

The difficult choice, Business as Usual or Decarbonized Utopia.

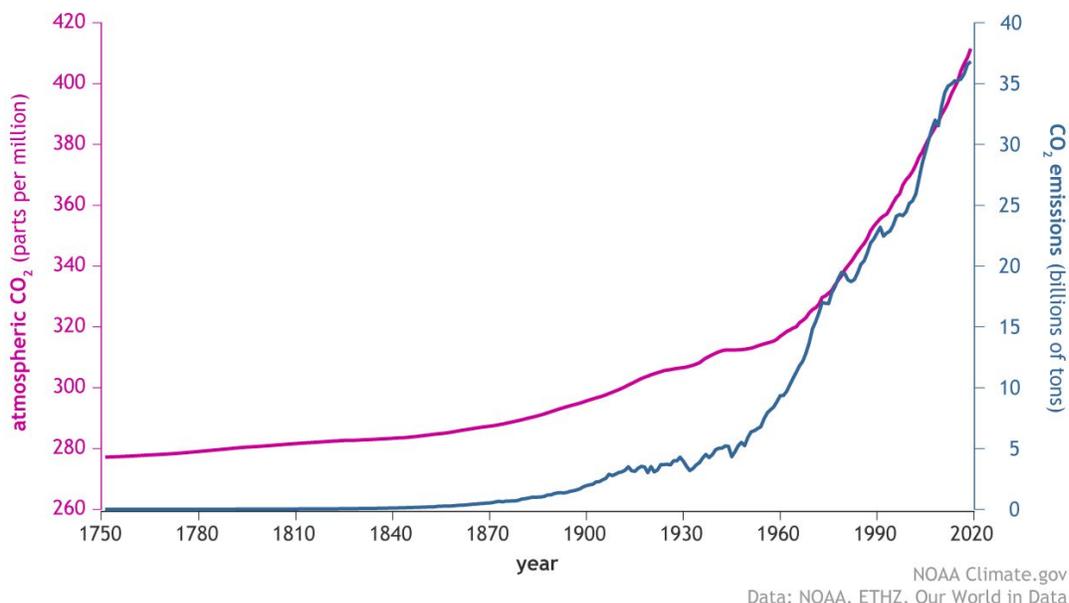
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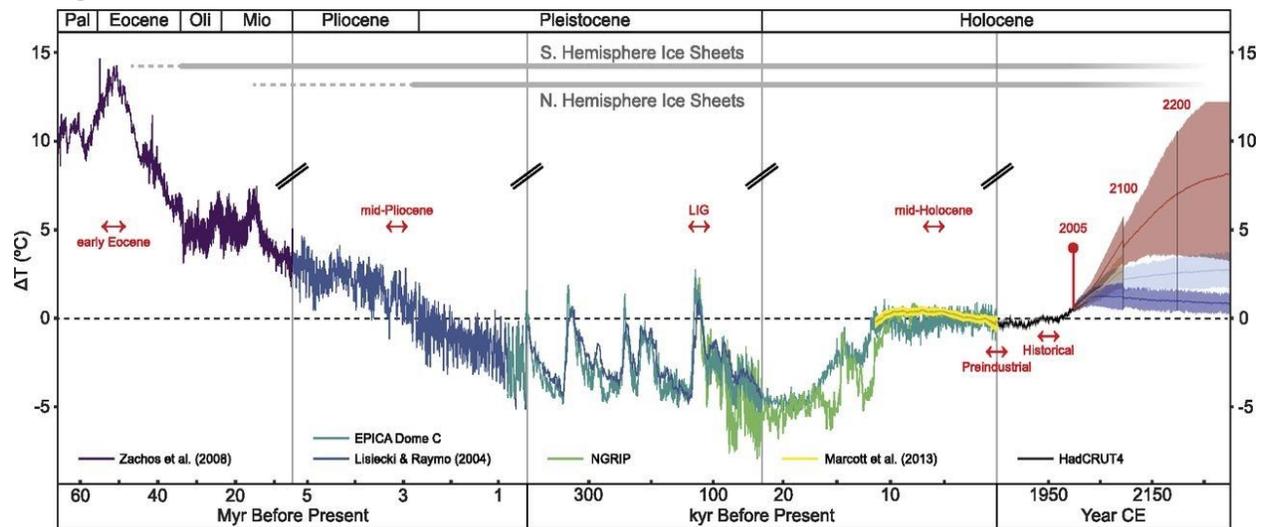
What is global warming and why should we worry about it? First, the greenhouse effect is an absolutely natural feature of our atmosphere. Without the greenhouse effect humans or any other life couldn't live on our planet. But as many other things, everything is in the balance. And in the same way, a planet without sufficient greenhouse effect would be a frozen ice desert. A planet with a too strong greenhouse effect is not something humans would wish to experience.

The below graph shows the rise in the carbon amount in our atmosphere. 280 ppm is the level before we humans started changing this carbon balance. You can call it the natural CO₂ level for our planet today. It is seen that it started rising fast after the second world war. And today we are at a high at 410 ppm, with a never-ending growing trend. A growth which can be explained nearly 100 % by human CO₂ emissions. So in short, we humans are strengthening the earth's greenhouse effect by our CO₂ emissions, and thereby ruining our planet's delicate temperature balance and causing what we know as global warming.

CO₂ in the atmosphere and annual emissions (1750-2019)

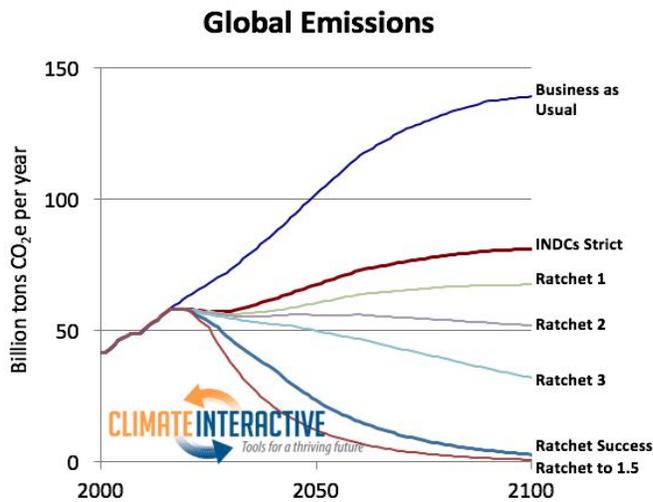


To understand why a CO₂ level at 410 ppm is problematic, let's look at the past of our planet. Because one thing we need to know is that we are living on a planet with a seriously imbalanced climate at the present. The yearly rise in CO₂ is simply too fast to achieve a balanced climate system. We have a lot of weather changes in store, just by waiting for the climate to catch up with the CO₂ level. The time lag in reaching a balanced climate system can best be explained by the earth's huge oceans taking a lot of time to warm and the Antarctic and Greenland ice sheets taking a lot of time to melt.



Last time the CO₂ level was higher than 400 ppm was 3 million years ago in the mid-Pliocene. It was before humans and before the cycle of the ice ages started. We will consider the climate 3 million years ago as a balanced climate system, so it is a good prediction on how the planet would look with the present 410 ppm in CO₂. The northern hemisphere was nearly ice free with only smaller glaciers in the mountains of Greenland and in the highest mountains. There was no permanent ice in the Arctic ocean, only some seasonal ice in the coastal areas. Antarctica was covered in ice but had much smaller glaciers in west Antarctica. The sea level was 9-15 m higher than today. There were forests all the way to the northern coasts of Siberia, Canada and Alaska.

If we managed to stop all human CO₂ emissions in a short time frame, this is the climate we are going towards. A very different planet where we would need to abandon coastal cities and

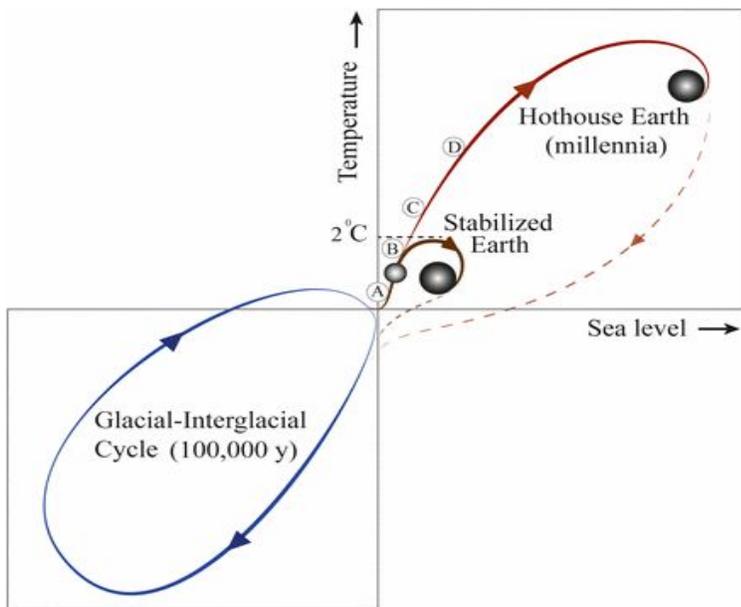


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Temp. Increase Over Preindustrial (90% C.I.)		Atmospheric CO ₂	Atmospheric CO ₂ e
4.5°C 8.1°F	(2.6°C-5.9°C) (4.8°F-10.6°F)	910 ppm	1255 ppm
3.5°C 6.2°F	(2°C-4.5°C) (3.6°F-8.2°F)	670 ppm	855 ppm
3.2°C 5.8°F	(1.8°C-4.2°C) (3.3°F-7.6°F)	630 ppm	775 ppm
3°C 5.3°F	(1.7°C-3.9°C) (3°F-7.1°F)	600 ppm	705 ppm
2.6°C 4.7°F	(1.5°C-3.5°C) (2.7°F-6.4°F)	555 ppm	620 ppm
1.8°C 3.2°F	(0.9°C-2.4°C) (1.7°F-4.4°F)	450 ppm	455 ppm
1.5°C 2.7°F	(0.8°C-2.1°C) (1.5°F-3.8°F)	425 ppm	420 ppm

communities and many low-lying countries would be flooded. To keep the CO₂ at the present level we need to get our emissions down to zero as fast as possible. It is the bottom scenario “Ratchet to 1,5” shown in the graph. We can call it the optimal dream scenario, which many environmentalists are advocating for today. But as we have seen, this is not a good scenario. It is a scenario with a planet with a very unbalanced climate with very big changes in store. Changes which probably will be catastrophic for our society as we know it.

But we are not stopping here, the trend in our CO₂ emissions is only going one way and that's up. Let's instead look at the most realistic scenario. It is called “Business as Usual” and



basically it means we keep on doing what we usually do. And when it accounts to human behavior that is usually what happens. If we follow the “Business as Usual” scenario the CO₂

level is predicted at 910 ppm in the year 2100. 1255 ppm CO₂e (CO₂ equivalent) if we account for all released human greenhouse gasses like methane. To understand this scenario let's look at last our earth experienced a CO₂ level higher than 1000 ppm. It happened in the Eocene 47 million years ago. The climate at this period is called a hothouse, and it is considered the warmest state the earth's climate can be in. When the earth is in the hothouse state both poles are completely ice free, with only small glaciers in the highest mountains. With no big ice sheets left the sea level is much higher, probably around 60-80 m higher than the present sea level. With ice free poles the poles are very different places, with warm summers and mild wet, snowy winters.

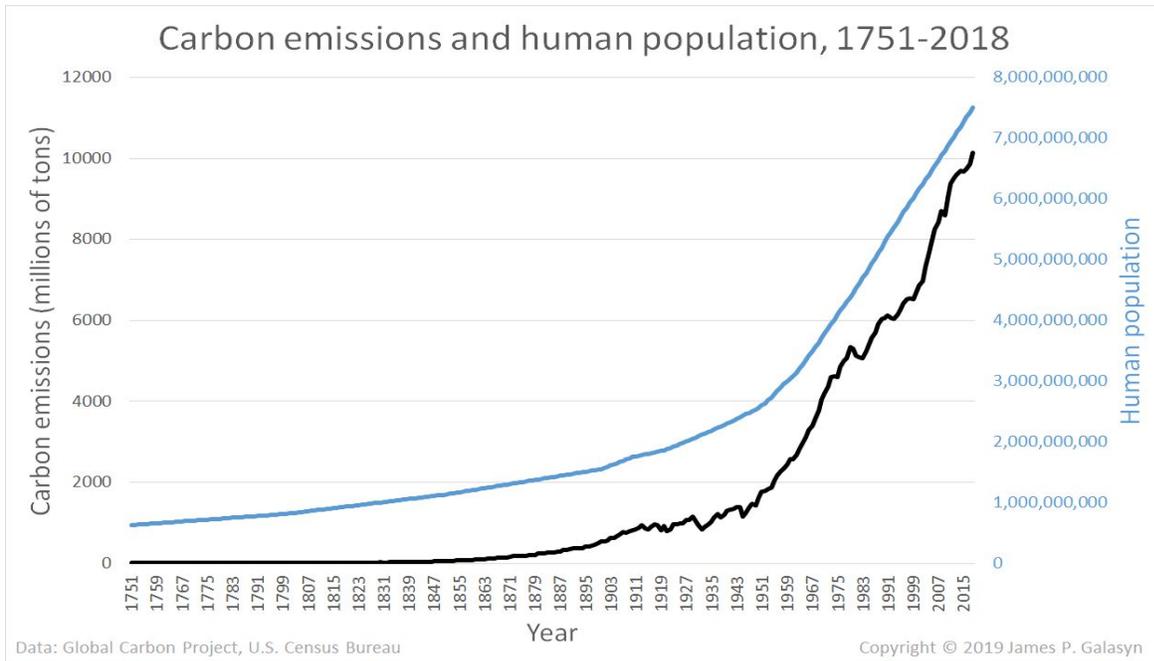
The poles can probably best be compared with the temperate regions of our planet today. Everything is different on this hothouse planet. With the poles having a temperate climate, the circulation pattern of earth's atmosphere will be completely changed. Where it is dry now it can rain, where there is rain now it can become desert. The oceans will be changed. The ice cold bottom waters of today's oceans are formed at the poles. This formation of cold bottom waters will stop now when there doesn't exist any cold polar seas anymore. Disrupting the circulation patterns of our oceans and our oceans ability to store CO₂ and hold nutrients.

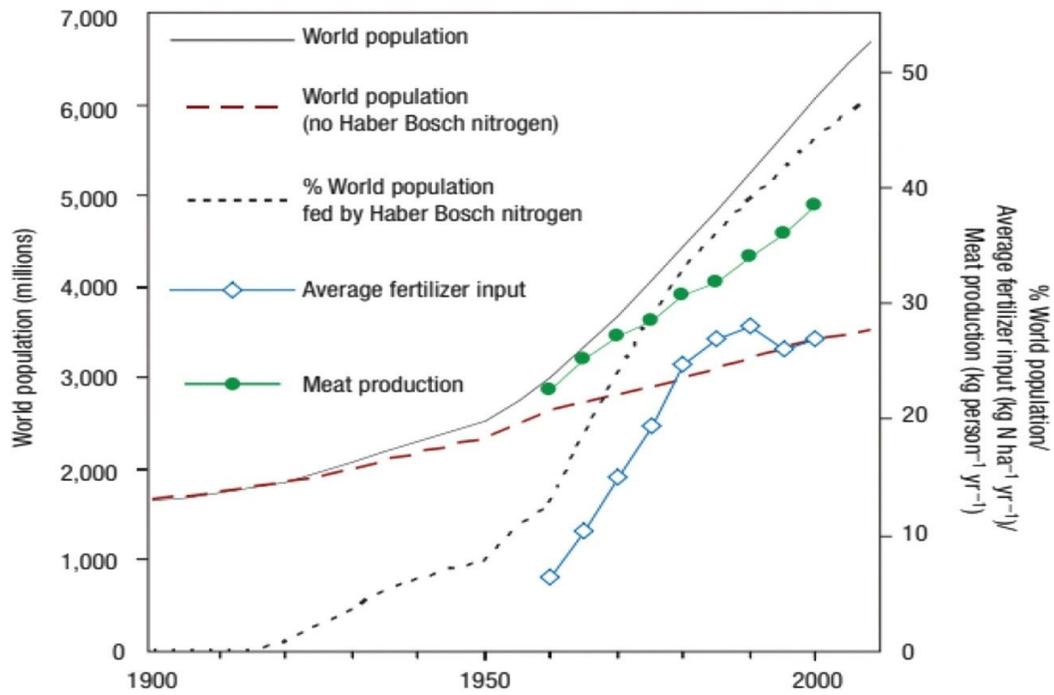
We have learned now that we are already on a planet with a very imbalanced climate, with huge geographical and weather changes waiting for us, even in the best case where we manage to decarbonize fast. But more realistically we will stay on the Business as Usual scenario, further enhancing the imbalance in our climate system, spiraling us into the frightening hothouse state of our planet. With catastrophic changes in store for us happening in a very short timeframe, probably being an end to our civilization and giving nature a difficult time adapting to the changes. Can we avoid these scenarios? Yes, we can. But we have now seen that the best scenario is not enough to stop this dire future. The "Ratchet to 1,5" scenario should be combined with immediately doing the best we can to remove the CO₂ from the atmosphere again.

How can we remove the CO₂ from the atmosphere again? The best and most safe way is to let nature do the job for us. Restore swamps and wetlands from drained farmlands which because of their anaerobic soils are some of the strongest known carbon sinks. Simply if you leave organic material in a swamp, the carbon will stay, transforming into peats and in the end new fossil deposits. Change agriculture into traditional ways. The ancient secret to enrich soils was simple, store carbon in the soils thereby lessening the need for fertilizer and further capturing carbon in the carbon storage process. Let forests grow and expand into formerly forested areas. Give undisturbed nature more space on earth. Eat less meat, because meat production is one the most land consuming farming traditions we have. And our planet is in desperate need of undisturbed lands to capture back the carbon from the atmosphere, so our current meat industry can simply not be allowed.

Human growth should stop in all parameters. Our current population number of 7,8 billion is only possible through our use of fossil fuel. As seen in the last graph, we could feed

less than half our current population without the use of nitrogen fertilizer made through a very CO₂ emission heavy process. To free us from this unsustainable practice, the first and easiest step would be to stop our current meat industry. But the end goal should be lowering our population to a more sustainable number. If it's 4 billion people or less than 2 billion depends on how much space we allow for undisturbed nature.





All these steps are possible and do not demand any unknown technologies. Can we find the political and public will to get it done? This is the challenge. If we don't the "Business as Usual" scenario will happen with bigger changes to our lives than anyone can imagine.