

David Comings, M.D. podcast interview

I am a physician/scientist with a specialty in genetics. I spent my career as Head of the Department of Medical Genetics at the City of Hope Medical Center in Duarte, California. During that time, I published over 490 peer reviewed papers. I say that simply to show my great interest in doing research.

After I retired, I turned my research interests to climate change and global warming and followed the scientific literature on this subject. I kept a running account of what I learned in a document called *How to Combat Global Warming*. It eventually ran to 396 pages with 42 pages of references. It and the text of this pod cast, and other items are available for free download at www.thecomingsfoundation.org. (spell comings)

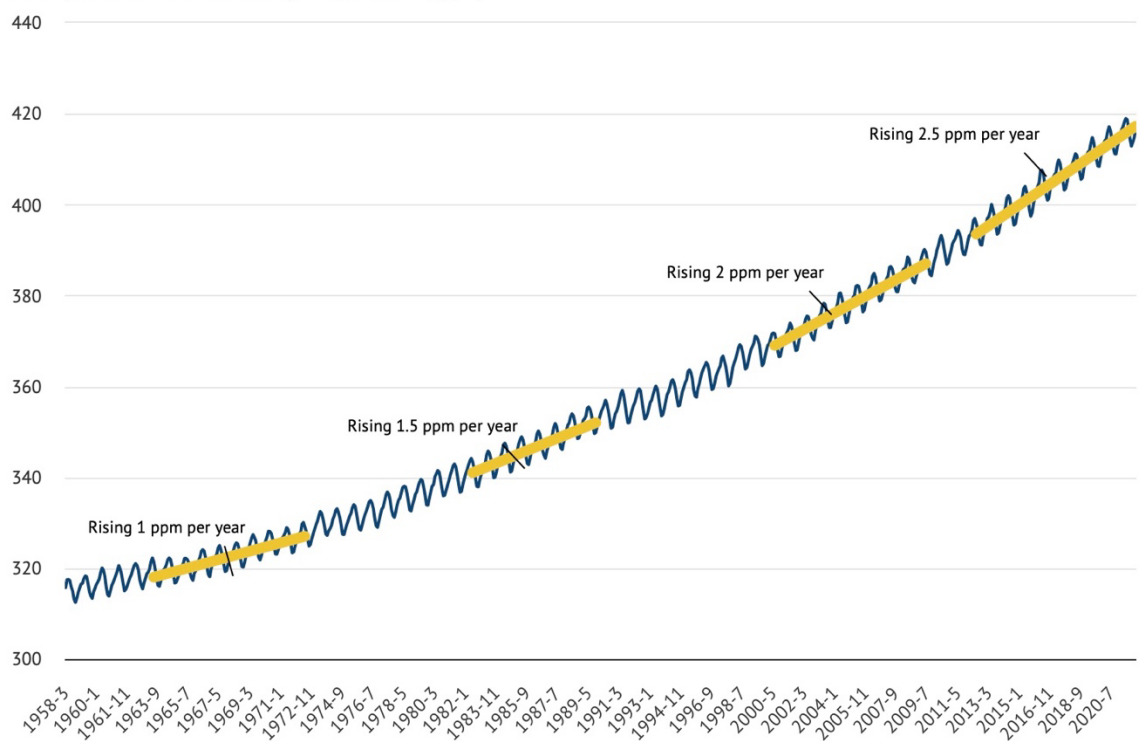
One day during this research, a truly mind-boggling illustration came to my attention.

But first, a bit of background. In 1958 David Keeling set up a station on the top of Mauna Loa in Hawaii, to monitor the levels of Carbon Dioxide in the atmosphere. After he died, the monitoring station was taken over by his son, Dr. Ralph Keeling of the Scripps Oceanographic Institute in La Jolla, California and sponsored by NOAA the National Oceanic and Atmospheric Administration. The record is called the Keeling Curve. As would be expected, because of the burning of fossil fuels the Keeling Curve showed a progressive increase in the level of atmospheric CO₂ over time. The level has risen from 315 parts per million in 1958, to 420 parts per million today. Since we are continuing to burn fossil fuels, this continued rise was expected. But

what I did not expect to see, in the latest version of the curve, was that the **rate** of increase of Atmospheric CO₂ was also increasing. (Figure 1).

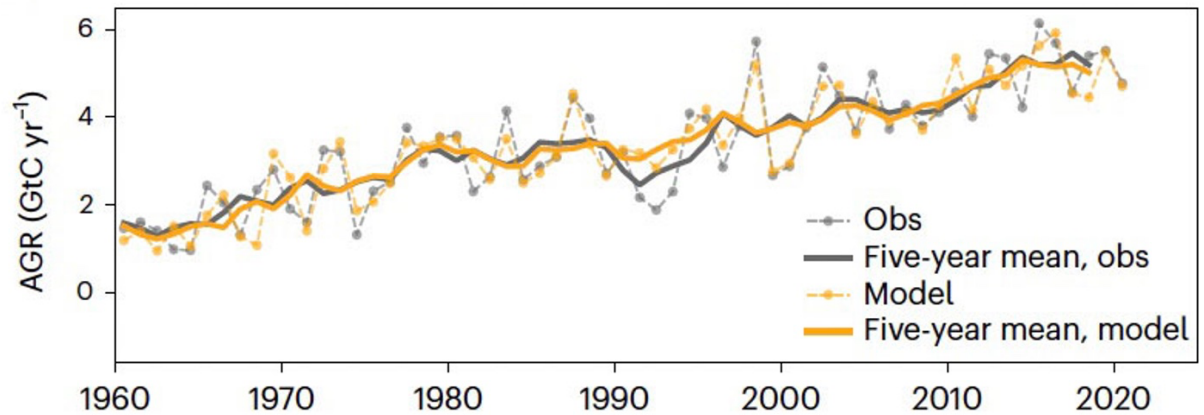
The build-up of CO₂ in the air has been accelerating

Atmospheric CO₂ concentration (parts per million, ppm)



As an example,

- in 1967 - 1.0 ppm/year,
 - in 1987 - 1.5 ppm/year,
 - in 2007 - 2.0 ppm/year,
 - in 2017 - 2.5 ppm/year,
 - in 2023 - 2.8 ppm/yr.
- 1 ppm = parts per million.



This trend was confirmed by a recent paper also from the Keeling group. In this study the variable was Atmospheric Growth Rate in gigatons C/year. A gigaton is a billion tons. This showed that the rate of accumulation of carbon into the atmosphere increased from 1.8 gigatons/yr in 1960 to 4.6 gigatons/yr in 2020.

Thus, two different variables gave the same result. They showed that:

Not only is the amount of carbon dioxide in the atmosphere increasing, but the rate at which it accumulates is also increasing

I will pause for a moment to let that sink in.

Not only is the amount of carbon dioxide in the atmosphere increasing, but the rate at which it accumulates is also increasing

This is very rarely talked about. It is clear that until we bring emissions to NET ZERO, the amount of CO₂ in the atmosphere will continue to increase. But why is the rate also increasing? To me, that was extremely disturbing.

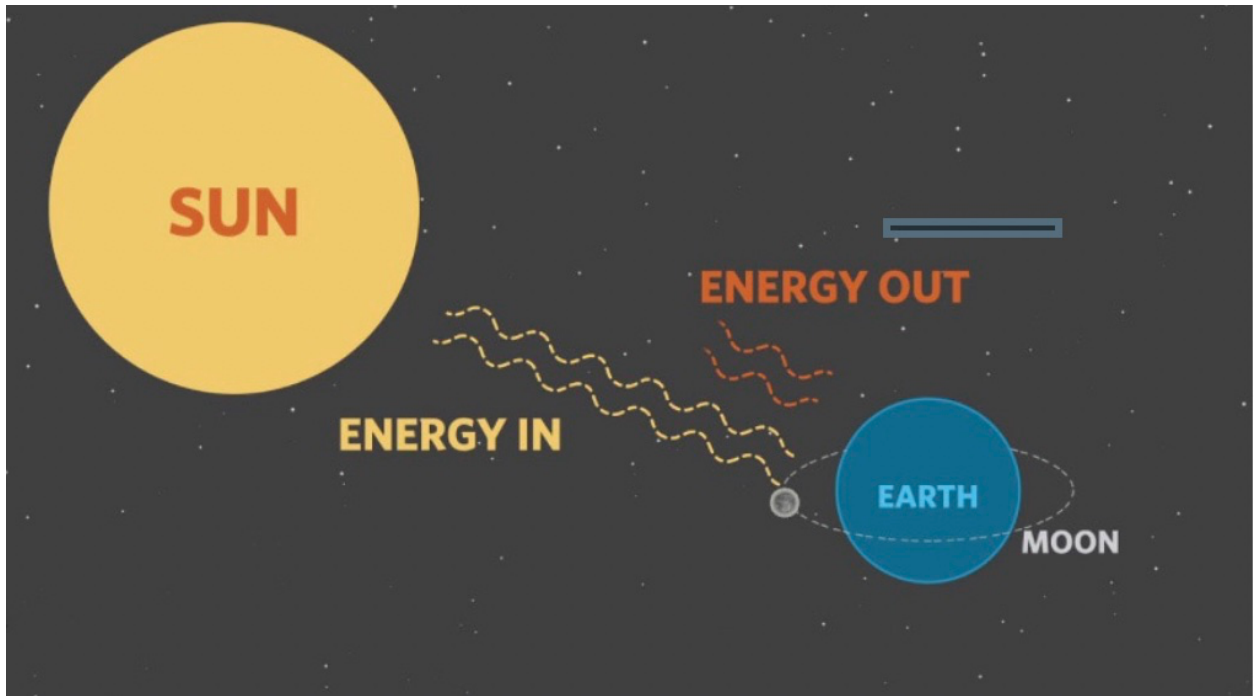
I can see three reasons.

1. The rate of CO₂ emissions from burning fossil fuels is being underestimated. I find this unlikely because the amount of fossil fuels produced and burned can be accurately determined.

Of note, the rate of emissions by the United States has progressively decreased in recent years because we have dramatically cut back on the use of coal. Unfortunately, Trump now wants to increase the use of the coal, the dirtiest CO₂ releasing fuel known to man. A very very Bad idea!

2. Thus, a second possibility is that current amount of global warming has set off several other sources of CO₂ emissions, such as the massive forest fires across the globe, the melting of the permafrost, the burning of peatland, the loss of albedo, and others. When a country like the U.S. or Canada experiences a massive wildfire, it totally wipes out over a year's worth of trying to decrease CO₂ emissions from the burning of fossil fuels.

3. The third possibility for this increase in rate, is the earth's heat imbalance.



The earth's heat imbalance refers to the fact that more heat is coming into the earth from the sun, than is going back out. This is due to two factors:

First, the high level of CO₂ in the atmosphere is trapping the heat. This is the well-known greenhouse effect of atmospheric carbon dioxide. This continues to increase, making the earth's heat imbalance progressively worse.

Second, is the progressive loss of albedo.

Albedo refers to the rate of reflection of incoming sunlight, like the reflection of a mirror.

Glaciers and sea ice reflect 90% of incoming heat irradiation. Clear oceans and ground reflect only 9% of incoming irradiation. This loss of albedo is due to the melting of sea ice and polar glaciers.

The magnitude of this heat imbalance is gigantic. It is measured in zeta joules.

A joule of energy is the equivalent of raising one apple one yard.

90% of this heat imbalance goes into the ocean. This occurs at a rate of 200 zettajoules per year. One zetta joule is a 1 with 21 zeros after it. In more relatable terms, the heat energy entering the earth's oceans is,

Equivalent to 432,000 Hiroshima type atom bombs going off in the ocean every day.

I will also, let that sink in for a few seconds. If someone asked me what the heat imbalance was equivalent to, I would have said maybe 1 or two atom bombs per year.

In fact, our heat imbalance is equivalent to 432,000 Hiroshima type atom bombs going off in the ocean every day.

In addition, the level of heat imbalance has been increasing since 1974 as the level of CO₂ has been increasing.

Sea water holds about 50 ten times more CO₂ than the air.

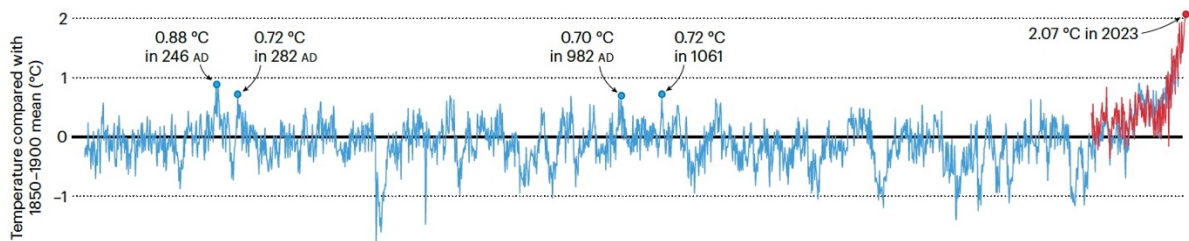
A warm ocean holds less CO₂ than a cold one and as the ocean temperature increases because of the heat imbalance, it releases this excess CO₂ to the atmosphere.

This produces a positive feedback loop. As the ocean heats up due to the heat imbalance, it releases more CO₂ into the atmosphere which results in more heat imbalance.

I suspect that this may be the major reason that the rate of CO₂ accumulation in the atmosphere is progressively increasing.

A warm ocean heats the air causing deadly heat waves killing thousands of people. The last few summers are the hottest on record for **2,000 years**.

This belies deniers who claim cycles of warm climates have always occurred, when in fact nothing like what is now happening, has occurred for 2,000 years, and probable much longer.



There are many reasons why global warming is a serious threat to the world. This is just some of them:

- air temperatures are getting progressively hotter with many thousands of people across the globe, that cannot afford air conditioning, projected to die of the excess heat.
- There will be increasing severity of hurricanes and of forest fires with many more billions in property losses.
- Droughts and crop failures with millions dying of starvation and leading to mass migrations of people.
- permafrost and methane hydrates contain trillions of tons of carbon largely in the form of methane. This amount of carbon is greater than that of all the fossil fuels burned and still in the ground. And that permafrost with its huge amounts of CO₂ and methane is melting all over the arctic.



- **methane is 25 times more potent of a greenhouse gas than CO₂. Over a 20-year period it is 84 times more potent, over 100 years 30 times more potent, and over 500 years 10 times greater than CO₂.**

- **It is rarely appreciated that that the phytoplankton in the sea adsorb as much CO₂ and produce as much oxygen as all the plant life on land.**

I will repeat that: It is rarely appreciated that that the phytoplankton in the sea adsorb as much CO₂ and produce as much oxygen as all the plant life on land.

- **In the 2023 heat wave, 22% of the phytoplankton in the equatorial Atlantic and Pacific died off.**

- **as the oceans continue to heat up and acidify, this source of CO₂ sequestration and this source of oxygen production, and this critical base of the marine food chain, eventually responsible for feeding billions of humans, - will die off - with catastrophic results.**

So, what can we do to save the planet? Getting emissions to Net zero will be very important, but with the earth already in a positive feedback mode independent of emissions, that will not be enough.

Since a portion of the CO₂ stays in the atmosphere for a thousand years, it will be necessary to remove massive amounts of CO₂ and safely sequester it somewhere. By massive amounts we are talking about at least 10 gigatons per year until 2050 and then 20 gigatons or more each year after that.

The current emphasis is on removing CO₂ from the air and burying it underground. In my book, I outline 10 reasons why this will not only be inadequate, but potentially dangerous.

In the book, I outline four approaches to combating global warming. They are:

1. Restoring the Earth's Albedo using highly reflective paint on rooftops and other structures. This will help to reduce the earth's heat imbalance.

2. Combating Ocean Acidification using a hybrid electrolytic Ocean Alkalinization Enhancement technology placed on hundreds of catamarans. I anticipate that 500 such catamarans purchased and operated by all of the countries of the world with access to the ocean, and operating continuously for 5 to 10 years could reverse ocean acidification.

3. Enhanced Weathering using crushed climate rocks such as olivine. These rocks adsorb CO₂ and safely bind it in mineral form above ground. These crushed rocks can be spread on all types of land utilizing a drone program that would allow ordinary citizens to participate in carbon dioxide removal.

In addition, the rate at which enhanced weathering occurs varies 29-fold in various parts of the world, such as cool dry temperate regions

versus the “hot-spots” in the wet tropics. Using vertical “farming” techniques, large tracts of greenhouses can be built that provide optimal “hot spot” conditions for enhanced weathering, anywhere in the world, such as next to olivine deposits, thus cutting down on transportation costs.

4. *situ* CO₂ sequestration. This involves the injection of CO₂ from the air into basalt formations where it is mineralized and thus safely and permanently sequestered. It has been stated that world-wide this has the capacity to safely sequester trillions of tons of CO₂.

A new technique called COF 999 has been developed that is far more efficient and cheaper than previous techniques for pulling CO₂ from the atmosphere.

It should be noted that the vast amount of carbon in the world is stored in mineralized form while all the life on earth is accounting for only 0.00074%.

I would also like to say something about wind power, that Trump wants to stop.

In addition to generating electricity wind power generates jobs. There are currently 150,000 people working in the U.S. Wind industry and hundreds of thousands are projected by 2050. Across the U.S. wind has generated more than 10% of the country’s energy and it has **added more than \$20 billion to the economy. Wind energy contributes to the U.S. avoiding over 340 million tons on CO₂ emissions per year equivalent to the output of 73 million cars. It generates \$2 billion in state and local taxes and land lease agreement yearly. This helps to reduce the tax burden on homeowners and businesses.** Wind and solar projects are now more economically competitive than gas, geothermal, coal, or nuclear facilities. **Wind power is one of the cheapest sources of electrical power.** Any effort to discontinue

expanding the use of wind power in the U.S. is massively misguided and a major mistake. It would definitely make the U.S. LESS GREAT.

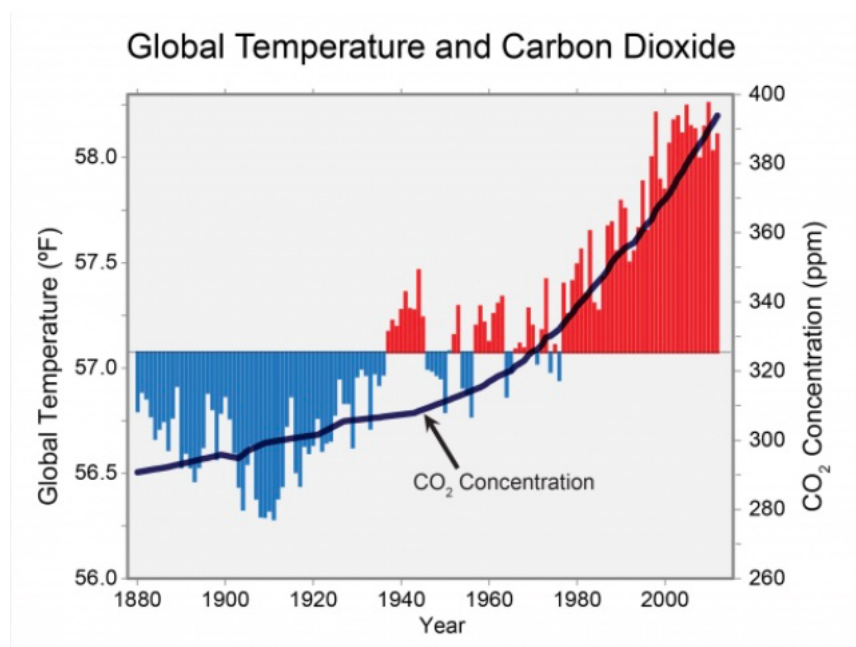
I am very concerned about the current administration's total denial about all matters relating to climate change, from withdrawal from the Paris accord, canceling all government grants that even mention climate change, elimination of controls on the amount of methane released, refusal to use wind and solar power, return to the use of coal, drill-baby-drill, and many other anti-climate change directives. The United States is the second largest emitter of greenhouse gases in the world. Not only is Trump stopping efforts to combat global warming he is initiating programs that make it worse. A four-year hiatus in combating global warming would be disastrous. China, the world's largest emitter of greenhouse gases, has an extensive, multipronged, multibillion dollar approach to fighting global warming that puts the U.S. to shame.

In addition, the Trump administration wants to eliminate the arm of the NOAA that oversees research on climate change including the Keeling curve that monitors the increased rate of CO₂ accumulation. This is analogous to thinking your house cannot catch on fire if you take out all the smoke detectors. **I will let the listeners decide if they think that is a wise move.**

The greatest extinction event to ever hit the earth was the Permian-Jurassic extinction. It was due to excessive volcanism causing high CO₂ levels. It was called the Great Dying with 70 to 81% of species on land and in the sea, going extinct.

We are currently increasing our atmospheric CO₂ level at a rate 10 times faster than what occurred during the Permian-Jurassic extinction.

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The Biden administration did everything in its power to slow the rate global warming. By contrast, the Trump administration is doing everything it's power to speed it up. They seem to be in a great hurry to have the earth match the devastation of the Permian-Jurassic extinction.

The tragedy of global warming is that it will have relatively little effect on the climate change denying politicians who live in a rich country with plenty of air conditioning and food, and who are in their

60's and 70's and currently run our government. They will all be dead 10 to 25 years. By contrast, if no attempt is made to bring it under control, global warming will have a devastating effect on our youth who will live another 40 to 60 years, and if efforts to control global warming are ignored, by that time the earth will have reached a mean temperature of 3.7°C or more over preindustrial times - **with absolutely catastrophic results.**

If you would like a taste of what that would be like, I recommend David Wallace-Wells book *The Uninhabitable Earth*.

A study of 10,000 young people ages 16- to 25-years-old, in 10 different countries, showed that, 83% believe politicians have failed to take care of the planet and they are feeling betrayed. I agree.

If the Trump administration continues in its climate change denial, the four-year gap in combating global warming by the world's second largest emitter of carbon dioxide will be nothing short of disastrous. It will not only adversely affect U.S. citizens, but it will also affect everyone on earth.

One of the issues conservative politicians have with combating climate change relates to the amount of government regulations involved attaining Net Zero emissions. They may find that switching from an emphasis on Net Zero to an emphasis on carbon dioxide removal is far more palatable and supportable. Let the non-governmental organizations take care of Net Zero issue.

A brief plug. My book, entitled *If I were a Billionaire, these are the Four Things I Would do to Combat Global Warming and Help Save the Planet* with a subtitle of *The Science of Global Warming*, is only 168 pages, 23 of which list the 193 literature references. It also has 92 illustrations, remembering the old phrase a picture is worth a thousand words. Thus, it is a quick read, makes the science of global

warming easy to understand and contains everything I have discussed here, plus much more. It is available on Amazon for only \$14.95.

I am also having it printed locally and plan to send it to all the members of Congress, all members of the Trump administration, the directors of hundreds of non-profit climate change organizations, and 950 U.S. billionaires, hoping to reverse the disastrous negative approach to climate change of the Trump administration. I am hoping to convert them from climate change deniers to developing a project, like the Manhattan or Apollo projects, to once and forever rid the world of the devastations of global warming.

Grass root support for this proposal would greatly help.

I am a 90-year-old retired scientist on a fixed salary and a post stroke survivor. If any listeners are as concerned about what the Trump Administration is doing, as I am, your help would be greatly appreciated. I definitely do not have the resources to do this on my own.

If you would like to help, go to the donation page on the www.thecomingsfoundation.org website. That is spelled Comings.
Thank you!