111	64,003	
UK	67,736,802	45,485	
Japan	123,294,513	34,135	
Russia	123,294,513	15,482	
China	1,425,671,352	12,598	
Indonesia	277,534,122	4,788) together
India	1,428,627,663	2,389) 2,170,000,000
Nigeria	223,804,632	2,184) 33% of world
Pakistan	240,485,658	1,597) population
Notes:			
1. Not highest per capita but highest GDP			

Nevertheless, in recent times, Australia has agreed to join other Western nations to assist developing countries by pouring trillions of dollars into these countries, to minimise emissions through renewable energy technologies. Yet, there is precious little evidence that this vast expenditure will have any significant effect on GATC or resultant climate change. Rather, it will prove to be wasted billions, if not trillions of dollars. Here in Australia, the Labor/Greens government is on an ideological bent to obtain zero emissions by 2050 at an estimated \$1.5 trillion, all to no avail as it will have zero effect on global temperatures, let alone expected resultant climate change. A busted flush as an investment, one may say!

Like so many other great debates in the world today, there is always one or more elephants in the room. In this case, the elephant is the huge push for renewable energy production by solar, wind and hydro, whereas these will prove to be a huge waste of money and actually destructive to the planet's environments. By all means roof-top solar and hydro-generated power where appropriate but nuclear is the only real suitable renewable source of energy. While fission reactors have been operated successfully for many years in industrialised countries, research continues into the holy grail of fusion reactors (like the sun itself), although extremely difficult and probably never achievable.

In Australia, the antipathy to nuclear energy production by the Labor/Greens governments and much of the public at large is, quite frankly, absurd. In fact, the whole energy approach at present by the Labor/Greens will prove to be self-defeating at huge expense and cost to the environment. As critics say, they are willing to destroy the environment in order to save it.

The other elephant in the room, for the whole world, but particularly for Australia, is that China has captured virtually all of the solar panel market, some 70 per cent of wind turbine manufacture and control of essential rare earth minerals. In short, China could cripple Australia's energy grid at will, with the willing cooperation of a gullible and deluded government.

Relationships

Given that the essential relationships probably affecting climate change are world population, causing demand for energy, which produces greenhouse gases, particularly CO₂, which causes an increase in the GATC, which in turn is said to cause permanent climate change, manifested by more frequent, more intense and changing weather patterns around the globe.

The concentration of CO₂ in the atmosphere, by parts per million (ppm), is taken as a proxy for energy demand. This relationship is not explored here but is well pursued in in the paper, Bib1.

CO₂ concentration is said to cause the change in GATC. Again, the GATC is taken as a conflated proxy for surface temperatures all around the globe which, in fact, vary greatly by region.

The relationship between GATC and permanent climate change is explored by computer modelling (of doubtful accuracy) and statistical monitoring of climatic events.

Before moving on, a major effect of possible climate change (not explored here) is what is happening in the oceans of the world that cover some 70 per cent of the Earth's surface. Some 54 per cent of CO₂ produced by burning fossil fuels is absorbed by the oceans and is reported to be near saturation and causing significant changes in water chemistry, in temperatures, in the behaviour of ocean currents, the creation of marine heatwaves and ill-effects on the ecosystems and food chains of the oceans.

Table 7 explores the relationships between CO₂ ppm, GATC and population, in terms of correlations.

The correlation between CO₂ppm/GATC and GATC/Pop would appear to be very significantly positive. That between CO₂ppm/Pop, while still highly positive, is less so.

Caution: Like all correlations, these do not prove any direct cause and effect, even though one may derive a relationship such as the ratios of ppm/GATC and GATC/ppm (columns 6 and 7 of Table 5). How valid be these ratios is problematical.

Table 7							
Correlations							
CO₂ppm/GATC/Population							
CO₂ ppm	Decade	Year	GATC C°	Pop (Bill)	PPM/TC°	TC°/ppm	
317	0	1960	-	3.10			
331	10	1970	0.17	3.69	8.405655	0.01190	
346	20	1980	0.34	4.44	8.674258	0.01153	
362	30	1990	0.52	5.29	8.969672	0.01115	
378	40	2000	0.69	6.14	9.268884	0.01079	
395	50	2010	0.87	6.97	9.578078	0.01044	
413	60	2020	1.05	7.82	9.897586	0.01010	
432	70	2030	1.23	8.55	10.22775	0.00978	
451	80	2040	1.42	9.20	10.56893	0.00946	
471	90	2050	1.60	9.70	10.92149	0.00916	
493	100	2060	1.79	10.10	11.28581	0.00886	
515	110	2070	1.98	10.30	11.66229	0.00857	
538	120	2080	2.17	10.40	12.05132	0.00830	
0.004409118 Ae^(bT)							
Correlations (1)							
Variables	Correlation	Comment					
CO ₂ ppm/GATC	0.9985	Very significant					
CO ₂ ppm/Pop	0.9724	Significant					
GATC/Pop	0.9831	Very significant					
Notes:							
1. Correlations only - not necessarily cause and effect							

Conclusions

Essentially, despite vast investment in renewables and climate change research, the world is not winning the emissions war. Global warming is a threat but not necessarily the main threat to the world. The following conclusion three years ago, from the paper at Bib 1 still holds, if not worse.

Rather, it would appear that the world is facing a 'perfect storm' of several possible existential threats over the next 50 years or so, given the pressures of an ever-growing population, nationalistic threats, religious intolerance, rapidly advancing technology and the perverting effect of social media, let alone the risk of permanent climate change. Above all, the threat of global warming and consequential climate change should be kept well in perspective.

Are these threats not even worse now? World population is yet to grow at least another 30 per cent, nationalistic threats are real with wars now in the Ukraine and Israel/Gaza, China sabre rattling over Taiwan, and over 2 billion Moslems and their religious intolerance bent on terrorism and war.

Notwithstanding the various sources of serious threats, before the turn of the century the unchecked growth in global population and its natural consequences, as discussed herein, could yet prove to be the greatest existential threat to humanity in general - with or without global warming, unless world conflagration trumps even that. Global warming is the least of our worries at present and yet so much time, effort and money being wasted beyond reasonable in trying to curb emissions.

It is considered worthwhile to repeat here (with some update), the principal conclusions and messages derived in the paper at Bib1, three years ago.

- Australia accounts for only 0.33% of the world population and contributes about 1.1% of world greenhouse gas emissions. Consequently, no matter what Australia does to lower its emissions, it cannot make any significant impact on global warming, let alone on climate change.

- Australia may be the world's largest exporter of coal (all high-quality) and gas, but accounts for only 7% of total world black coal production. It makes zero sense for irrational calls to close-down our biggest export industries and main sources of wealth. Australia's coal and natural gas should be allowed to meet international demand as economics dictate.
- In 2022, renewable energy sources in Australia accounted for 35.9% of electricity production¹¹, being about 9% of its total annual energy demand. One must question the feasibility of the Governments goal of zero emissions by 2050 which, in fact, is considered not possible.
- The average world surface temperature is currently, gradually increasing by about 0.02°C per annum, but the claim of climatologists that greenhouse gas emissions, especially of CO₂, are the primary cause thereof, is not yet proved. While there is a well-documented gradual increase in atmospheric CO₂ concentrations, the relationship between average temperature and average CO₂ concentration is but a correlation, albeit highly positive, and not an established cause and effect relationship. Seasonal dynamics of the Earth's atmosphere are far too complicated to draw such conclusions, even with use of the powerful computers available today.
- Climate change is not the 'existential threat' to the world, let alone Australia, claimed by climatologists and camp-followers. In Australia's case, we should be much more worried about the threats posed by Chinese expansionism and its import dominance of critical infrastructure materiel, sustainable population growth and how to adequately climate-proof Australia.
- Instead of wasting billions, even trillions of taxpayer funds on reducing greenhouse gas emissions for zero effect, that money should be put into capturing and managing our water resources, protecting our agricultural sectors, rebuilding our manufacturing industries and drought/flood proofing the country.
- Australia is currently meeting its commitment under the Kyoto Protocol and Paris Agreement as a responsible world citizen. It need not be shooting itself in both feet in its current ideological and wasteful pursuit of emissions reduction for zero effect on climate change.

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Canberra
October 2023

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¹¹ https://en.wikipedia.org/wiki/Renewable_energy_in_Australia