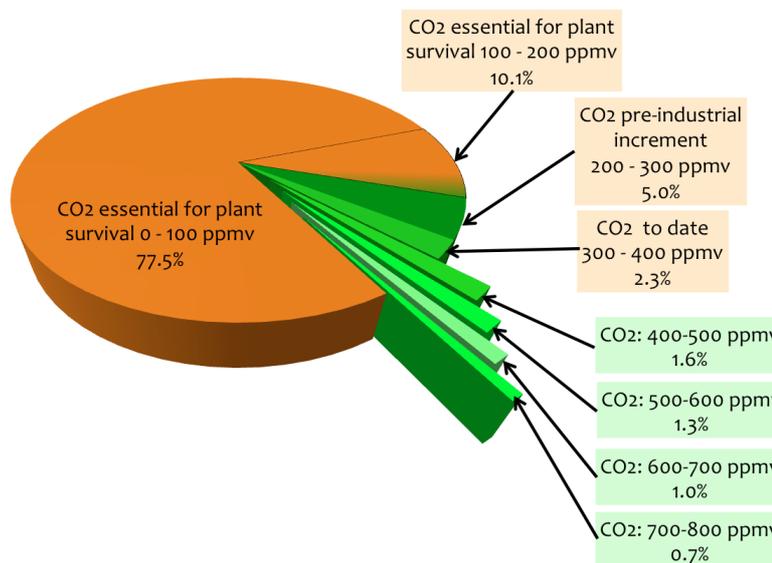


The effect of CO₂ as a Greenhouse gas becomes ever more marginal with greater concentration: the much vaunted political upper safe limit of +2.0°C can never be attained

As the temperature increasing effect of atmospheric CO₂ is known to diminish logarithmically with increasing concentration, these notes clarify the actual amount of warming that might result from additional CO₂ released into the atmosphere by man-kind and the temperature reduction impact of any policy actions to control CO₂ emissions.

Proportions of the Greenhouse Temperature Effect attributable to increasing concentrations of CO₂ in measured 100ppm^v tranches



This diagram translates the increasing concentrations of CO₂ from 0 - 800 ppm^v into the reducing temperature changing effectiveness of such increases according to the known fact that CO₂'s temperature effect becomes ever more marginal, logarithmically, with increasing concentration.

Immutable historic components:	% effect	cumulative
CO ₂ essential for plant survival 0 - 100 ppm ^v	77.5%	
CO ₂ essential for plant survival 100 - 200 ppm ^v	10.1%	
CO ₂ pre-industrial increment 200-300 ppm ^v	5.0%	
CO ₂ to date 300 - 400 ppm ^v	2.3%	94.9%
Remaining components that climate change policy could affect in future:		
CO ₂ : 400-500 ppm ^v	1.6%	
CO ₂ : 500-600 ppm ^v	1.3%	
CO ₂ : 600-700 ppm ^v	1.0%	
CO ₂ : 700-800 ppm ^v	0.7%	4.6%

It shows the level that is essential for photosynthesis and plant growth (0-200 ppm^v) and the amount that was established in pre-industrial times, (prior to the influence of man-kind), about an extra 100 ppm^v, about 93%. Since then the IPCC asserts that man-kind alone has added a further ~100 ppm^v going from 300 - 400 ppm^v since 1850 adding 2.3% to the temperature effect of CO₂.

The proportional values shown above present are universally accepted by skeptics and Global Warming alarmists alike and whatever other actual temperature measures, (see later), are used the proportions remain much the same.

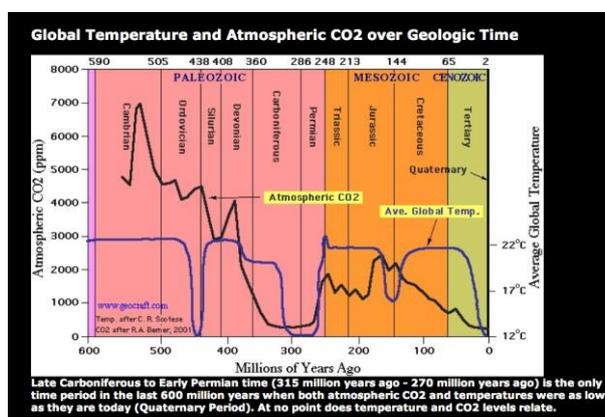
From either point of view the immutable portion, (annotated in orange), amounts to ~95% of the effect of CO₂ on temperature that is already committed, leaving only a further ~5%, (green, shown exploded out), that could be affected by any actions of man-kind in future between 400 - 800 ppm^v.

In other words, however many resources and whatever political efforts are made to reduce man-made CO₂ emissions worldwide, (and to be effective they would have to be universal and worldwide), those efforts are never going to be enough to have any useful impact to realistically control world temperatures into the future.

All plant life is dependent on atmospheric CO₂. Plants evolved at times when the CO₂ levels were much higher. Increased levels of CO₂ markedly improve plant growth and reduce their water requirements for transpiration as plants need fewer, water releasing, stomata to ingest their essential CO₂.

Plants are stressed by low CO₂ levels and do not survive well at levels of much less than ~200 ppm^v, shown in grey above.

Geological comparisons show that the world presently has comparatively low CO₂ levels at 5 - 15 times less than have been common in the last 600 million years. World temperatures are also comparatively low even though the world is in a warmer interglacial period.

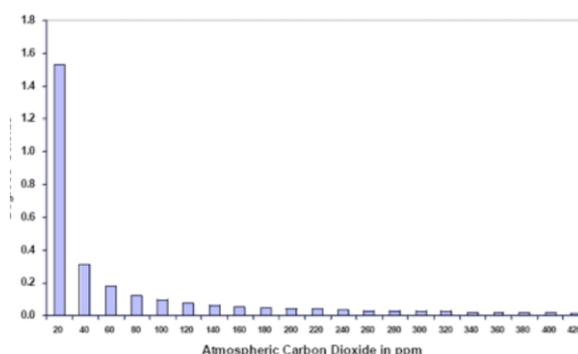


The world is presently in the grip of a long-term ice age that has been in the ascendance for some millions of years. Fortunately this long ice age has fairly regular intermittent ~10,000+ year long warmer interglacial periods regularly interspersed about every 100,000+ years. These changes are driven by planetary mechanics.

Our most recent (Holocene) interglacial period has been responsible for the whole of the advanced development of the civilization of mankind since 8000 BC. Judging from the length of other recent interglacial epochs, at 10,000+ years it is now getting towards its end,.

IPCC Published reports, (TAR3), acknowledge that the effective temperature increase caused by growing concentrations of CO₂ in the atmosphere radically diminishes with increasing concentrations. This information is in their reports. It is well disguised for any lay reader, (Chapter 6. Radiative Forcing of Climate Change: section 6.3.4 Total Well-Mixed Greenhouse Gas Forcing Estimate).

The following graph gives an idea of the agreed rate of diminution in 20 ppm^v steps that results. Opinions on the actual temperature effects of CO₂ concentration vary widely.



Using the Modtran program, maintained at the University of Chicago, the previous diagram noted by skeptical scientists shows that the first 20 ppm^v (parts per million by volume), of CO₂ concentration is responsible for about 1.53°C of the warming effect of CO₂. Thereafter the warming effect of CO₂ rapidly diminishes logarithmically.

This logarithmic diminution of the effect of CO₂ is probably the reason why there was no runaway greenhouse warming caused by CO₂ in earlier eons when CO₂ levels were known to be at levels of several thousands ppm^v, significantly greater than current values.

This inconvenient fact is well understood within the climate science community.

These notes explore the consequences of that radical diminution of CO₂ effectiveness and compares a skeptical point of view with those data of Global Warming alarmists and the IPCC.

	Sceptic views	IPCC assessments			IPCC average
	Plimer et al	Lindzen	Kondratjew	Charnock	
CO ₂ 0-20 ppm ^v	1.53°C	2.53°C	3.53°C	4.53°C	3.53°C
CO ₂ 0 - 100 ppm ^v	2.22°C	4.23°C	5.93°C	9.21°C	6.46°C
CO ₂ 100 - 200 ppm ^v	0.29°C	0.56°C	0.89°C	1.48°C	0.98°C
CO ₂ essential for plant survival ~200 ppm ^v	2.50°C	4.79°C	6.82°C	10.69°C	7.44°C
CO ₂ preindustrial increment ~+100 ppm ^v	0.14°C	0.42°C	0.44°C	1.34°C	0.73°C
Total CO ₂ pre-industrial effect in	2.65°C	5.21°C	7.27°C	12.03°C	8.17°C
IPCC 100% extra man-made CO ₂ to date: ~+100ppm ^v	0.06°C	0.28°C	0.45°C	0.89°C	0.54°C
Remaining available influence of CO ₂ : 400-1000 ppm ^v	0.15°C	0.70°C	1.19°C	1.78°C	1.22°C
Total warming effect of CO ₂ by 1000 ppm ^v	2.86°C	6.20°C	8.90°C	14.70°C	9.93°C
Other GHGs including Methane CDIAC estimate	0.41°C	0.41°C	0.41°C	0.41°C	0.41°C
Residue assigned to Water Vapour and Clouds	29.73°C 90%	26.39°C 80%	23.69°C 72%	17.89°C 54%	22.66°C 69%

For convenience and simplicity here the 20 ppm^v bands of the original graphs in have been grouped into bands of 100 ppm^v, and extended to range from 0 to 1000 ppm^v. Thus it becomes possible to look at comparatively simple values but with proportionally correct results.

There is considerable disagreement between the alarmist and skeptical scientific authorities as to the temperature effect induced by atmospheric CO₂. Both the IPCC assessments and combined skeptical views, (Plimer, Carter, Ball, Archibald), have been scaled off from the charts that those various authorities have published.

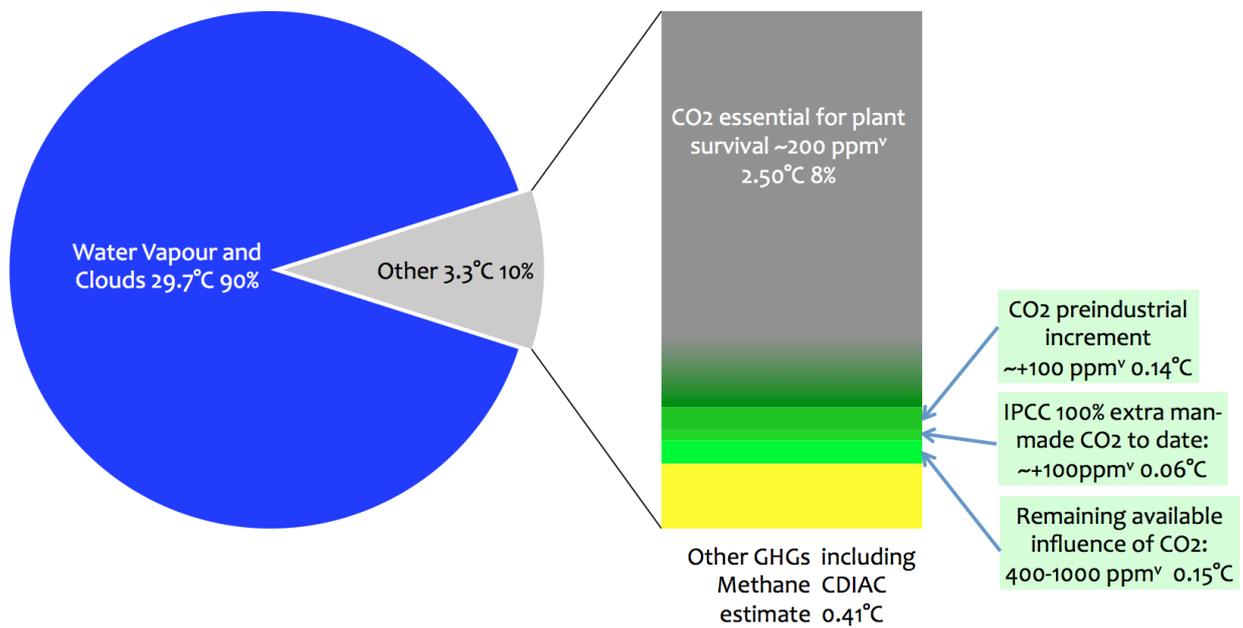
The scope of these differing views is set out in the table below.

By translating the increasing CO₂ levels into to their stated temperature effects this table reveals significant points assessing the scale of the impact of CO₂ concentration levels on global temperature:

- shown in brown above, the initial amount of warming from CO₂ that is essential for photosynthesis and the survival of plants, ie. up to ~200 ppm^v, in the skeptic view this translates to ~2.50°C. This is 7.5% of the total 33°C effect but in the IPCC view at 4.8°C (Lindzen) - 10.7°C (Charnock) amounting up to about 1/3rd of the total effect.
- the pre-industrial increment prior to about 1850 un-affected by anthropogenic CO₂ added between 0.14°C (skeptical) and 1.34°C (Charnock), shown in dark green above.
- accordingly the bulk of the temperature effect of CO₂ even up to the pre-industrial level ~80% - 92% is taken up by pre-existing CO₂ levels in the atmosphere. This leaves very little scope for the effect of any policy actions to be taken by governments that are attempting to control the world's temperature by further limiting CO₂ emissions.
- since 1850 about 100 ppm^v have been added to the atmosphere. The IPCC attributes this entirely to anthropogenic CO₂ emissions. Even so in the skeptic view this can only have increased temperature by some 0.06°C to 0.54°C.

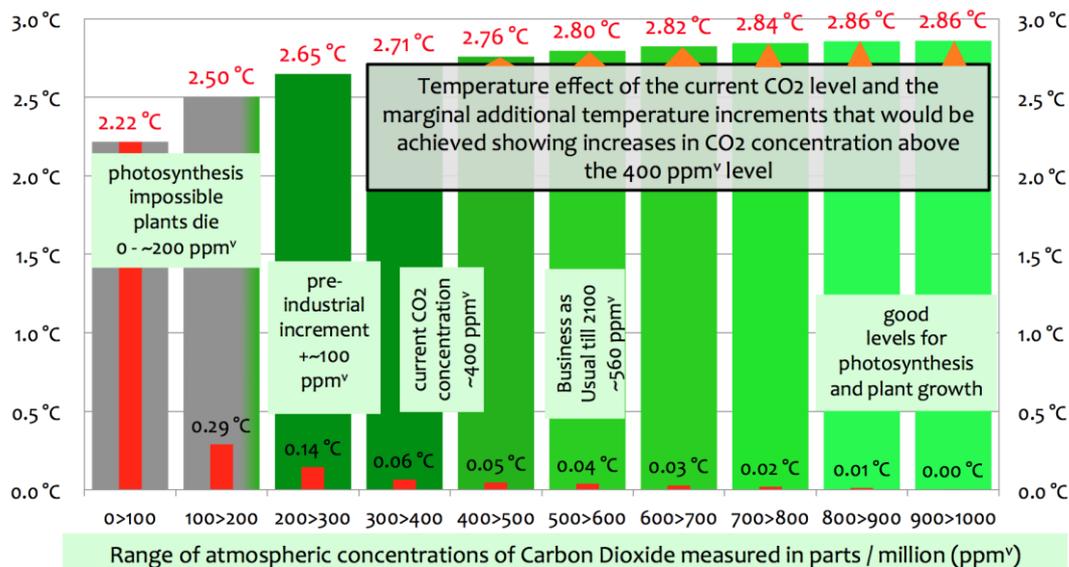
The most extreme IPCC view is that that had caused 0.89°C (Charnock) of additional warming, that would exceed the total warming that is known to have occurred since 1850.

- however the IPCC and alarmists do not admit to the other, possibly overwhelming reasons for recent warming other than additional man-made CO₂. Natural effects such as increased solar activity have added to current warming, especially sunspot cycles 21, 22 and 23 since 1975. The increase in CO₂ levels probably also arises from outgassing from the slightly warmer oceans since the end of the Little Ice Age.
- as for additional CO₂ emissions from the current 400 ppm^v up to 1000 ppm^v the skeptic view is that it could only ever add a further 0.15°C. Whereas the maximum the IPCC would add 1.78°C, nonetheless that would still be less than the stated political safe upper limit of 2.0°C. This approach assumes that there is no additional positive forcing feedback via water vapour and clouds. Some authorities state that water vapour feedback is negative, and it is certainly not massively positive as required by the IPCC for their predictions of catastrophic overheating.
- any additional CO₂ will substantially improve plant productivity to the benefit of the biosphere and man-kind and the recent CO₂ increase appears to have done so already.
- as CO₂ concentrations increase about half of any extra CO₂ is rapidly reabsorbed by the oceans and / or metabolised and thus fixed by plant life.
- the warming effect of other Greenhouse Gases, methane etc. is assumed to be constant at 0.41°C in accordance with published results for CDIAC, shown in yellow.
- The residue of Greenhouse warming is calculated as the remaining increase to make up the total of 33.0°C. The skeptic view shown here is that this amounts to ~90% of the effect. However the IPCC view is that this can range between 80% (Lindzen) and 54% (Charnock). Gavin Schmidt has stated that in his view is that the effect of water vapour and clouds only amounts to 75%.



Accordingly in the skeptic view, only ~5% or about ~+0.15°C of the effectiveness of CO₂ as a greenhouse gas remains beyond its current level of ~400 ppm^v. This amounts to about ~0.45% of the total 33°C Greenhouse Effect.

Incremental and cumulative temperature effects attributable to increasing levels of CO₂: 0-1000 ppm^v in steps of 100 ppm^v



Thus assuming these skeptical values the political target of controlling CO₂ emissions to limit the effect of future man-made global warming to only a further +2.0°C could never be attained, even if CO₂ levels exceeded 1000 ppm^v. To attain the supposed upper political safe limit of a further +2.0°C the level of positive feedback from the influence on extra warming of clouds and the water vapour in the atmosphere would have to be at least 13 fold.

Accounting for the diminution effect the actual temperature reductions achievable are in the range of few hundredths to a few thousandths of a degree Centigrade but that would only arise from the total, 100%, elimination of all CO₂ production worldwide. This will never occur.

It is already evident that vast economic damage is being inflicted by the minor and ineffectual but nonetheless immensely expensive CO₂ reduction efforts on the part of the Western nations of the free world.

Such severe economic damage occurs firstly from direct expenditures on grant support and advantageous business terms for renewable energy, carbon trading, uneconomic feed-in tariffs, etc.

But much more serious is the loss of industrial competitiveness for those participating Western nations and thus the diversion of their industries and jobs and thus CO₂ emissions to less developed countries with much less concern about growing CO₂ emissions. These actions probably give rise to increased CO₂ emissions overall and are thus self defeating.

Any of the efforts by participating nations should be seen in the following context:

- normal daily temperature variations at any a single location range from 10°C to 20°C.
- normal annual variations value can be as much as 40°C to 50°C.
- participating Europe as a whole only accounts for about 12% of world CO₂ emissions.
- the UK itself is now only about 1.5% of world CO₂ emissions.

A trivial calculation gives the effectiveness of the elimination of say 50% of Europe's and the UK's CO₂ emissions up to 1000ppm^v at some time in the future as follows:

- Europe as a whole - $0.15^{\circ}\text{C} \times 12\% \times 50\% = 0.009^{\circ}\text{C}$: or $\sim 1/100\text{th } ^{\circ}\text{C}$.
- at only 1.5% the UK contribution to this effect would only achieve $\sim 0.0011^{\circ}\text{C}$ or $\sim 1/1000\text{th } ^{\circ}\text{C}$.

As the margin of error for temperature measurements is about 1.0°C, these miniscule temperature effects arising from the extreme economic efforts of those nations attempting to control their CO₂ emissions, can only ever be marginal, immeasurable and thus irrelevant.

In other words what is anticipated and what is already being attempted by some Western governments for CO₂ emissions reduction is the purposeless, rapid and total economic collapse of those participating nations, in the name of “saving the planet” from a non-existent problem.

The IPCC tacitly acknowledges that the crucial logarithmic diminution effect with increasing CO₂ concentrations exists, but it certainly does not go out of its way to emphasize it, nor to explain its consequences. Like the Medieval Warm Period, that the IPCC attempted to eliminate with the Hockey Stick graph in 2001, the IPCC knows that wide public knowledge of the diminution effect with increasing CO₂ concentration would be utterly detrimental to their primary message.

“Man-made CO₂ emissions are the cause of global warming / climate change”.

The IPCC certainly does not explain these devastating consequences for the Catastrophic Anthropogenic Global Warming theory in their Summary for Policy Makers. As an essentially political organization, the IPCC is solely tasked with the promotion and presentation of Man-made Global Warming / Climate Change from CO₂ emissions, as an accepted and indisputable fact for world’s politicians. But they never explain the insignificance of the simple arithmetic shown here.

Thus the IPCC is entirely misleading in its central claim for Policy Makers, as they say:

“Warming of the climate system is unequivocal. Most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations.”

Any unquestioning, policy making reader is thus led to assume that all increasing Man-made CO₂ concentrations are progressively more harmful because of their escalating Greenhouse impact.

That is clearly not so.

In addition the alarmists only ever propose solutions for the control of Global Warming, (overheating), by reducing CO₂ emissions. However the climate is presently changing, (as it does naturally), to a colder phase, probably because of reducing solar activity and changes of ocean circulation patterns.

Alarmists entirely fail to explain how reduction of man-made atmospheric CO₂ can ever help to control Climate Change towards a cooling world.

From the present concentration of atmospheric CO₂ at ~400 ppm^v, only ~5% of the effectiveness of CO₂ as a Greenhouse Gas remains. Conservatively this can only give rise to a maximum of a further of ~+0.15°C. Thereafter beyond 1000+ ppm^v the effect of increasing levels of CO₂ can only ever be absolutely minimal even if CO₂ concentrations were to increase indefinitely.

It is for this irrefutable physical fact that the widely held alarmist policy ambition and much vaunted policy that has been promoted by politicians:

“to constrain Man-made temperature increase to only +2.0 °C”

could in fact never be reached, however much more Man-made CO₂ was released.

Having made so many dire predictions of the impending adverse climate effects of overheating, Climate Alarmists fail to accept that a climate change towards a cooler climate is more likely to lead to more intense adverse weather. There is good reason to expect this, simply because the energy differential between the poles and the tropics is bound to be greater and that in itself can lead to less stable atmospheric conditions, according to Richard Lindzen and Fred Singer.

It has been shown in the past that the warmer climate in the Roman and Medieval warm periods was more conducive to the wellbeing of the biosphere and man-kind. The world could well adapt to having larger areas for a more productive agriculture.

Even a marginally cooling world as the Northern Hemisphere has seen over the past 5 years would lead to much more dire consequences for the biosphere and mankind than any realistic amount of warming that could ever arise from man-made CO₂ emissions. Cold is a much greater threat to mankind than any moderate amount of additional warmth as has been indicated here.

National policy makers and the United Nations are not recognizing and are not preparing for this eventuality.

With a quietening sun, changing ocean circulation patterns and the present evidence of much colder winters in the Northern Hemisphere over the past 5 years, that cooling could already be upon us.

The cooling climate could well last for many decades or even centuries.

A reassessment and extension of the postulate that the effectiveness of CO₂ as a Greenhouse Gas diminishes radically with concentration.

Summary

relation of CO₂ concentration to temperature in 100 ppm^v stages

- maximum CO₂ GHG effect: 0-1000 ppm^v ~2.9°C
- at less than 200 ppm^v plant life is stressed: equivalent to ~2.5°C essential for plant life
- uplift beyond that level to pre-industrial level >~300ppmv: equivalent to ~0.14°C
- 300 - 400 ppm^v additional CO₂ 100% allocated 100% by IPCC to man-made additions: no allowance is made for other potential natural causes: equivalent to ~0.06 °C
- 400 - 1000 ppm^v equivalent to a further +~0.15°C
- +2.0 °C political upper limit could never be achieved with unlimited additions of CO₂, even up to 1000 ppm^v