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Welcome to Oslo and Gardermoen

Oslo is Norway's capital, the smallest county in area, and the most populous city. Oslo municipality has 724,290 inhabitants as of January 1, 2025. Together with parts of eleven neighboring municipalities, Oslo as an urban area has a population of 1,082,575 as of January 1, 2023.

Oslo city surrounds parts of the Oslofjord and people in Oslo make a lot of use of the fjord, especially because it's right at the city's edge and easy to reach by foot, bike or ferry. Some of the most popular ways include boating and sailing, swimming and sunbathing, kayaking and fishing, and day trips to the islands.

Oslo is unique in that it's surrounded by vast forests known as Oslomarka, which cover almost half the municipality. People in Oslo make the most of them year-round, and enjoying "Marka" is a big part of local culture. In summer and autumn, there is hiking and trail running on endless marked trails from short walks to full-day hikes. Biking – both road cycling on gravel traces and mountain biking is also very popular. Then there is swimming and picnics by forest lakes and finally berry picking and mushroom foraging – a very much beloved autumn activity. In winter there is cross-country skiing, downhill skiing and snowboarding. All year around there is wildlife and bird watching.

A number of Norway's most popular tourist destinations are located in Oslo. The Frogner Park with the Vigeland Sculpture Park is Norway's most popular attraction, with more than one million visitors annually.



The Vigeland Sculpture Park, open 24-7-365, with the large granite column Monolitten,

Other popular attractions include Holmenkollen and the Ski Museum. In the city center is also the Norwegian Opera, with a landmark building that is also a very popular destination. The angled exterior surfaces of the building are covered with marble from Carrara, Italy and white granite and make it appear to rise from the water. On sunny spring and autumn days, many people walk up the trapezoidal roof or have a drink, a snack or a full lunch or dinner in the Brasserie Opera or the Restaurant Havsmak (Taste of Ocean). Not far from the Opera is also the new Munch Museum.

The Viking Ship Museum is also very popular. This museum houses archaeological ship finds from the Viking Age, such as the Tune Ship, the Gokstad Ship, and the Oseberg Ship, as well as objects found during their excavation. You can also find the Fram Museum and the Kon-Tiki Museum, which, together with the Norwegian Maritime Museum, make up the three well-known museums at Bygdøyenes.

Oslo today is only to a small extent an industrial city. From the 1960s and into the 1970s, increasingly larger parts of the industrial and commercial sectors moved beyond the city boundaries and into neighboring municipalities. However, not far from Oslo's borders, we find large Norwegian companies such as Norsk Hydro, Det Norske Veritas, Kvaerner Engineering, Norconsult, Norwegian Contractors, Schlumberger, and a number of other companies in ICT, petroleum, and engineering. We also find the headquarters of Statkraft, Microsoft, and Pfizer, and just across the border in Bærum, there are Oracle, Computas, SAP, Cisco, PGS, and Nokia. A great many Oslo residents also work in Fornebu, where there is a total of more than 10,000 employees in Norske Skog, Aker, Norwegian, Telenor, and the small businesses at IT Fornebu.

Oslo Gardermoen Airport is an international airport serving Oslo, connected to the city with a high-speed train line running at ten-minute intervals. The airport is one of the largest in Scandinavia and the Nordics. It is a hub for Scandinavian Airlines and an operating base for Norwegian Air Shuttle, Norse Atlantic Airways and Widerøe. In 2025, it is connected to 31 domestic and 164 international destinations.

In the area around the airport, we find major Nordic hotel chains and a long list of other smaller accommodations. Several of the hotels are popular venues for conferences, and the largest conference host is the Clarion Oslo Airport Hotel, host of the sixth Nordic Climate Conference.

Science of Climate Change

Volume 5.4

Proceedings of the 6th Nordic Climate Conference

**“The Climate Knowledge Crisis – how does it impact
Freedom of Speech, Journalism, Climate Science and
Politics?”**

**Oslo Gardermoen
Clarion Oslo Airport Hotel**

November 2025

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Preface

This is a special issue of *Science of Climate Change* which contains extended abstracts from the 6th Nordic Climate Conference which took place in Oslo – Gardermoen August 30-31, 2025.

The conference was arranged by the Norwegian Climate Realists.

The keynote speaker was Nobel Laureate John F. Clauser.

The previous Nordic Conferences were held in Gothenburg October 20-22. 2024, Copenhagen September 14-15. 2023, Oslo October 18-19. 2019, Gothenburg February 16-17. 2018 and Stockholm October 7-9. 2016. Due to the Covid pandemic, there were no climate conferences during 2020 – 2022.

In this issue, you will find the conference program, the Table of Contents for this issue as well as shorter and extended proceedings.

Oslo, October 2025

Hermann Harde
(Chief-Editor SCC)

Stein Storlie Bergsmark
(Editor & Chairman SCC Assoc.)

A digital version of this volume can be found here: <https://doi.org/scc202511/01>

The Climate Knowledge Crisis – how does it impact Freedom of Speech, Journalism, Climate Science and Politics?

Clarion Oslo Airport Hotel

Saturday 30 august

09.40-10.10: Registration

10.15-10.25: Vorspiel: Prof. emer. Olav M. Kvalheim introduserer til debatt om
ytringsfrihet og desinformasjon i klimavitenskap og klimapolitikk

10.25-11.25: Debatt med styremedlem i Klimarealistene Arild Fridstrøm, Cand. Polit.
Mathias Dannevig og jurist Tor Engeness i panelet

11.30-12.30: Lunch

12.30-12.45: Prof. emer. Olav M. Kvalheim – Conference Opening Address

12.45-13.30: Assoc. Prof. Geir Hasnes – A substitute for Science: Recognizing climate
rhetoric

13.30-13.45: Break

13.45-14.30: Prof. emer. Rögnvaldur Hannesson – Net zero 2050?

14.30-15.30: Aerospace Technical Fellow Forrest Frantz – USA EPA Repeal of
Greenhouse Gas Rules on Oil, Gas, and Coal

15.30-16.00: Break, coffee & snacks

16.00-16.45: Siviløkonom Ole Østlid – The Norwegian Climate Journalism – Lack of
Knowledge or Activism?

16.45-17.00: Break

17.00-18.00: **Keynote speech: Nobel Laureate in Physics 2022 Dr. John Clauser:**
Climate change is a hoax - A cloud thermostat stably controls the Earth's
climate, not greenhouse gases. There is no climate crisis!

19:00: Middag/Dinner

Sunday 31 august

9.00-10.00: Physicist and cyberneticist Stein Bergsmark – How Courts support Climate Activism and Politicization of Science

10.00-10.15: Break

10.15-11.00: Samfunnsøkonom Øystein Sjølie - Hva må en fornuftig politikk for å begrense klimagassutslipp ta hensyn til?

11.00-11.30: Prof. emer. Ingemar Nordin - How to avoid talking about an inconvenient truth

11.30-12.30: Lunch

12.30-13.15: Chem. eng. MSc Søren Hansen – The collapse of the green energy transition

13.15-13.30: Break

13.30-14.10: Dipl. eng. Ferdinand Engelbeen – Increase in atmospheric CO₂ - primarily caused by human activity

14.10-14.50: Prof. emer. Hermann Harde - Atmospheric CO₂ - What physics dictates

14.50-15.15: Discussion atmospheric CO₂ increase – mainly natural or anthropogenic?

15.15-15.30: Closing of the conference

15.30-16.00: Coffee & snacks

Opening address, Gardermoen Climate conference, August 30-31, 2025:

The climate knowledge crisis – How does it impact freedom of speech, journalism, climate science and politics?

Olav Martin Kvalheim

Department of Chemistry, University of Bergen, Norway

Chairman, Klimarealistene, Norway

Why is this conference needed?

The motivation for organizing this conference is the ongoing climate war on two connected battlefields: i) the scientific controversy about the cause of the observed increasing atmospheric CO₂ level and its possible impact on the climate, and ii) the belief that human CO₂ emission is the main driver of global warming and that reduction of anthropogenic CO₂ emission represents a cure for an upcoming climate crisis. Almost every human activity lead to CO₂ emissions, but energy production from fossil fuels is the dominating source of anthropogenic emissions.

Due to the crucial role of available energy for human life, “climate policy” to achieve CO₂ cuts has direct consequences on almost every aspect of the society. Thus, the positive correlation between unlimited access to affordable energy sources and prosperity of a society is undisputable. And this is precisely why fossil fuels have been and still are crucial for our welfare. In addition, nondogmatic climate science challenges the idea of CO₂ as a main driver for climate change and the narrative of an ongoing climate crisis caused by CO₂. So why not just adapt to climate change as humans always have always done instead of trying to impose a so-called green energy shift to reduce CO₂ emissions which results in energy poverty and unstable energy with fatal consequences for human prosperity and welfare?

What are we, the climate realists, fighting for and against in the “climate war”?

We ask for a sober climate debate where the basic scientific questions are scrutinized using the scientific method and the results are reviewed and disseminated without censorship based on the argument “the science is settled” or by labeling opponents as “climate deniers”, a term that may be appropriate in a religious setting, but not in discussions between scientists with opposing views.

The consensus argument is not only used for silencing opposing scientists in scientific journals controlled by scientists promoting the paradigm of the crucial role of CO₂ for global warming, but also to cancel opposing views both on climate science and climate policy in mainstream media. Actually, it appears harder to get any information or views that oppose the International Panel of Climate Change (IPCC) climate narrative through the firewall surrounding the mainstream media than for a camel to go through the eye of a needle to cite a well-known biblical expression. The only arenas which are not closed for “climate deniers”, are social media. But these channels are under attack from both state authorities such as the Norwegian minister of culture, Lubna Jaffrey, and other IPCC believers in the society insisting on the nomination of state-approved fact-checkers paid from governmental budgets. Their official justification for such a claim is that this is necessary to prevent spread of disinformation that potentially can misinform the public and thus harm support for expensive and unpopular climate policy “to save the planet”. Our constitution

(§ 100) forbids state advance censorship and requires that limitations in the freedom of expression only can be executed by law and must be based on compelling reasons. The model-based narrative of a climate crisis does not fulfill this criterion.

State censorship has also been asked for by contributors to the magazine *Teknisk Ukeblad* (TU) which historically has been an important source of information for engineers and scientists in Norway. TU has already been executing strong censorship for more than a decade by rejecting all contributions which challenge the IPCC narrative and the realism of the government's climate policy which typically focuses on very expensive measures such as carbon capture and storage (CCS). TU has even installed algorithms to censor opposing comments on their published articles. Recently, they published an article about the first storage of CO₂ captured at the production site of cement in Brevik, located in Southeast Norway. The CO₂ storage reservoir is in Øygarden, which is just outside Bergen in Western Norway. There was no information about the cost per ton of CO₂ for this mission in the TU article, so I wrote the following comment: «What is the cost per ton of CO₂ including the cost of capture, intermediate storage in Brevik, transport by ship to Øygarden, intermediate storage there, and injection into the reservoir? Does anybody dare to publish that calculation?»

I immediately got the following response typed in red: “Warning! Our text analysis believes that your comment can be perceived as erroneous, hateful or offensive. If the comment is published in its present form, it will be flagged for moderation. If the comment then is, for instance, hateful or offensive, it will be deleted. Please consider your formulations to ensure that this is not the case, before you publish.”

Where is the hateful or offensive content in this comment? Is it the word dare? Maybe the well-known phrase “How dare you?” had passed the algorithm?

It is frightening that even a technical magazine has gone so far on the road to censorship and politization of the climate debate that even an obvious question about the cost of a technology to cut CO₂ emissions automatically is classified as potential disinformation, hateful or offensive. I discussed the problem with their moderation algorithm with one of their chief editors, Tormod Haugstad, but, to use another well-known biblical expression, he washed his hands, argued that he was not responsible for moderation, and instead pointed to the company who developed the algorithm. My conclusion is that TU has defined their role to be a microphone stand for IPCC and their followers in the climate debate. For them, the freedom of speech in climate discourse represents a threat that must be minimized not to confuse their readers with deviating views. Exclusion of counterarguments from their audience seems to be accepted tools to achieve this goal. Thus, our fight for spreading truthful information about a climate policy that leads to de-industrialization and significant welfare loss for the people in Europe must play out on other platforms. It is necessary for us to win this information war to save the European countries from economic suicide.

It is also evident, that except for a few other western-oriented countries, such as Canada and Australia, the European countries are the only countries which are ruled by politicians who are willing to destroy their own societies to “save the climate”. They do this willingly by committing to the Paris agreement and steadily increasing their countries' CO₂ ambitions. It is a paradox that Western-oriented societies with less than 15 % of the world's total CO₂ emissions, are the only countries that have made binding obligations to cut CO₂ emissions. But with steady increase in use of coal and accompanying increase in CO₂ emissions in China, India and other so-called developing countries, the global emissions will continue to increase, as Europe's relative share of global CO₂ emission decrease as will the impact of Europe's CO₂-cuts.

How can we win the climate war?

We need to change the voters' and the political leaders' delusion of an ongoing climate disaster and convey the information that even net zero emission in Western societies will have (almost) zero impact on global temperature. The only way to do this is by informing the people about important errors and false claims propagated by IPCC and their supporters in society. This information must be communicated at a level appropriate for "ordinary" people. And we need to show them the consequences of the net zero CO₂ emission goal for the economic basis for our welfare and our freedom to make our own choices in our daily life without being stigmatized or taxed for "wrong" choices.

Who are we fighting against?

The IPCC narrative was created by researchers who developed climate "models" that predicted apocalyptic global warming which they ascribed (almost) exclusively to anthropogenic CO₂ emissions. These unreliable predictions were used to predict and spread a picture of catastrophic sea level rise and increased incidents of extreme weather events. As an example of this practice, the Bjerknes climate center in Bergen published a report in 2008 describing an ongoing sea level rise that would flood the harbor and town center of Bergen with catastrophic effect on the UNESCO World Heritage Site Bryggen. This site is renowned for many buildings dating to medieval times when Bergen was central in the Hanseatic league, a network of cities in Northern Europe aiming at protecting and developing trading. This report created a media storm, with dramatic animation on television showing how the town center was flooded. And with a climate researcher, Helge Drange, outside one of the historic buildings and demonstrating how the sea water would continue to rise and in a few decades would reach a couple of meters up on the wall of that building if not strong preventive measures to reduce CO₂ emissions were enforced. Fortunately, there was a fixed point close to Bryggen where relative sea level had been recorded since 1915. I used these measurements to calculate a linear model between the relative sea level and year, and was able to show that the relative sea level had dropped by 1 cm from 1915 to 2007 (Figure 1 overleaf). However, the mean prediction error for the model was ± 4 cm so the conclusion was that the sea level at Bryggen had not changed in the last 92 years.

The reason for this surprising result is of course that land rise is still ongoing after the last ice age, so a moderate sea level rise is cancelled by this factor and will continue to do that for the years ahead. Despite this, new reports, with the same erroneous models and the same dramatic message, are regularly written and uncritically cited in mainstream Norwegian media with the conclusion that urgent climate measures are necessary, no matter what it costs. And, of course, the authors of these repetitive reports get their salaries from governmental budgets.

We published our critics to the sea level report in Bergens Tidende, the main newspaper in Western Norway. Thus, in 2008, it was possible to oppose and engage IPCC loyal scientists to debates in mainstream media. However, after I leaked the Climate gate e-mails in 2009 to all major newspapers in Norway, the censorship of IPCC opposing views has gradually been tightened until the point we have reached today where IPCC opponents are almost 100 % cancelled in all leading Norwegian mainstream media, including our state-owned national broadcasting NRK which has transformed into a 100 % IPCC-loyal climate channel. NRK has built up its own editorial climate section with 9 devoted journalists who must have sworn faithfulness to the IPCC narrative. Thus, these journalists disseminate uncritically and even magnify errors and misinterpretations from the IPCC camp. In addition, whenever possible, they blow up natural weather episodes as extremes as a constant reminder of the ongoing imaginary climate crisis. This summer, they have consistently reported heat waves in Spain to scare Norwegians from taking their holiday there.

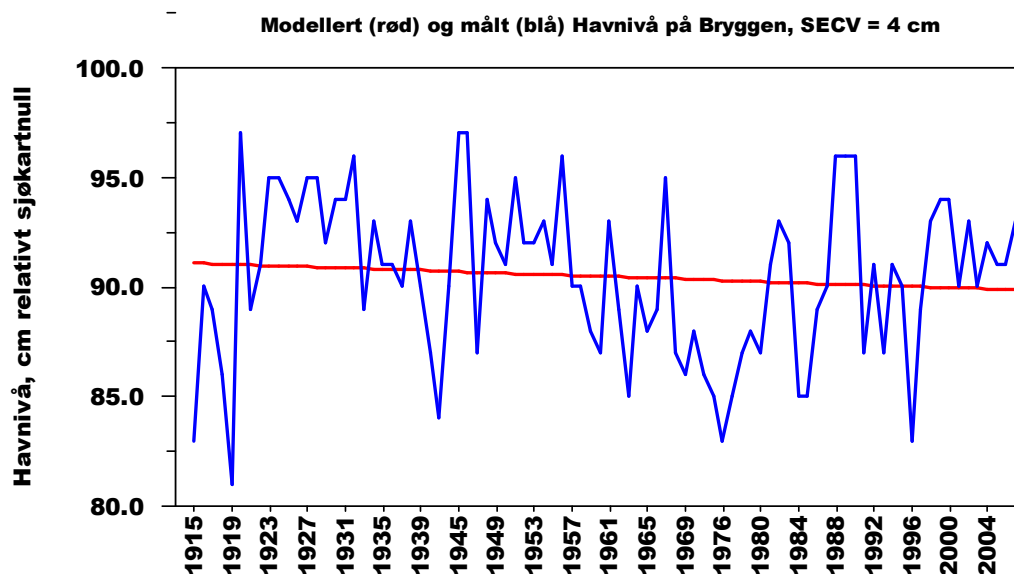


Figure 1. Measured (blue) and regression line (red) for a linear model between annual relative sea level for the period 1915-2007.

Just like NRK, many of the mainstream newspapers also depend on financial support from governmental budgets for their economic survival. Hundreds of millions NOK in yearly governmental financial support may be a factor explaining the concordance between the climate message in these media and leading Norwegian politicians and their eagerness to suppress critics of the IPCC narrative and expensive climate policy. Politicians and journalists also lack a basic understanding of the crucial difference between politics and science. In politics, an issue is decided by voting. The majority vote wins and one can continue to the next issue.

In science, opposing views are resolved by experimentation, theoretical developments and discussions. Voting has no place in science; it is the explanation or model that fits and predicts the data best that wins. So, terms such as consensus or disinformation have no place in science. However, Western politicians with zero competence in science still compete on implementing expensive climate policy to eliminate CO₂ emissions with the goal of net zero emissions within a few decades. At the same time, all the other countries in the world with 85-90 % of the total population and emissions are increasing their use of fossil fuels, mainly coal, which is by far the largest source of anthropogenic CO₂ emissions. China's part of the global emissions was 34 % in 2023 and their emission per capita was 20 % higher than Norway which has only 0.3 % of China's population. Still China is blessed by most Norwegian politicians as a leading star in the "green" revolution.

Nongovernmental organizations (NGOs) are important players in the climate movement. They previously organized demonstrations aimed at forcing politicians to passing laws and regulations to reduce carbon emissions. They always get a lot of public notice through mainstream media and, especially, our climate channel NRK who eagerly and uncritically communicate every move from the NGOs. Recently, NGO's have changed their tactic by challenging political decisions in court rather than in democratic elections or by demonstrations. Their main goal is to liquidate the oil and gas industry which, by far, is the most important industry in Norway being the foundation of our welfare state by covering directly and indirectly approximately two thirds of the state budget. Election after election has shown that a large majority of Norwegians supports this industry, but this does not stop the NGOs in their efforts of trying to convince judges to rule against the industry

“to save the planet”. Ironically, most of the budget for the NGOs is covered by state funding and, even more ironically, the state often also covers their expenses in the court processes. It should be mentioned that Norwegian gas is crucial for Europe’s energy safety. Furthermore, by replacing coal as energy source Norwegian gas has led to enormous CO₂ cut in UK and Germany.

Another opponent that we must consider is the new “green” industry. Thousands of engineers and other workers get the main part of their salary from state subsidies to develop, for instance, hydrogen and battery technologies, to build offshore wind farms and to build infrastructure for CCS. A common denominator in these endeavors is the need for “risk reliefs”, meaning that money is transferred from profitable companies and individual taxpayers to companies that will probably never be profitable. This transaction of money to the climate-industrial complex is performed by “green” governments, i.e. incompetent politicians.

Conclusion

By categorizing opposing views in the climate discourse as disinformation and the proponents of such views as deniers, right wing extremists etc., democratic core values such as freedom of speech and open scientific debate in Western countries are contested by the climate movement including their faithful supporters in politics, media and bureaucracy.

Our aim in general and on this conference in particular is to show that “true” science reveals there is no emerging climate crisis and that the concept of net zero CO₂ emissions represents a road to energy poverty and the death of profitable industry facing high and increasing taxes on CO₂ emissions or the requirement of using extremely expensive “green” technology. Ultimately, the “green” revolution is a path to the death of the welfare states and the leading role of Western civilization.

Acknowledgements

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I will also thank the other members of the program committee: Ove Bengt Berg (press contact), Stein Storlie Bergsmark, Mathias Dannevig, and Dag Hallvard Østtveit (secretary).

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A Substitute for Science: Recognizing Climate Rethoric

Geir Hasnes

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Abstract

Climate rhetoric is filling the news media, based as it is on the IPCC Assessment Reports, which pose as untainted pure science. First, a part of the IPCC AR WG II is examined, and its science fails abysmally. Second, the general rhetorical tricks are examined, and when looked into, one finds that they also fail abysmally, not only among scientists, but also among most people.

Keywords: Climate rhetoric; rhetorical tricks; propaganda; IPCC

<https://doi.org/10.53234/scc202511/02>

1. Climate rhetoric

In the Norwegian journalist trade magazine *Journalisten* appeared an article on the coverage of the climate area in 2007, in which one critical author, Onar Åm, and one climate researcher, Rasmus Benestad, gave their views on the topic. (1)

The article stated that “Scientists who challenge the prevailing consensus on the climate area, complain about one-sided media coverage and refused newspaper contributions. The author of the new book *“The fight about the climate”*, Onar Åm, believes Norwegian media has decided that the debate has ended.

“At the Meteorological Institute, climate scientist Rasmus Benestad is employed. He thinks that media coverage of the climate changes suffer from other weaknesses. Recently, he accused the website *Forskning.no* (An official research website in Norway) to act uncritically to the climate skeptics and further desinformation that is apt to cast doubt about the climate changes. Benestad feels that as a scientist, he must speak up so that media may convey the best possible knowledge on climate science.

“It is a sympathetic thought that the minority shall be heard. This is important in a democracy. But science doesn’t work like that, because there, what counts is quality. The goal is to give society the best knowledge.

“The sceptics are usually not climate scientists, but sun scientists, geologists or economists. And they often bring up topics that the climate science feel they have done with.

“The climate scientist states that no report has been examined more thoroughly than the UN’s climate report. – Science is not about what is most true, we are talking about what is most convincing. And scientific consensus is per definition most convincing, Benestad

says. The IPCC report is a summary of all scientific literature published after the previous report was published.”

Here we learn about pure climate propaganda in the making. We may notice the terms:

- Climate scientist,
- Accuses media to act uncritically,
- Climate skeptics,
- Desinformation,
- Casting doubt,
- Science no democracy,
- Sceptics not climate scientists,
- Topics are done with,

These are all domination techniques. The supreme domination technique is shown in these statements:

- No report has been examined more thoroughly than the UN’s climate report.
- Scientific consensus is per definition most convincing.

However, the first statement is remarkably uncritical to the IPCC report, while the second statement is only used to suppress criticism, referring to an alleged consensus between the scientists.

As we shall see below, the first statement will be shown not to be true. The second statement is an oxymoron: Science is not about consensus, and consensus has nothing to do with science.

2. Textual analysis of the UN Assessment Report, 2007

As a rule, we can’t always take statements on science at face value.

- Benestad states: No report has been more carefully examined.

However, let us examine a part of the Assessment Report. Let’s find out about peer review in practice.

- The passage we shall look at is part of AR 4, WG II, Chapter 10, pp. 469-506; 38 pages. 2)
- The chapter is authored by 23 ‘scientists, professors etc.’+ two review editors.
- Each person has authored on average 1,65 pages which they have been working with probably for years.
- The peer review of the report must have caused probably thousands of comments.

We shall have a look at Chapter 10.6.2, p. 493, the first two paragraphs, which we divide into nine separate statements:

10.6.2 The Himalayan glaciers

1. Himalayan glaciers cover about three million hectares or 17 % of the mountain area as compared to 2.2% in the Swiss Alps.
2. They form the largest body of ice outside the polar caps and are the source of water for the innumerable rivers that flow across the Indo-Gangetic plains.
3. Himalayan glacial snowfields store about 12,000 km³ of freshwater.

4. About 15,000 Himalayan glaciers form a unique reservoir which supports perennial rivers such as the Indus, Ganga and Brahmaputra which, in turn, are the lifeline of millions of people in South Asian countries (Pakistan, Nepal, Bhutan, India and Bangladesh).
5. The Gangetic basin alone is home to 500 million people, about 10% of the total human population in the region.
6. Glaciers in the Himalaya are receding faster than in any other part of the world (see Table 10.9)
7. and, if the present rate continues, the likelihood of them disappearing by the year 2035 and perhaps sooner is very high if the Earth keeps warming at the current rate.
8. Its total area will likely shrink from the present 500,000 to 100,000 km² by the year 2035
9. (WWF, 2005).

Now, we can scrutinize the different statements.

First finding

The first finding is that there is *something wrong with the specified sizes*:

- In Statement 1: Himalaya's glaciers cover 30,000 km² (about three million hectares).
- In Statement 8: Himalaya's glaciers cover 500,000 km².

So we need to look up the source for the statements and examine it.

Examine the source

The single source of these two paragraphs is listed as Statement 9 (*WWF, 2005*), which is found in the reference list at p. 505:

- *WWF (WorldWildlife Fund), 2005: An overview of glaciers, glacier retreat, and subsequent impacts in Nepal, India and China.* WorldWildlife Fund, Nepal Programme, 79 pp. (3)

We then find it on the internet:

- https://www.wwf.or.jp/activities/lib/pdf_climate/environment/Overview_of_Glaciers.pdf

Second finding

The second finding is that the number of 500,000 km² *does not exist* in *WWF, 2005*.

- Statement 8 has been given as reference Statement 9.
- But there is no such number in *WWF, 2005*.

Examine the source (WWF, 2005) further

We now look for other of the statements in the source.

Statements 6 and 7 are found at p. 29:

“Country Case Study 2 :India: Glaciers, glacier retreat and its impact: Introduction

“As discussed in the thematic introduction to this regional status review, there is particular concern at the alarming rate of retreat of Himalayan glaciers. In 1999, a report by the Working Group on Himalayan Glaciology (WGHG) of the International Commission for Snow and Ice (ICSI) stated: “glaciers in the Himalayas are receding faster than in any other part of the world and, if the present rate continues, the livelihood of them disappearing by the year 2035 is very high”. Direct observation of a select few snout positions out of the thousands of Himalayan glaciers indicate that they have been in a general state of decline over, at least, the past 150 years.”

We find Statement 6 and Statement 7 in this paragraph, with a reference to “*a report by the Working Group on Himalayan Glaciology (WGHG) of the International Commission for Snow and Ice (ICSI)*”.

Third finding

The third finding is that the WWF report took its material *from somewhere else*.

- (*WWF, 2005*) is not the main source of Statements 6 and 7. The sentence refers to *another report*, this time by *WGHG*.
- However, there is no reference to this WGHG report in the reference list of (*WWF, 2005*).

Examine the source even further

As we can't find a report by WGHG, we now search for the phrase ICSI.

It is found on p. 2 in (*WWF, 2005*):

“The *New Scientist* magazine carried the article “Flooded Out – Retreating glaciers spell disaster for valley communities” in their 5 June 1999 issue. It quoted Professor Syed Hasnain, then Chairman of the International Commission for Snow and Ice’s (ICSI) Working Group on Himalayan Glaciology, who said most of the glaciers in the Himalayan region “will vanish within 40 years as a result of global warming”. The article also predicted that freshwater flow in rivers across South Asia will “eventually diminish, resulting in widespread water shortages”.”

Fourth finding

The fourth finding is *that even though WGHG and ICSI are mentioned as sources, the sources are not given*.

- There is no reference to the ICSI-report from 1999 either in (*WWF, 2005*).
- There is only a reference to the *New Scientist* magazine.

Examine the source with regard to Statement 1

Statement 1 quantified the cover of the Himalayan glaciers to be about three million hectares. Can this be found in (*WWF, 2005*)?

On p. 36 we find:

“Recently the geologists of Geological Survey of India (GSI) counted 5,218 glaciers in the Himalayas (Puri 1994). It is estimated that 33,200 km² (Flint 1971)

of the Himalaya is glaciated and glaciers occupy about 17 percent of the total mountainous area of the Himalaya (Vohra 1978)”.

But on p. 44 we find:

“In the whole of the Himalayan Range, there are 18,065 glaciers with a total area of 34,659.62km² and a total ice volume of 3,734.4796 km³ (Qin Dahe 1999).”

Fifth finding

The fifth finding is that the glacier area was estimated to 33,200 km² in 1971 and to 34,659 km² in 1999.

- The statements in the source are both larger and more detailed than Statement 1.
- According to the report, *the glaciers grew from 1971 to 1999*, contradicting Statement 6.
- It doesn't make sense that the numbers in the given source *differ* from the IPCC report.

Sixth finding

The sixth finding is that the number of glaciers are given as 18,065.

- The statement in the source is larger and more detailed than Statement 4.
- Statement 4 states that there are 15,000 glaciers in Himalaya, but the reference gives the number 18,065. How can the number of glaciers change from the source to the IPCC report?

Examine the source of the source (New Scientist 1999)

Obviously, we have now found that the given source doesn't give the pieces of information that it is said to provide for IPCC report. So we have to examine the source for the source, which is given, as we can see above, as an article called *Flooded out* in the *New Scientist* magazine, June 5, 1999, by Fred Pearce. It opens: (4)

“Melting Himalayan glaciers are threatening to unleash a torrent of floods into mountain valleys, and ultimately dry up rivers across South Asia. A new study, due to be presented in July to the International Commission on Snow and Ice (ICSI), predicts that most of the glaciers in the region will vanish within 40 years as a result of global warming.

“All the glaciers in the middle Himalayas are retreating,” says Syed Hasnain of Jawaharlal Nehru University in Delhi, the chief author of the ICSI report. A typical example is the Gangorti glacier at the head of the River Ganges, which is retreating at a rate of 30 metres per year. Hasnain's four-year study indicates that all the glaciers in the central and eastern Himalayas could disappear at their present rate of decline.”

Seventh finding

The seventh finding is that we still *can't find the references* that have given the numbers of the IPCC report, while at the same time, the referred WGHG and ICSI report was *not published*.

- The *ICSI report* referred to in the *WWF report* is only mentioned in the *New Scientist* interview. There is no reference to it in the article.
- Still, the glaciers may disappear in 2035, but now it refers to the glaciers in the central and eastern Himalayas (only).
- In *Hydropower: Hydroelectric Power Generation from Alpine Glacier Melt* by Mauri Peltó, Encyclopedia of Earth Sciences Series, 2011, we find the report is referred to as “Hasnain, S. I., 1999. Report on Himalayan glaciology. Appendix 6, *unpublished minutes of the July 1999 meeting*, ICSI Bureau.” (5)
- While a report where Hasnain is co-author: *Atmospheric Brown Clouds*, UNEP, 2008, refers to the referred report as “Hasnain, S.I. (1999). Final report of Himalayan Glaciology Working Group (1985-1999). International Association of Cryospheric Sciences <http://www.cryosphericciences.org> (Unpublished)” (6)
- We also note that while the *New Scientist* article carried no own research, it was still given as source in the *WWF report*.

Examine the source of the source of the source (Down to Earth 1999)

The New Scientist article did not carry any references, but an internet search led to another journal, Down to Earth, which carried the article that the New Scientist based its article on: Glaciers beating retreat by the journal's staff, Apr. 30, 1999. (7)

Its ingress opens:

“Himalayan glaciers, source of water for the innumerable rivers that flow across the Indo-Gangetic plains, are receding. And that too at a phenomenal rate.”

Hear we can read that:

“Glaciers in the Himalaya are receding faster than in any other part of the world and, if the present rate continues, the likelihood of them disappearing by the year 2035 is very high,” says the International Commission for Snow and Ice (icsi) in its recent study on Asian glaciers. “But if the Earth keeps getting warmer at the current rate, it might happen much sooner,” says Syed Iqbal Hasnain of the School of Environmental Sciences, Jawaharlal Nehru University, New Delhi. Hasnain is also the chairperson of the Working Group on Himalayan Glaciology (wghg), constituted in 1995 by the icsi.”

“The glacier will be decaying at rapid, catastrophic rates. Its total area will shrink from the present 500,000 to 100,000 square km by the year 2035,” says former icsi president V M Kotlyakov in the report *Variations of snow and ice in the past and present on a global and regional scale* (see table: *Receding rivers of ice*).”

Eighth finding

The eight finding is that we now find *the real source* behind much of the IPCC chapter.

- The first two sentences in the first paragraph gives nearly word by word (except for the table reference) Statement 6 and 7 in the report. Here, Syed Hasnain is quoted as saying this.
- Now we also find Statement 8 in the second paragraph. Here we find yet another source, a report by some V. M. Kotlyakov, which we must investigate.

- We must also notice that the WWF report lists the *Down to Earth* article in the references, but there is no reference to it in the text.

So far, still, the glaciers will disappear by 2035, and now there is no limit to which glaciers as in the *New Scientist* article.

Let us also note this from the article:

“In India, there is very poor database on glaciers. And whatever exists is in the form of snapshots. On the other hand, excellent studies have been conducted on Nepal’s glaciers. So we presume their conclusions would also be applicable for glaciers in our country, particularly those in Sikkim, Garhwal and Kumaon Himalaya,” says Hasnain.”

- We note that Hasnain is quite sure on the receding glaciers, with *very poor data*.

Ninth finding

The ninth finding is that the IPCC editors have included a *non-referred source*.

In *Down to Earth* we can also read:

“Himalayan glaciers cover about three million hectares or 17 per cent of the mountain area as compared to 2.2 per cent in the Swiss Alps. They form the largest body of ice outside the Polar caps. The 15,000-odd Himalayan glaciers form a unique reservoir which supports mighty perennial rivers such as the Indus, Ganga and Brahmaputra which, in turn, are the lifeline of millions of people. The Gangetic basin alone is home to 500 million people, about 10 per cent of the total human population.”

- The passage is used almost word by word in the *IPCC report*, Statements 1, 2, 4 and 5.

The WWF report, about the same topic, states:

“Himalayan glaciers form a unique reservoir that supports mighty perennial rivers such as Indus, Ganga and Brahmaputra, which are the lifelines of millions of people.”

And:

“Himalayan glacial snowfields store about 12,000 cubic kilometres of freshwater and have a significant cooling affect in the entire region,” says [Jagdish] Bahadur.”

- The passage is used as input to the IPCC report’s Statement 3.

It also states:

“Recently the geologists of Geological Survey of India (GSI) counted 5,218 glaciers in the Himalayas (Puri 1994).”

- Let us hope the 5,218 glaciers are found in India, as the number differs from the 15,000 and 18,065 given elsewhere.
- The source: *Puri, V.M.M. (1994). Glacier Inventory, Geol. Surv. India (unpublished lecture notes), Foundation Course in Glaciology, 20p.*, is interesting since it is unpublished.

Examine the source of the source of the source of the source (Kotlyakov, 1996)

We find the report *Variations of Snow and Ice in the past and present on a Global and Regional scale*, Edited by V. M. Kotlyakov (Paris: UNESCO), 1996, on the internet. (8)

On p. 66 we can read:

“The degradation of the extrapolar glaciation of the Earth will be apparent in rising ocean level already by the year 2050, and there will be a drastic rise of the ocean thereafter caused by the deglaciation-derived runoff (see Table 11). This period will last from 200 to 300 years. The extrapolar glaciation of the Earth will be decaying at rapid, catastrophic rates – its total area will shrink from 500,000 to 100,000 km² by the year 2350. Glaciers will survive only in the mountains of inner Alaska, on some Arctic archipelagos, within Patagonian ice sheets, in the Karakoram Mountains, in the Himalayas, in some regions of Tibet and on the highest mountain peaks in the temperate latitudes.”

Tenth finding

The tenth finding is that the number of 500,000 was *not about Himalaya alone*.

- It was not the glaciers of Himalaya, as in statement 8, but *all non-polar glaciers*, that covered 500,000 km² and were going to shrink to 100,000 km².
- The authors of the IPCC report have *misunderstood* this what they have included.

Eleventh finding

The eleventh finding is the year of **2350**.

- The year when 20% of the glaciers should be left, was 2350, not 2035.
- *The authors, review editors, commentators etc. of the IPCC report have accepted the year as 2035 without any critical sense at all.*

Twelfth finding

The twelfth finding is that *no complete disappearance is found in the source*.

- The likelihood that the glaciers may disappear completely is *not treated by Kotlyakov*.
- It is simply something that *Hasnain opinionated* – without any backing.

Textual conclusions

In Chapter 10.6.2 The Himalayan glaciers, IPCC presented a hotchpotch:

- Statement 1) Himalayan glaciers cover about three million hectares or 17% of the mountain area as compared to 2.2% in the Swiss Alps. Source: *Down to Earth*, inaccurate statement.
- Statement 2) They form the largest body of ice outside the polar caps and are the source of water for the innumerable rivers that flow across the Indo-Gangetic plains. Source: *Down to Earth*, first part taken from the article's content, second part taken from the ingress.
- Statement 3) Himalayan glacial snowfields store about 12,000 km³ of freshwater. Source: *Down to Earth*, quote from Jagdish Bahadur.
- Statement 4) About 15,000 Himalayan glaciers form a unique reservoir which supports perennial rivers such as the Indus, Ganga and Brahmaputra which, in

turn, are the lifeline of millions of people in South Asian countries (Pakistan, Nepal, Bhutan, India and Bangladesh). Source: *Down to Earth*, countries are added.

- Statement 5) The Gangetic basin alone is home to 500 million people, about 10% of the total human population in the region. Source: *Down to Earth*.
- Statement 6) Glaciers in the Himalaya are receding faster than in any other part of the world (see Table 10.9). Source: *Down to Earth*, here quoting the unpublished ICSI-report. Not taking into account that the source says that the glaciers are *badly monitored* and that the WWF source also gives numbers showing that the glaciers are *growing*.
- Statement 7) and, if the present rate continues, the likelihood of them disappearing by the year 2035 and perhaps sooner is very high if the Earth keeps warming at the current rate. Source: *Down to Earth*, the first part quoting, wrongly, Kotlyakov who gives the year as 2350; the second part taken from the quote from Hasnain, who *opinionates*, because Kotlyakov doesn't state that they will disappear.
- Statement 8) Its total area will likely shrink from the present 500,000 to 100,000 km² by the year 2035. Source: *Down to Earth*, quoting Kotlyakov wrongly; he doesn't speak about Himalaya and uses the year 2350.
- Statement 9) (WWF, 2005). Minimally has been taken directly from the given source.

Methodical conclusions

Chapter 10.6.2 of the IPCC AR4 WG2 report of 2007 has been thoroughly examined:

- It fails abysmally. Nothing of it can be trusted, except the superficial facts, for instance that Himalaya has got some glaciers.
- The facts are inaccurate, differ between them, and have originated on different dates.
- Its main conclusions are not only wrong, but either
 - misunderstood (not only Himalayan glaciers),
 - remembered wrongly (2035),
 - mixing numbers without seeing it (30,000 vs. 500,000),
 - the opposite of what the source actually says (the glaciers grew)
 - or even made up (likelihood of them disappearing by the year 2035 and *perhaps sooner*).
- Its use of sources is abysmal.
- It is completely unbelievable that this chapter must have taken months to produce.
- The review editors cannot have 'reviewed' the paragraphs more than just reading through it and accepting it at face value. They haven't even spotted the contradictions and the unlikely year of disappearance.
- The peer review may have caused comments, but we do not know anything else than that those comments cannot have been taken into consideration.

With respect to Benestad's statements, we may therefore conclude that:

- It is not true that 'no report has been more critically examined than the IPCC report'.
- 'Scientific consensus' is not most convincing.
- Looking into the texts, we don't always find that 'consensus' when it comes to the facts.

With respect to the IPCC's treatment of scientific criticism, we note that:

- The 2035 statement caused a scandal in 2007. The IPCC including its chairman vehemently rejected all criticism.
- Reluctantly, they accepted the error by 2010.
- The IPCC report has not been corrected since; it is still found on the official site in its original state.
- Therefore, the IPCC reports can not be trusted.

What we see here is the two worst things you can do in science:

- Making up facts to fit theories
- Avoiding to examine the sources

3. Climate rhetorical tricks

Calculated propaganda

The IPCC is not the only institution that bends the facts and their interpretation. The editors of *The Guardian* made the following statement about their coverage on climate in a guideline in 2019 (9)

- We recently reviewed the language used in our coverage of the environment, and whether the terms we use reflect the phenomena that they describe in an accurate enough way.
- We want to ensure that we are being scientifically precise, while also communicating clearly with readers on this very important issue.
- The phrase 'climate change', for example, sounds rather passive and gentle when what scientists are talking about is a catastrophe for humanity.
- Increasingly, climate scientists and organizations from the UN to the Met Office are changing their terminology, and using stronger language to describe the situation we're in.
- That's why we want to change the terms we now use as follows: Use *climate emergency*, *crisis* or *breakdown* instead of climate change; use global heating instead of global warming, use *climate science denier* or *climate denier* instead of climate skeptic.

One may wonder whether they are desperate.

Recognizing propaganda

A discussion about scientific topics may often include textual clues that unmask statements as unscientific and meant for propaganda purposes. Below, a few of such types of statements are listed:

- *Uncertain or vague terms* that people can put whatever they imagine into, such as 'climate *change*', 'emissions' 'man-made warming', 'earlier than expected', 'extreme', 'sustainable', 'green',
- *Unrelated terms* that people can imagine are related, such as 'wildfires', 'cow farts', 'eating meat', 'heatwave', '97%',
- *Unrelated phenomena* such as cooling towers with water vapor coloured dark brown, giving the impression of 'man-made dangerous emissions', or dying polar bears,
- *Unknown authorities* that people regard as truth witnesses, such as '[something scary may happen soon], say scientists' – always in plural,

- *Vague scientific terms* that people don't understand at all, such as 'climate sensitivity', 'greenhouse effect', 'tipping point', 'the precautionary principle', that sounds important on a large scale,
- *Lying by presenting truth, but not the context*, such as 'the country is warming twice as fast as the world', but not adding that the ocean is part of the world,
- *Apocalyptic prophecies* – 'we only have [n] years to save...', they are in general not true,
- *Appealing to emotions* such as 'our children', 'rich versus poor', 'inequalities',
- In short, everything that makes the reader/listener *assume* something bad.

Recognizing assumptions

We do not always recognize that in every discussion, there is a need to agree upon some common assumptions, as if they were agreed upon facts.

- The '1,5-degree goal' – goal for whom? What about the original '2-degree goal'?
- 'It has never been as hot before!' – note the use of 'never',
- 'The climate has been stable for so-and-so long' – pretty undocumented,
- The very best propaganda is the one that makes people put their own opinion into it. That's why Obama succeeded with the bland phrase "Yes, we can!" and Trump with the equally bland phrase "Make America great again!". Both seem suggestive of people's imaginations because everyone can imagine something that needs something to be done about it.

The main assumption in the scientific debate is that the 'hockey stick splice' of graphs is a fact. To which one may answer: "And Marilyn Monroe was a mermaid."



Figure 1. Proof that Marilyn Monroe was a mermaid.

Al Gore on propaganda (10)

- “Nobody is interested in solutions if they don’t think there’s a problem.”
- “Given that starting point, I believe it is appropriate to have an over-representation of factual presentations on how dangerous it is, as a predicate for opening up the audience to listen to what the solutions are, and how hopeful it is that we are going to solve this crisis.”

The science of 97 %

It is being said: “... 97 % of research points to human activity as a contributor.” Contributor to what then?

- Man-made CO₂ as a contributor to a greener planet? 100 % agreement.
- Man-made destruction of the environment as a contributor to effects on climate? 100 % agreement.
- Man-made climate propaganda as a contributor to climate religious measures with no root in science? 100 % agreement.

Every time you see that there is 97 % agreement on something, you can easily conclude that this is a made up number, used to make an impression because:

- 100 % can too easily be disproved,
- 99 % sounds like too much, it sounds made up, like 99,99%
- 98 % is a bit too much,
- 96 % is too charged, as it is the alcohol content of moonshine; actually, it sounds funny to us,
- 95 % is too accurate,
- 94 % is just ridiculous.

No, 97 % is perfect, and peer-reviewed research has concluded that this is because 97 is a prime number, with all the suggestive mystery dwelling on the primes.

What actually is climate propaganda?

- Climate propaganda is free of cycles, feedback systems and falsification of hypotheses,
- It’s free of reason,
- It’s obviously manufactured to intimidate,
- And better yet, it makes such unqualified claims that most people can imagine their own fantasies into the predictions.
- If one examines climate science as presented in the climate reports, one finds a completely different and rather fragmented picture of the various branches of science, where it oozes uncertainty,
- Yes, every single thing in the report is indicated with the probability of whether it might happen or not.
- Try telling your loved one that you’re 97% likely to love her or him, and look at the results.
- Climate propaganda is simply outrageously naïve, and stupidly produced.

Propaganda production

However, propaganda is being produced in large numbers.

“Covering Climate Now” is a global journalism collaboration cofounded by *Columbia Journalism Review* and *The Nation*, in partnership with *The Guardian*. They coordinate

more than 500 media actors and expect to reach more than one billion readers. They provide a coordinated horror campaign with supplies for every single day, especially before large Climate Summits. Here you will find CBS, Bloomberg, BuzzFeed News, HuffPost, Newsweek, Rolling Stone, The Weather Channel, and many other famous or infamous websites. (11)

You can only imagine where (the Norwegian news bureau) NTB's material comes from and is spread in this country.

Are they succeeding? Reading at coveringclimatenow 25/17/07, one could see: (12)

- Last Thursday, CNN ran a story that inadvertently underscored the fact that most journalism is still not getting across the full truth about climate change.
- Harry Enten, CNN's polling analyst, [displayed](#) Gallup data showing that 40% of Americans are "greatly worried" about climate change.
- But this 40% is "the exact same percentage as [were worried] back in 2000," he pointed out, "despite everything we see [today] on our television screens, our computer screens... the hurricanes, the tornados, the flooding."
- "Americans aren't afraid of climate change," Enten concluded. "Climate activists have not successfully made the case to the American people."
- Perhaps not, but neither have most journalists.
- The extreme weather events Enten cited have gotten extensive news coverage, but most of that coverage did not make the climate connection.
- As , "In the summer of 2024, for example, when record high temperatures brutalized outdoor workers, withered crops, and worsened hurricanes, [only 12% of US national TV news segments](#) mentioned climate change, though its role in driving such extreme heat has long been scientifically indisputable."
- Anthony Leiserowitz, the executive director of the Yale Program on Climate Change Communication, said Yale's latest survey found that only 29% of Americans are "very worried" about climate change — a remarkably low number, considering that climate change is already killing people and devastating communities around the world and threatens much worse if left unchecked.
- "I constantly make the point that only 29% are very worried, when it should be 100%," Leiserowitz told Covering Climate Now. "This reflects [climate change's] lack of salience for most Americans. There are many who are not deniers, but do not adequately understand the risks, that the impacts are here and now, and the urgency of action."

What to do when people don't believe you?

Here are some labels used by climate propagandists, when everything else fails:

- Flat Earth Proponents
- Old White Men
- Conspiracy Theorist
- Right-wing
- Right-wing extremist
- Fascist
- Paid for by the oil industry

One may easily dismiss persons using these words in their arguments.

Does climate propaganda work?

Norway has been one of the most eager climate propaganda nations in the world. A recent poll in *Nettavisen* showed that Norwegians are not worried at all! (13)

Hvordan ser du på klimaendringer?



Totalt 5 344 stemmer. Kun verifiserte brukere har kunnet avgi stemme.

Figure 2. Norwegian poll in a climate propaganda propagating news website, showing that 56% of adult Norwegians are not worried about climate change at all, while 21 % are a bit worried, but believes it all is going to end up well.

4. Conclusions

Climate rhetoric has for long substituted scientific reports in news media. It can be easily be analyzed and rejected and every rhetorical statement on climate can be examined to see whether it holds water as science.

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Net Zero by 2050

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1. Introduction

Net zero by 2050 means that the world's anthropogenic emissions of CO₂ will, by that time, be limited to the planet's ability to absorb these emissions, believed to be 2 gigatonnes per year. This is an enormous undertaking; currently these emissions are about 40 gigatonnes, whereof 35 from burning fossil fuels. Many countries, including the European Union, have committed to this goal. This is grounded in a special report from the Intergovernmental Panel on Climate Change (IPCC), which in 2018 issued a report advising that the rise in temperature since the middle of the 19th Century be limited to 1.5 degrees Celsius.¹ To achieve this, net emissions would need to be cut to zero by 2050.

In this article I shall discuss how likely it is that this goal will be achieved, in the light of what has been accomplished with respect to cutting emissions so far. I will not address the scientific basis of the net zero goal except for cursory comments on the high degree of uncertainty on this issue. My take on this is that the question we face is whether high and relatively certain costs of decarbonization are worth the highly uncertain benefits from avoiding the consequences of, again, highly uncertain increase in global average temperature.

2. How are we doing thus far?

The International Energy Agency (IEA) has done us the favor of analyzing what kind of policy measures are needed for the world to achieve the net zero target by 2050. In the 2024 issue of the World Energy Outlook they provide three conceivable emission paths from 2024 to 2050, one that they call "stated policies scenario", which presumably means that we go on pretty much as we have done up to now, a second one called "announced pledges scenario", which presumably includes the climate goals many countries have set themselves and even put on their law books, and a third path leading to the net zero goal.² All paths rise for a few years and then decline. The business as usual path ends in 2050 with emissions of about 30 gigatonnes CO₂, way above target. The path resulting from pledges that countries have made, but probably without the ability and even the intention to live up to them, ends slightly above 10 gigatonnes in 2050. The prospects for net zero by 2050 certainly do not look good.

We have seen this movie before. Fifteen years ago the fashionable climate target was 450 ppm, that is, the concentration of CO₂ in the atmosphere should not exceed 450 parts per million to have a 50-50 chance of limiting global warming to 2 degrees Celsius. The IEA at that time also calculated an emission path compatible with this goal and compared it to alternative and, as it turned out, more realistic paths, stretching out in time to 2035.³ One was labelled "current policies

¹ IPCC (2018): Global Warming of 1.5°C.

² IEA (2024): World Energy Outlook, Figure 5.25.

³ IEA (2012): World Energy Outlook, Figure 8.3.

scenarios”. By 2024 the world’s emissions turned out to be almost exactly on this path. Then there was another one, “new policies scenarios”, which presumably included the climate pledges various countries were making at the time. This path was 3 gigatonnes below the actual emissions in 2024. Finally there was the path compatible with the 450 ppm goal. This path was almost 10 gigatonnes below where we were in 2024.

3. What we need to do to attain net zero 2050

The IEA has listed many things the world needs to do in order to achieve the goal of net zero by 2050. Here is one: “Our pathway calls for scaling up solar and wind rapidly this decade. ... For solar PV, this is equivalent to installing the world’s current largest solar park roughly every day.”⁴ Table 1 show how many times we need to increase the production of several critical minerals relative to the 2020 level to satisfy the needs of the “green” transition.⁵ In addition there are substantial amounts needed of copper and aluminum. The mining industry is not among the cleanest industries in the world and, in the poorest countries, it employs child labor under hazardous conditions. The “green” transition is not an obviously apt term to apply to an energy transition critically dependent on these minerals; the dirty transition might be a better one.

Table 1. How many times the production of several critical minerals must be increased relative to the 2020 level to satisfy the needs of the “green” transition.

Graphite	Lithium	Cobalt	Nickel	Rare earths
25	42	21	19	7

In 2020, the IEA had the following vision about the net zero by 2050 path: “Total consumption [of fossil fuels] rebounds marginally following its 5 percent drop in 2020 [during Covid-19], but it never returns to 2019 levels in the NZE scenario”.⁶ It also stated that we would not need to find more oil and gas to stay on this path, a statement received with glee among some climate activists, even in Norway where this crowd doesn’t seem to be aware of what it is that supports their home country’s high standard of living. It took one year for this wishful thinking to be put to shame: in 2021 the use of fossil fuels had recovered to its 2019 level and has continued to increase from there.

It is one thing to draw up scenarios that lead to some given goal, but quite another to believe whether they will happen. Yet it appears that the IEA harbors some unrealistic beliefs about the possibility of achieving the goal of net zero:

“... the world economy in 2030 is some 40% larger than today but uses 7% less energy”.⁷ Really? With more people in the world and greater world production? By comparison, from 2000 to 2024 the world’s use of energy increased by 1.8 percent per year on average. What is going to be so radically different during the next fifteen years?

4. What is happening to the CO₂ emissions?

Despite all pledges to the contrary, emissions of CO₂ are increasing year by year, as shown in Figure 1. The figure shows emissions from energy production only, but these are the overwhelming part (85-90%) of all man-made emissions. The exceptions are few and easily identified with

⁴ IEA (2020): Net Zero by 2050, p. 14.

⁵ IEA (2021): The Role of Critical Minerals in Clean Energy Transition, p. 9.

⁶ IEA (2020): Net Zero by 2050, p. 60.

⁷ IEA (2020): Net Zero by 2050, p. 14.

economic troubles most people would rather be without, like Covid-19 in 2020, the financial crisis in 2008, the Arab oil embargo in 1974, and the second oil crisis in 1979-80. Otherwise, when things are going well in the world economy the CO₂ emissions increase. Nobody should be surprised; fossil fuels still account for over 80 percent of our primary energy, with solar and wind producing less than 3 percent. The necessary change in energy infrastructure to substantially reduce the dependence on fossil fuels is going to be costly and time-consuming. Even the time horizon out to 2050 will likely turn out to be short in that context.

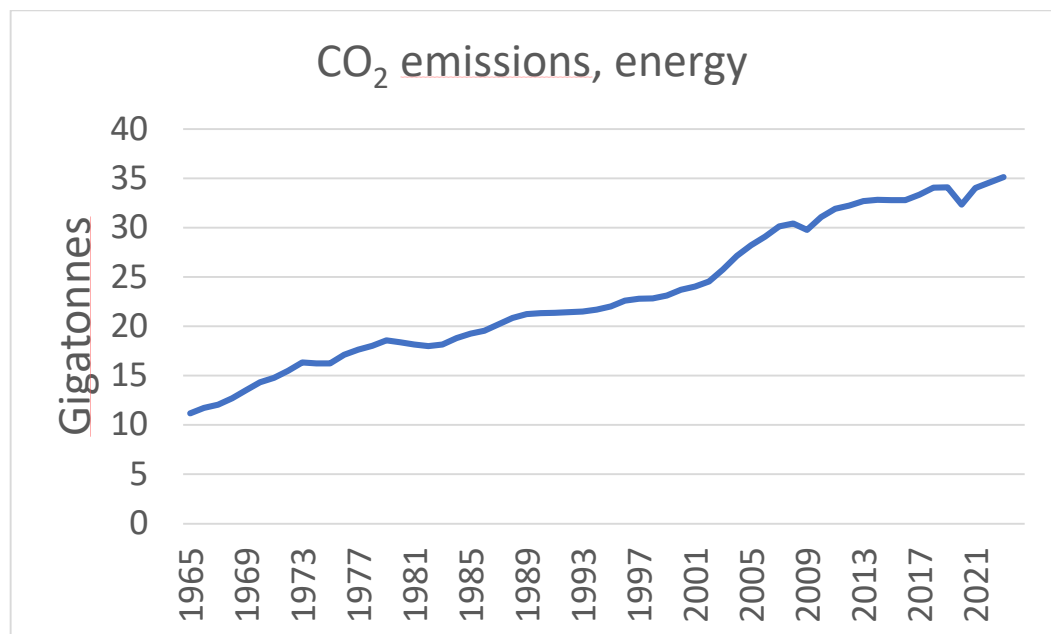


Figure 1: Emissions of CO₂ from energy production 1965 – 2024.

But emissions have not increased uniformly everywhere, and it is of interest to see where they increase most. Figure 2 shows the energy-related emissions in rich (OECD) versus developing (non-OECD) countries in 1997 versus 2024. 1997 was the year the Kyoto Protocol took effect. According to this, countries were supposed to reduce their emission levels by 5 percent relative to 1990. We see that the rich countries did reduce their emission levels substantially, but this was more than made up by what happened in the developing countries, so total emissions have increased by 50 percent since 1997. The developing countries were exempt, presumably in recognition of the fact that they were entitled to further economic growth, which is driven by increased use of energy, and where was that going to come from if not from fossil fuels? Some also hoped that the rich countries would set an example for the poorer ones to follow, but there has apparently been little of that. A part of the complete picture is that the rich countries are not quite as virtuous as they seem, because they have outsourced much of the production of energy-intensive goods they use (steel, for example) to developing countries. CO₂ emissions are accounted for in the countries where goods are produced and not in the countries where they are finally used.

Table 2 shows the ten countries where emissions increased most in the period 2014 – 2024. It also shows the GDP per capita in these countries and compares it to the GDP in the United States. These countries are, with the exception of Saudi Arabia, either poor or medium rich. We can safely conclude that the highest priority in these countries is to catch up with the rich countries of the world, and for doing so they need economic growth and what fuels it—energy. Where is the energy going to come from? We can safely conclude that climate concerns and cuts in the use of fossil fuels do not rank high on the list of priorities of these countries. As a further sobering

thought; 45 percent of humanity lives in just six countries in south and east Asia, four of which we find in Table 2.

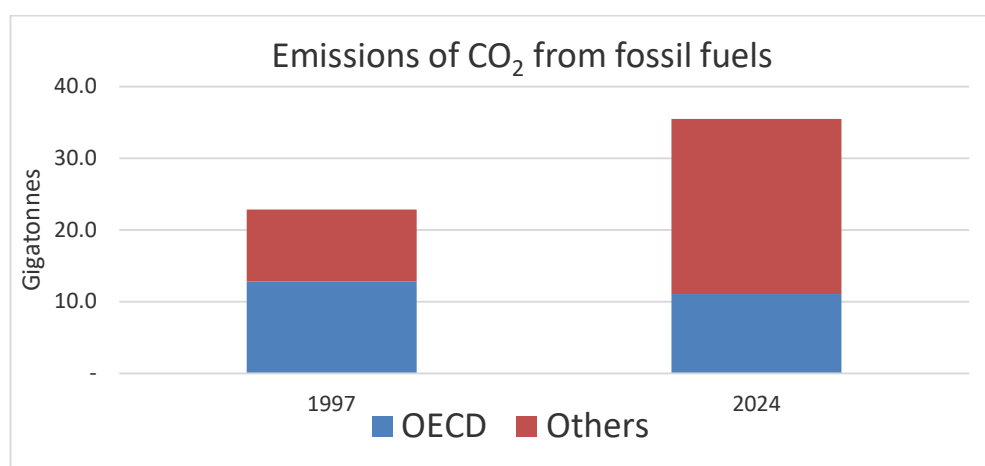


Figure 2: Energy-related emissions of CO₂ in OECD versus non-OECD countries 1997 and 2004.

It is in these countries that the future development of CO₂ emissions will be decided and not in countries like Norway whose less than one promille of world emissions pales into insignificance. Not even the European Union with its 7 percent share of world emissions will achieve a great deal by further cuts. The climate problem, to the extent it is a problem, is a world problem that needs actions on a world scale.

Table 2. Increase in energy-related CO₂ emissions in million tonnes 2014 – 2024.

	Increase in emissions	GDP per capita, ppp	% of US
China	1937.3	27104	31
India	906.5	11159	13
Indonesia	298.3	16448	19
Vietnam	184.0	16386	19
Iran	156.8	18442	21
Russia	129.6	47405	55
Turkey	102.7	43932	51
Saudi Arabia	71.4	71243	83
Iraq	66.9	14464	17
Philippines	66.8	11794	14

5. Europe's green transition

This last remark gets us to the green energy transition that the European countries, including Great Britain, are attempting. Surprisingly, and unfortunately, this is not a transition to nuclear power, a reliable and controllable source of energy that doesn't emit any CO₂, but to wind and solar energy which is entirely subject to the weather and cannot be called upon whenever it might be needed. This type of energy produces only 30-40 percent of the time and not necessarily when we need it. Hence, on windy and sunny days, the owners of these installations are often paid for not producing anything because there is no need for the electricity or even because there are no power lines that can transport the electricity to where it is needed.⁸

⁸ On the growing need to switch off the Scottish offshore wind parks, see David M. Newbery and Daryl R. Biggar: *Energy Policy* 191 (2024) 114206.

We are often told that wind and solar energy is cheap and competitive compared to fossil fuels. This is based on so-called levelized cost of energy, which simply is the cost of the energy divided by the kilowatthours produced. This is gravely misleading. The levelized cost of energy doesn't take into account the backup energy we need when the sun doesn't shine and the wind doesn't blow, nor does it take into account the cost of additional power lines for energy sources that often are far away from where the energy is used. One can find staggering numbers on this in the academic literature. One source reports levelized cost of energy in Germany of 36 US\$ per MWh for solar photovoltaic and 40 US\$ per MWh for wind. After adjusting the cost for availability and need for backup sources we get the staggering figures of 1380 (solar) and 483 (wind).⁹

Germany is probably the country which has gone furthest in its transition to green energy, but the issue is confounded by the fact that at the same time Germany has decommissioned all its nuclear power plants, which provided an alternative source of carbon-free energy. Since 2000 the generative capacity in the German power industry has been doubled while the production of electricity has stagnated. The new solar and wind installations have mainly replaced the nuclear power plants, with no addition to electricity production. This is reported to have cost 500 billion euros, which amounts to the cost of 40 Olkiluoto nuclear power plants.¹⁰ This would have been enough to cover the entire electricity production in Germany. The Olkiluoto plant became notorious for cost overrun and construction delay, but appears as a good bargain compared to the German wind turbines and solar panels.

So what have the Germans achieved, besides abolishing their nuclear power industry? The use of coal has declined by almost a half from 2000-2007 to 2020-2024, but coal is still a major input in the German power industry; when the wind doesn't blow or the sun doesn't shine the coal power plants are turned on rather than turning the lights off. Over the same period the CO₂ emissions have declined from a little over 800 million tonnes to 600. There is still a far way to go to net zero.

In general, the green transition has turned out to be costly. Figure 3 shows the price of electricity for households 2020 – 2022 versus the share of solar and wind in the production of energy. The positive correlation is obvious. The academic journals are full of papers discussing the decline of wholesale prices, which can even fall below zero when the wind is blowing optimally and the sun is shining from a clear sky, but their fixed costs have to be paid and so does the back-up energy when solar and wind energy is not available. Somehow, unsurprisingly, these costs find their way into the energy bills of households.

6. Norway's climate policy

The Kyoto Protocol stipulated that industrialized countries should by 2012 have cut their CO₂ emissions by 5 percent relative to the 1990 level. Instead, Norway's emissions were almost 30 percent higher. That was perhaps just as well; the increase in emissions was to a large extent due to more petroleum production, and without that there would have been no petroleum fund nor other goodies that came as a result of the formidable income of the petroleum industry. Since 2015 Norwegian emissions have begun to fall and were 15.5 percent lower in 2024, a decline of 0.73 million tonnes per year.

In the spring of 2025 the Norwegian parliament amended the climate law and stipulated that emissions of CO₂ should have fallen by 70 percent by 2035. This is a decline from 38.9 million tonnes in 2024 to 11.7 in 2035, or 2.5 million tonnes per year, more than three times the annual decline in the period 2015 – 2024.

⁹ Robert Idel, *Energy* 259 (2022) 124905.

¹⁰ Tim Gregory (2025): *Going Nuclear*. Penguin (UK) and Pegasus Books (US).

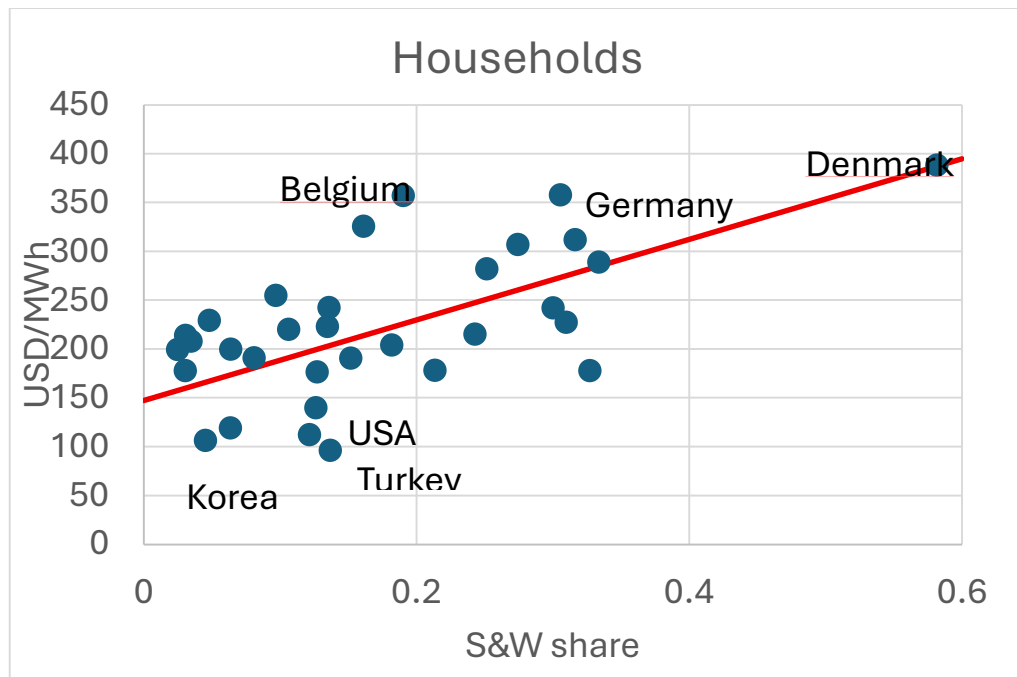


Figure 3: Price of electricity for households versus share of solar and wind in energy production in OECD countries 2020 – 2022.

What kind of miracle medicine will the Norwegian authorities put into use? Maybe more of the same, so what did they do in the period 2015 – 2024? Mainly three things:

- Replacement of gas and diesel cars by battery driven cars
- Replacement of gas turbines by electricity on the petroleum platforms
- Emission quota trading with other countries

About 30 percent of Norwegian cars were battery-driven in 2024, so there is still some way to go with this policy. Battery driven cars make more sense in Norway than in many other places, because they can be charged with electricity from hydropower. Even so, the success of this policy tells us more about the outrageous price level for cars in Norway before the battery driven vehicles came on the scene. In most countries the high cost and inconveniences of these cars have been a major obstacle to their adoption. In Norway the transition to battery driven cars was facilitated by abolishing taxes and fees on these vehicles, which blew a large hole in the government's finances. There are attempts under way to accomplish a similar transition for trucks and heavy duty machinery, but the cost and inconvenience increases as the machines get bigger and more power-demanding.

Replacement of offshore gas with electricity, usually from shore, is among the worst climate policies one can find. The gas saved due to electrification is exported, which provides a zero effect for emissions, or worse, because building the power lines and other facilities requires heavy duty machinery that runs on diesel. The cost is not negligible, and the electricity is diverted from other and better use. But there are still gas-driven platforms waiting to be electrified, and the oil companies love it because they save the CO₂ fees and quota costs. The politicians also love it because the electrification reduces the emissions in Norway, even if they increase the emissions just as much elsewhere.

Some of the reduction in Norwegian emissions have been accomplished by buying emission quotas from other countries, developing countries among them. Some of them are among the most

corrupt countries in the world; here we find, for example, both of the republics of Congo. What typically happens is that these countries undertake to plant trees or to reduce their deforestation. There is good reason to wish the Norwegian authorities good luck with the monitoring of this process; do the countries live up to what they say they will do? Furthermore, a new government may reverse the process; deforestation can be resumed quickly. This is what happened when Bolsonaro became president of Brazil.

7. Conclusion

It all boils down to this: Do the benefits of climate policy justify the costs? There are many studies that have tried to answer this question, and they come to different conclusions, which just illustrates how uncertain the benefits are. The climate economist Richard Tol has recently summarized many of these studies.¹¹ The general conclusions are that the costs are probably greater than the gains, with the gains being highly uncertain, but the costs much less so. Furthermore, there are very large variations between different studies. It all boils down to this simple thing: The costs occur immediately or in any case soon and are relatively easy to predict, while the benefits are uncertain and occur in the future, sometimes in the very distant future.

The uncertainties are many and formidable and sometimes we cannot even be sure of their sign. There is a chain of cause and effects we must go through to evaluate whether or not climate policy makes sense:

1. Is global warming happening? Yes, certainly, but it may well be exaggerated because of the heat island effect and problems with aggregating temperatures from various parts of the planet.
2. Is it caused by increased concentration of CO₂? Possibly; CO₂ is a greenhouse gas, but how potent is it? It is recognized, also by the IPCC, that every additional molecule of this substance has lesser and lesser effect. IPCC finds that the climate sensitivity of CO₂ is somewhere between 2.5 and 4, a wide gap it would seem. It presumably makes considerable difference whether the global temperature increases 2.5 times or 4 times for doubling the CO₂ concentration in the atmosphere. And the natural forces that have affected the climate in the past have hardly gone on vacation. The causes of this natural variability are still poorly understood.
3. Is the observed higher concentration of CO₂ caused by human emissions? Probably, but there are other forces at work. Fluctuations in sea surface temperature are closely correlated with changes in CO₂ concentration in the atmosphere. The trend in the concentration of CO₂ in the atmosphere can be explained by human emissions while the year to year variations appear to be related to variations in sea surface temperature.
4. Are the effects of global warming negative or positive? The little warming that we have had in the northern countries since the Little Ice Age has in my view been for the better. Can we say much more than that the global effects are highly uncertain and will probably vary from place to place? In some places they might be positive, in other places negative. For one thing, global warming has had no negative effect whatsoever on food production, and even the IPCC admits that a higher concentration of CO₂ in the atmosphere has given us a greener planet. If anything, this should be good for food production.

¹¹ Richard Tol: Costs and benefits of the Paris climate targets. *Climate Change Economics* 14(4), 2023, special issue on net zero 2050.

So, to conclude, is it really a good idea to destroy our reliable and cheap energy system for the sake of uncertain effects on the climate, effects that could be beneficial rather than bad?

USA EPA Repeal of GHG Endangerment Act/GHG Rules

Forrest Frantz

Climate Intel, USA

Abstract

Outlines the plan to end Climate Lysenkoism globally through legal action.

Keywords: Climate Lysenkoism, FRE 702, highest authority, official climate records.

<https://doi.org/1053234/scc202511/04>

1. Introduction

U.S. EPA set a trap for Climate Lysenkoists to sue the EPA for repealing GHG findings and regulations, which will result in ending Climate Lysenkoism globally.

2. Net Zero

In the U.S. FRE 702 requires findings of fact to qualify per the standards set by the scientific method. Two theories will be tested: UN Climate theory and NASA Biospheric theory. It will be shown that 1000+ tests were conducted of theory predictions. UN Climate theory only passed tests in desert and short growing season (snow/frost) biospheres. In the rest of the biospheres, including the global case. UN Climate theory consistently had the wrong sign. NASA Biospheric theory predictions were correctly evidenced by all the tests.

2.1 Net Zero is the Historic Cause of Catastrophic Heating

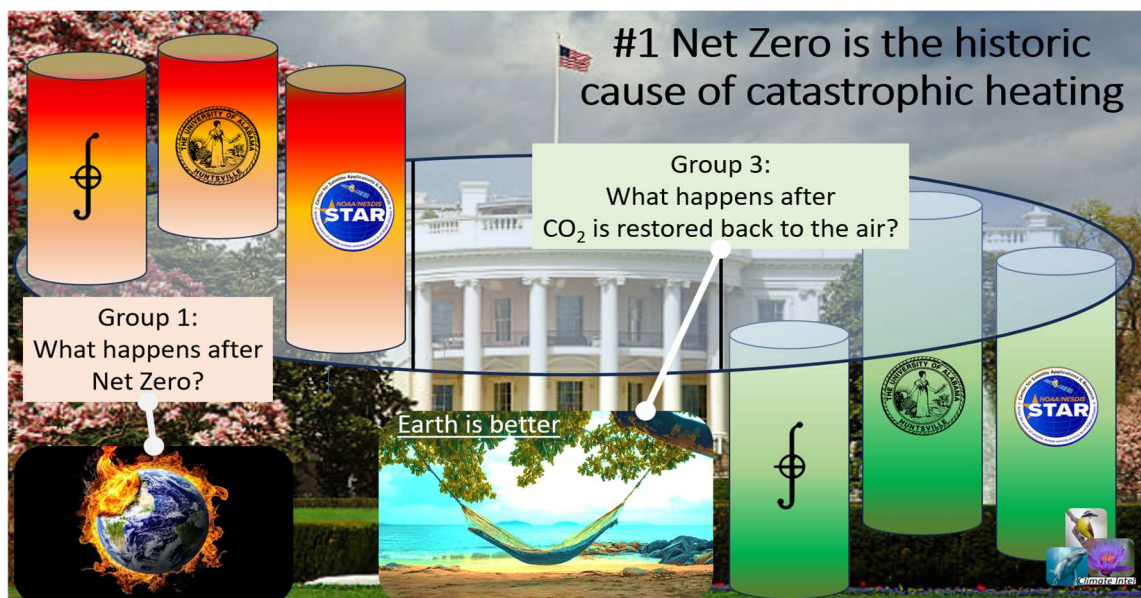


Figure 1: Ordinal analysis using satellite global Earth temperatures and NOAA Global CO₂. proves that UN Climate theory got the sign wrong on CO₂ – a common problem in physics and chemistry.

2.2 Net Zero is the Historic Cause of Temperature Instability

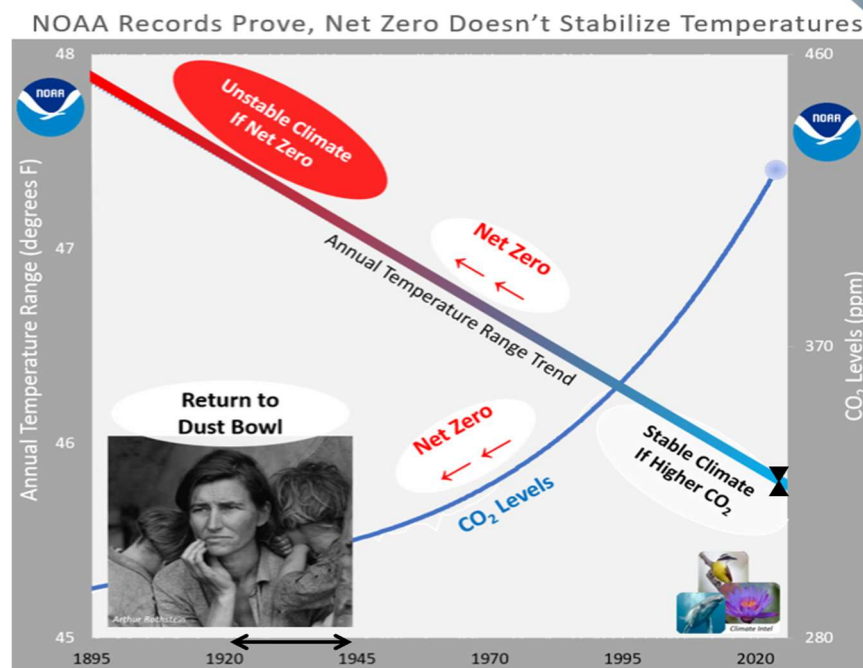


Figure 2: Net Zero suppresses the nighttime warming and daytime cooling effects of CO₂ – returning the global biosphere back to higher daily highs and freezing nightly colds.

2.3 Net Zero is the Historic Cause of Precipitation Instability

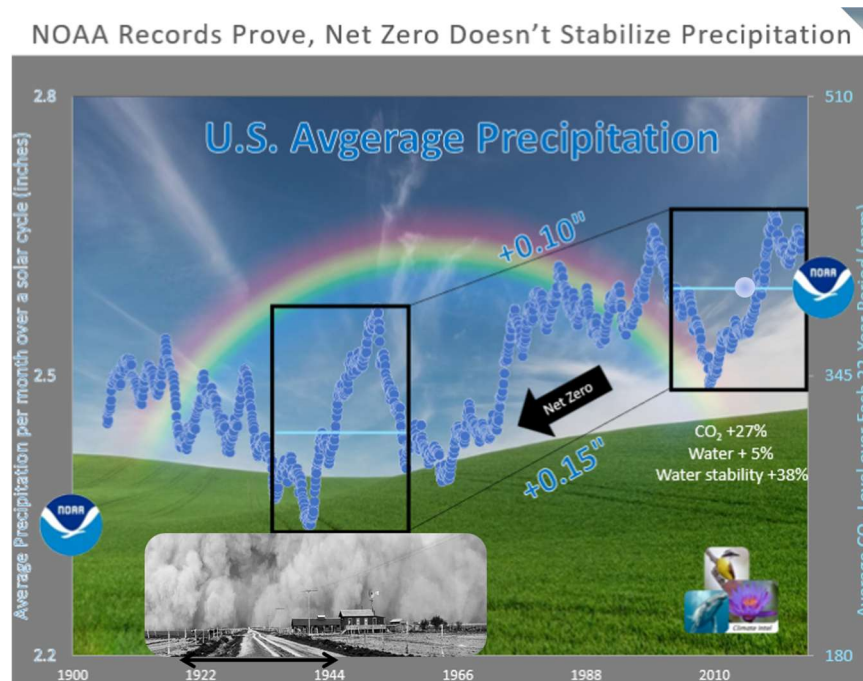
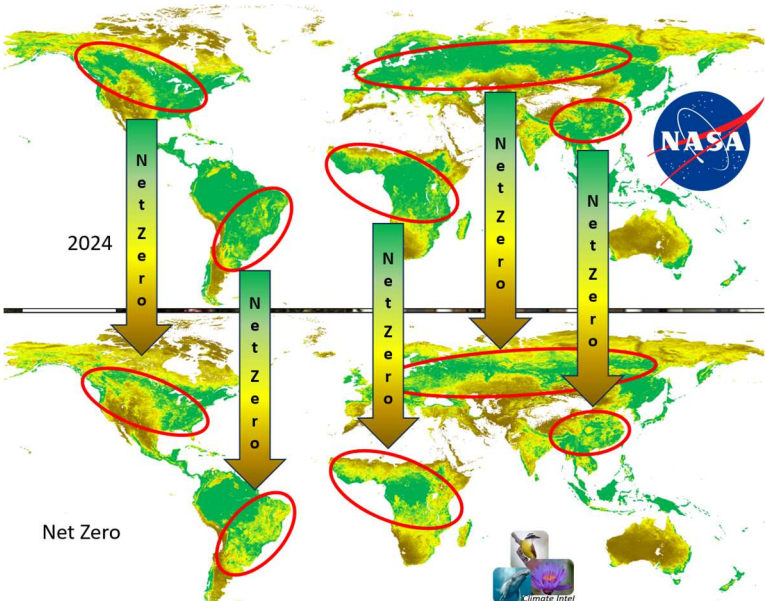
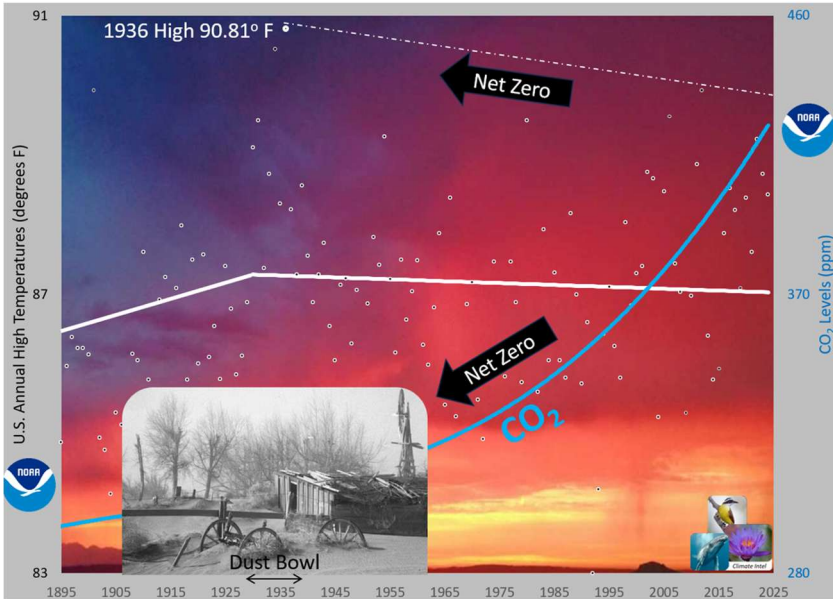


Figure 3: Net Zero suppresses daytime cooling effects of CO₂. This allows the air to hold (not give up) moisture – returning the global biosphere back to lower precipitation and more frequent drought.



2.6 Net Zero Promotes Energy That Kills Biospheres

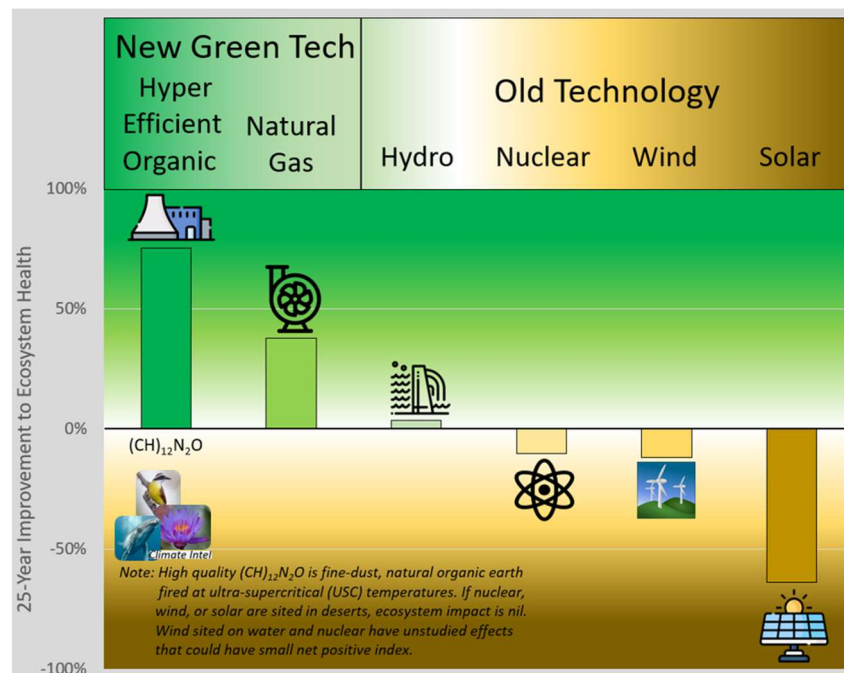


Figure 6: NASA-NEO satellite images are used to track the health of ecosystems before and decades after the operation of powerplants. This chart shows the average change in health of surrounding ecosystems. On a green index, Hyper Efficient Organic is green (improves regional ecosystem health) while Solar is brown (kills local ecosystems).

Funding

No direct or indirect government industry funding – required by Climate Intel to maintain the status of an independent and unbiased science organization that tests theory.

Acknowledgements

Thanks to Klimarealistene of Norway and Climate Realists of British Columbia for continued interest, review, and feedback.

The Norwegian Climate Journalism – Lack of Knowledge or Activism?

Ole Østlid

Editor verstat.no

Abstract

This article describes three cases of malpractice of climate journalism by Norwegian media. The first case shows how temperature statistics for Svalbard was presented with several flaws and which created a false impression of a “hockey-stick” development. The second case shows how landslide statistics has been misused to create an impression of a dramatic increase, not supported by the underlying data. The third case shows how a journalist uncritically published a false claim by a climate scientist, and how the article still contains incorrect information.

Keywords: Climate journalism; Svalbard; landslide; Arctic Sea ice; Media bias

<https://doi.org/10.53234/scc202511/05>

1. Introduction

This article is a summary of a presentation held at *The Climate Knowledge Crisis* conference, held in Gardermoen Norway 30th and 31th August 2025.

Verstat.no is a website publishing climate related statistics, in-depth articles and critical review of media coverage of such statistics. Since its inception in 2020, verstat.no has published 135 critical articles which document weaknesses and malpractices in the media when covering climate statistics. This article describes three documented cases of malpractices in Norwegian climate journalism previously published on verstat.no.

2. Three cases of malpractice

2.1 NRK on Svalbard temperature statistics – the accidental “hockey-stick” graph

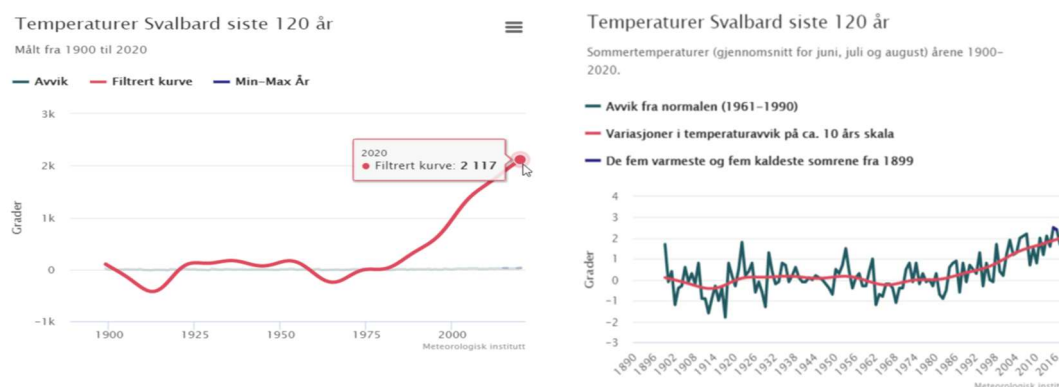


Figure 1: The original version of Svalbard summer temperature statistics presented by NRK (left), third attempt of corrected graph after questions from verstat.no (right)

On 5th September 2020, the Norwegian public broadcaster NRK published an article about the abnormal summer temperatures in Svalbard that year (NRK, 2020). The article presented long-term summer temperatures based on the reconstructed temperature series for Svalbard airport. The original chart is shown to the left in Figure 1. This chart was erroneous and presented filtered temperature values in thousands of degrees Celsius. When not showing the yearly unfiltered values, the chart creates a “hockey-stick” impression. After correction, shown to the right in Figure 1, the development is significantly more nuanced.

In verstat.no the same underlying data has been published (Østlid, 2025), see Figure 2. By showing both winter and summer mean temperatures in the same chart, we see an important fact; the summer temperatures are relatively stable from 1899 to 2000 and have since shown a modest increase in comparison to winter temperatures. It is the winter temperature development that has contributed mostly to the increased yearly mean temperatures in Svalbard from the 1970’s until today.

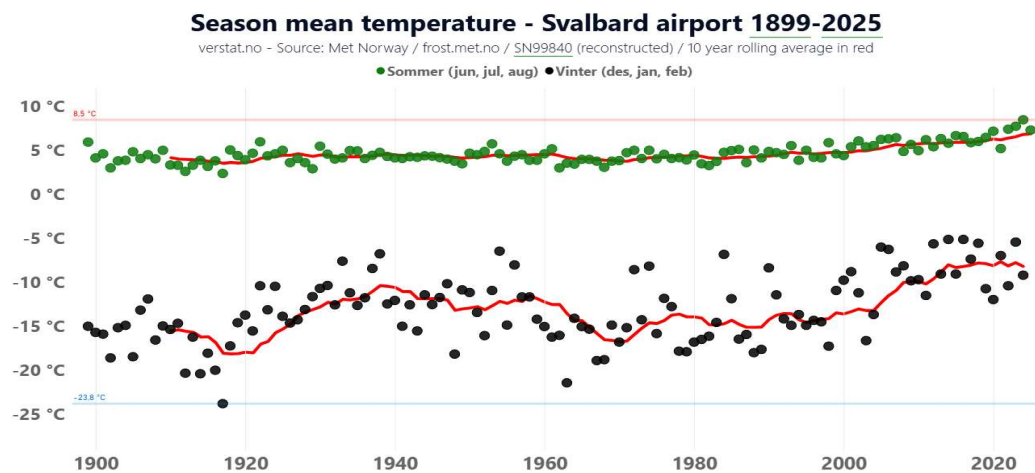


Figure 2: Seasonal mean temperatures for summer months (green) and winter months (black) for the reconstructed temperature statistics for Svalbard airport. Ten-year rolling mean in red solid line.

When showing all the underlying daily mean data unfiltered in one chart (see Figure 3), we get an impression of the Svalbard climate. The daily mean has a large daily variation in the winter, while the summer variation is significantly lower.

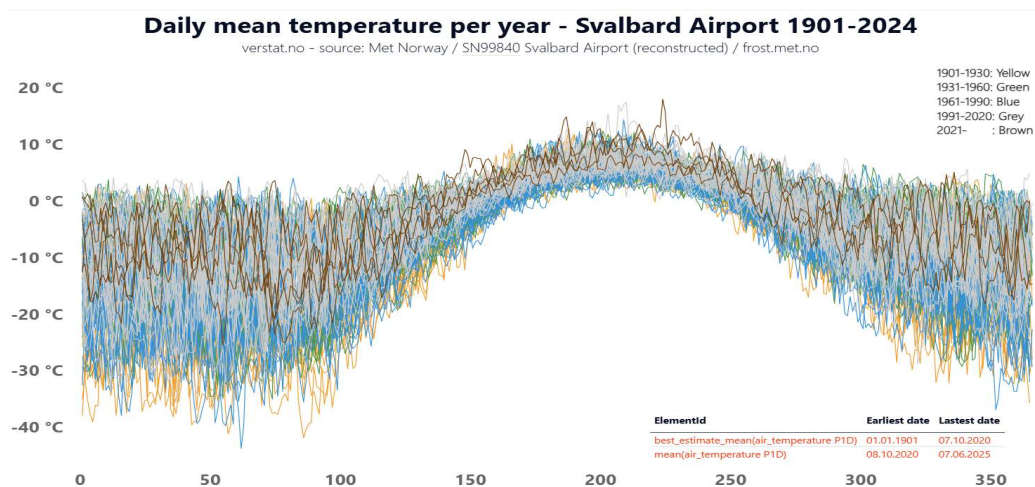


Figure 3: Daily mean temperatures per year for Svalbard airport. 1901-1930 in yellow, 1931-1960 in green, 1961-1990 in blue, 1991-2020 in grey, and 2021- in brown

2.2 NRK on landslide statistics – journalists withholding information

In the evening news on NRK on 5th August 2023 (NRK, 2023) there was a report on the increased insurance claims related to landslides in Norway and its claimed links to increased frequencies of landslides.



Figure 4: Screenshots of news report from NRK 5th August 2023. Chart showing average yearly insurance claims from landslides from 1980s to 2020s, and reporter claiming that the cause is more frequent and more powerful cloudburst rainfall (left). Chart showing registered soil- and flood landslides 1980-2022, subtitle show that NRK erroneously claim that the chart is showing development in actual number such landslides (right).

In this report, as shown in figure 4, NRK made conclusions on the cause of the substantial increase in number of insurance claims related to landslides, and linked the increase to a similar increase in registered number of soil- and flood landslides (water-triggered landslides). NRK claimed that the cause is due to more frequent and more powerful cloudburst rainfall.

The acting section manager Odd Arne Jensen from the Norwegian Water Resources and Energy Directorate (NVE), made oral statements in the news report that some of the 14-times increase in soil- and flood landslides is also due to better registration. But he believes that the increase we now see is due to climate change.

To verify the claims made by NVE, I asked for the total landslide statistics from NVE. The total statistics has been published on the verstat.no website (Østlid, 2023a):

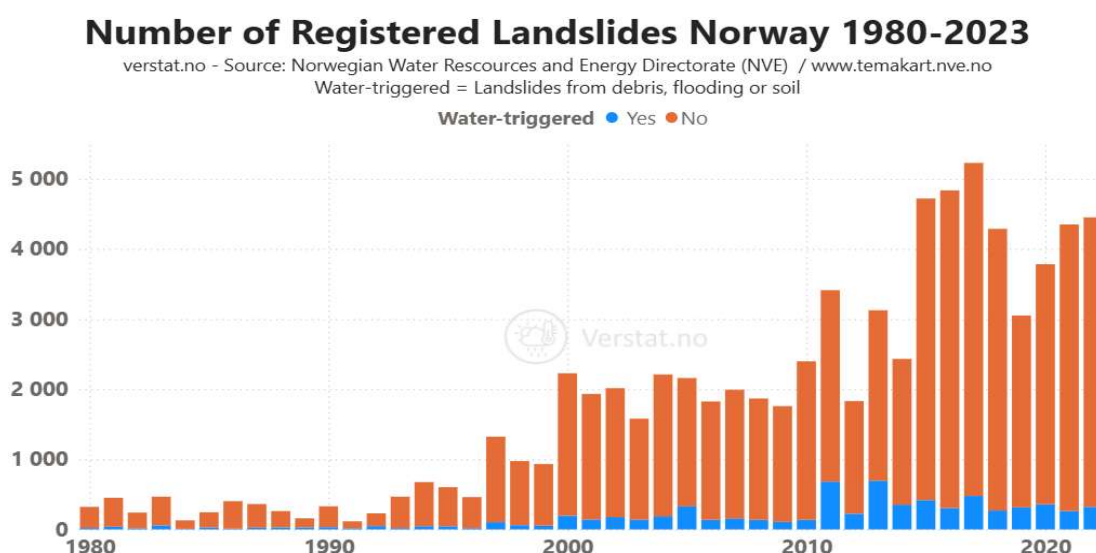


Figure 5: Norway landslide statistics by Norwegian Water Resources and Energy Directorate (NVE), visualised and published by verstat.no. Data in blue (water triggered landslides) is similar to data presented by NRK (see figure 4, right).

The total statistics, as shown in Figure 5, shows that non-water-triggered landslides are by far the most frequent type of landslides registered in Norway (in orange). Both water-triggered (blue) and non-water-triggered show similar significant increase from 1980s to 2020s.

This important context was not mentioned by NRK in the news report.

To identify what information NRK possessed when making this report, I used the Freedom of Information Act to request to all NVE communication between NRK and NVE related to this news report.

The first reply from NVE to NRK about this statistic clearly shows that NRK was given this information alongside the total statistics. Excerpt from internal NVE email (Østlid, 2023b) from a senior engineer forwarded to the NRK journalist (translated to English):

“It's worth noting that one cannot simply say that these numbers reflect a real development in the number of landslide events, since the focus on registering such events has increased considerably in recent years. However, one might see that the proportion of water-triggered landslides has gone up in comparison with other types of landslides.”

The NRK journalist replied to this answer by pointing to the insurance claim statistics and the similar trend in the soil- and flood landslide statistics from NVE and asking for a comment on the development and causes. NVE replied to these questions with the oral statements from Jensen.

The news report ends with a dialogue between a NRK journalist and the Norwegian Climate and Environment minister.



Figure 6: Dialogue between NRK journalist (right) and Norwegian Climate and Environment minister Espen Barth Eide (left). News report NRK 5th August 2023 landslide related insurance claims and soil- and flood landslide statistics.

In this dialogue the NRK journalist claims: “We must cut emissions, but it going to slowly. This is the reality now”. The minister replies that what NRK have shown has been expected and he states that such landslides are getting more frequent.

2.3 NRK on Arctic Sea ice – took claim at face value, and uncorrected error

On 25th December 2022 NRK published an article about the Arctic Report Card for 2022 by National Oceanic and Atmospheric Administration (NOAA). The article linked to a summary page for the report and listed some of its main findings. NRK claimed that one of the findings was that “the sea ice is becoming increasingly thinner.”

I examined this claim and did not find any evidence in the summary of the report of such a finding.

Figure 5 in the Arctic report card report on sea ice shows a stable development in the sea ice volume in the arctic (NOAA 2022a):

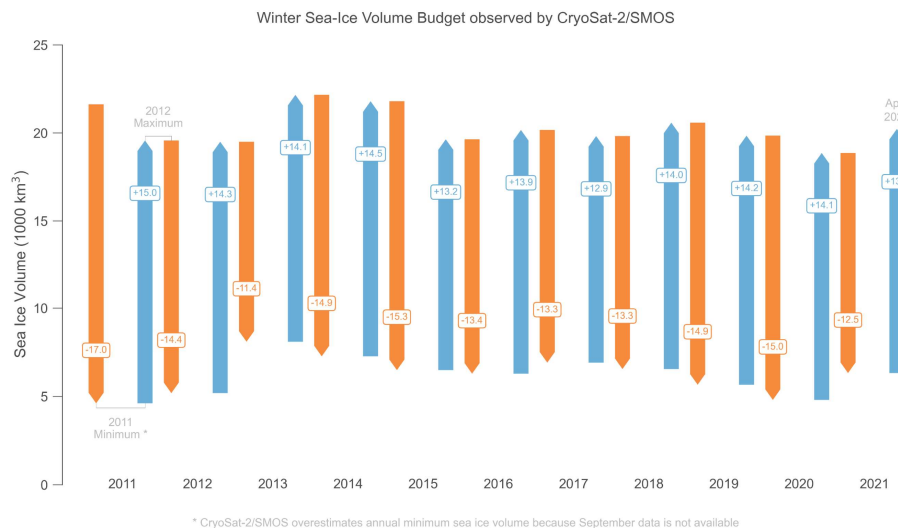


Figure 7: Fig. 5 Annual Sea ice volume loss (orange) and gain (blue) between annual maximum and minimum from CryoSat2/SMOS (satellite data). Data show stable development from 2011 to 2022.

After asking the NRK journalist about the discrepancy between the report and NRKs claim about the report's findings, I received the following reply (translated):

“The general trend is still that there is less sea ice when looking at a longer time perspective. Sorry if this wasn't explained clearly enough. Maybe we should include something about what you wrote regarding the stable ice thickness over the past ten years — I've spoken with several researchers about this, and one of them told me that the sea ice has been getting thinner and thinner. I took that at face value. Maybe that needs to be corrected!”

The NRK journalist admitted to taking a researcher's claim about the sea ice volume development at face value without checking the claim with the report findings.

After this exchange, NRK changed the article (NRK 2022):

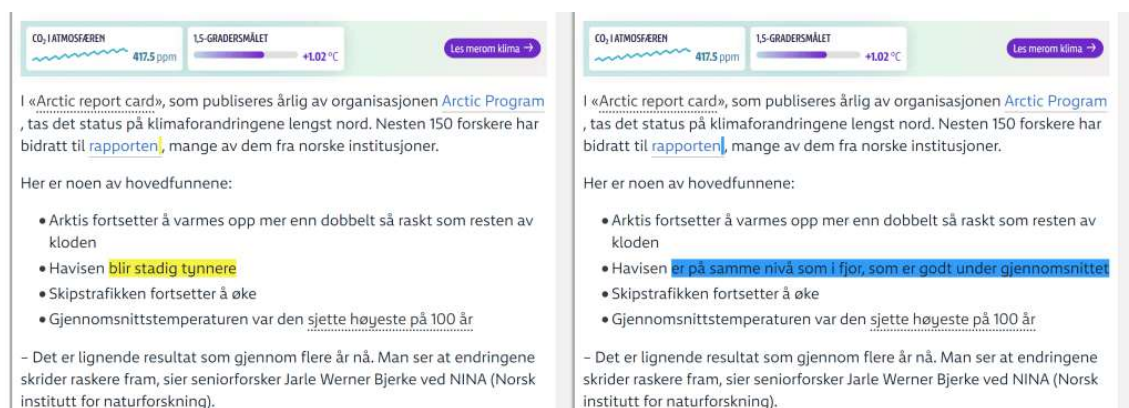


Figure 8: Internet Archive comparison between original article published 25th December 2022 (left) and change made 26th December 2022 (right). Original text in yellow and changed text in blue.

The corrected article now says, “The sea ice is at the same level as last year, but well below average,” in line with the Arctic Report Card 2022 summary (NOAAb).

In addition to the incorrect statement of the sea ice volume development, the article also claims that the “North pole could be ice free as soon as 2040”. The claim is backed up by a link to another

NRK article about research related to Barents Sea (NRK 2018), not relevant to the claim. NRK was notified about this mistake but failed to make a correction. The article still contains this statement with an unsupported source.

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Climate change is a hoax - A cloud thermostat stably controls the Earth's climate, not greenhouse gasses. There is no climate crisis!

John F. Clauser

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Keywords: Climate change; Earth's power balance; greenhouse gases, cloud thermostat
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Abstract

The International Panel on Climate Change (IPCC) along with its various collaborators and contributors forecast an impending climate crisis with catastrophic consequences for the Earth's population. The crisis is claimed to be due to an impending increase in the frequency of extreme weather events and other bad natural phenomena. This paper shows that their claims amount to a pseudoscientific hoax. I show that they have made a series of serious quantitative mistakes and have fudged and fabricated much of the observational data used in their assessments of the Earth's global power balance and climate feedback. They have also ignored important contradictory evidence to their conclusions. Most important among these is an important work by King *et al.* (2013), which showed that clouds have very different distributions and properties over land versus over the ocean. This fact is particularly important because oceans cover 71 % of the Earth, and their dynamics and high sunlight reflectivity (albedo) are shown herein to dominate the Earth's weather and climate.

I expose many of their mistakes and fudges and show that the IPCC's actual observational data are fully consistent with zero long-term climate change and zero increase in the frequency of extreme weather events. I show here that as a result of their mistakes, data fudges, and obsessive focus on the comparatively negligible effects of atmospheric CO₂, the IPCC *et al.* have misidentified the dominant process that actually controls the Earth's climate.

Herein I show that clouds are overwhelmingly more important than is atmospheric CO₂ buildup in determining the Earth's power balance and climate stability. Indeed, cloud-cover fraction variation dominantly determines the Earth's power balance and climate stability. I introduce and quantify the cloud-thermostat feedback mechanism, compare it with previously identified a climate feedback mechanisms, and show that it is clearly the overwhelmingly dominant mechanism. Its strength assures a stable long-term climate.



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How Courts support Climate Activism and Politicization of Science

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Keywords: Climate litigation; Climate activism; Our Children's Trust; Climate Judiciary Project; Greenpeace; Held vs Montana; Greenpeace og Natur og Ungdom vs Norway.

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1. Introduction

We are currently in what could rightly be called a “climate war”, that started with UN, IPCC and various NGOs, unanimously supported by all mainstream media in the western world. Climate litigation is now a fast-growing industry driven by specialized law firms and – Yes, NGOs. But UN and IPCC are the primary drivers. On 30 June 1989, a senior environment officer from UN said “entire nations could be wiped off the face of the Earth by rising sea levels if the global warming trend is not reversed by the year 2000”¹². The UN message has become ever stronger, we have now a climate emergency, and the public discourse is characterized by activism, censorship and sometimes even lies. UN secretary General António Guterres said on 27 July 2023 that “The era of global boiling has now arrived”, which is a bit stronger than his previous statement that “Humanity is on a highway to climate hell”, as the introductory message to the COP 27 summit. We can safely say that what Mr. Guterres says, is wrong.

Melissa Fleming, the UN Communications Official, touts Google search partnership with “We own the science”. And sceptic posts are regularly censored on many web platforms, after agreements with the UN or various authorities. An example of deep censorship emerging in UK is reported in TKP, the German blog for science and politics, which wrote on 30 July 2025 about the new censorship regime in UK. A completely harmless article about CO₂ and plants is no longer shown to Britons without restrictions. The statement, on platform X, was: “CO₂ is good for plants”¹³. Because this single statement conflicts with prevailing “climate policy,” it is only shown to adults whose age has been officially confirmed.

2. The status of climate litigation

A very good overview is given by the UN Environment Programme, in its Global Climate Litigation Report, “2023 Status Review”. The report shows that activists and NGOs go to courts to combat climate change. As of December 2022, the report shows the current status as being 2180 climate cases in 65 jurisdictions. Children, youths, woman groups, local communities and indigenous people go to court. This report is an essential tool for everyone that will understand current litigation practice.

¹² apnews-1989-06-29-united-nations-predicts-disaster-if-global-warming-not-checked-1.pdf

¹³ <https://tkp.at/2025/07/30/englands-zensiertes-internet-ein-beispiel/>

Another overview is given by Norton Rose Fulbright, in its “Climate change litigation update”. As of July 2025, the total number of climate change cases filed globally has reached 3099, showing a strong upwards trend.

A global map shows the location of some climate cases as of July 2023: USA 1986, United Kingdom 133, Germany 67, Australia 161, China 4 and Russia only 1.

Key trends include the acceleration in magnitude and geographical reach, rise of "climate-washing" lawsuits, increasing "polluter pays" cases holding corporations accountable, and "corporate framework" cases pushing for climate-aligned policies. And we now have some landmark judgments which – sometimes even in the case of loss – have shifted norms and expectations with regard to state obligations, “polluter” accountability for future emissions as well as liability for past emissions, shareholder behaviour and much more.

On July 23, 2025, the International Court of Justice ruled on countries’ duty to curb climate change. What may not be commonly known, is that a group of law students from low-lying Vanuatu island in the Pacific Ocean came up with the idea in 2019. This top UN court says that treaties compel wealthy nations to curb global warming, and that failing to comply with climate change treaties is a breach of international law.

Now, there are two climate narratives. The consensual one from IPCC and all types of activists, is model-based and where CO₂ is the main driver of temperature and climate change, and where the resulting climate change drives all kinds of severe damages.

The other narrative is based on short-, long- and very long observational series, with a wide range of natural phenomena influencing the climate and where there is no climate emergency.

From the court documents, we see that the court is stuck on the CO₂-driven and consensual narrative:

The court relies on IPCC, which gives the best available science on causes, course and consequences of climate change. The court states that science is uncontroversial and consensual, and that extreme weather events are more frequent and more serious, that natural habitats are destroyed with extension of species, that human life and health is in grave danger and that the consequences lead to immediate existential threats.

The judgement means that countries can sue each other for climate damage compensation, and no later than July 24, the day after the ruling, came the first demands. Margaretha Wewerinke-Singh, a lawyer from nowhere else than just Vanuatu, says that Britain can dodge climate lawsuits if it pays UN. And the Taliban’s top environmental official responded just as quickly, wanting the UN to include Afghanistan in climate talks, claiming that the country is severely affected by climate change, and that extreme weather and water scarcity are having a profound impact on people’s life and the economy.

The judgement was widely prized as being fair, but Bjørn Lomborg from the Copenhagen Consensus Center made some very relevant remarks. “There’s good news for lawyers in a landmark ruling. But not for the climate.” He also said that the Court of Justice’s ruling misreads both science and economics. It exaggerates climate risk and disregards the immense human benefits of fossil fuels, from feeding billions to lifting people out of poverty. And it will trigger costly litigation while doing little to advance real climate solutions¹⁴.

¹⁴ <https://www.washingtonpost.com/opinions/2025/08/19/un-court-climate-ruling-lawsuits-reparations/>

3. When judges become activists

It is now a fact that many judges act like being activists. Torsten Sandström, an emeritus professor from Lunds University in Sweden explains this phenomenon, using the term “activism” to describe cases when judges — rather than simply applying and interpreting laws as they are written — add their own political values or broad interpretations that almost encroach on the realm of the legislature or politics¹⁵. He says that judges shall not engage in politics, but they can be lured into political activism.

We have seen in many climate cases that judges have no real knowledge of the many aspects of climate change and that they rule according to the prevailing consensus narrative. Moreover, there are now organizations which give climate education to lawyers. One of the leading providers is the Environmental Law Institute (ELI) with their Climate Judiciary Project (CJP). ELI presents the project in this way:

As the body of climate litigation grows, judges must consider complex scientific and legal questions, many of which are developing rapidly. To address these issues, the Climate Judiciary Project of the Environmental Law Institute is collaborating with leading national judicial education institutions to meet judges' need for basic familiarity with climate science methods and concepts.

We are developing and disseminating a climate science and law curriculum and are conducting seminars and educational programs, in collaboration with leading climate scientists and legal experts. The goal of our project is to provide neutral, objective information to the judiciary about the science of climate change as it is understood by the expert scientific community and relevant to current and future litigation.

ELI has a track record of delivering highly-respected U.S. and international judicial education programs spanning more than three decades. This program holds true to ELI's course of nonpartisan ship and nonadvocacy, drawing deeply on ELI's commitment to high quality, bias-free content. Our collaborators — among them faculty of leading universities, government and private research institutions, and members of the National Academies of Sciences, Engineering, and Medicine — are likewise known for their impartiality and are at the top of their fields in science and judicial education.

Our shared vision is to make available to federal, state, and local judges the basic science they need to adjudicate the climate litigation over which they preside.

And CJP really has a lot to offer. They have recently launched a resource website that features a rich mix of materials, including their 13-module “Climate Science and Law for Judges” Curriculum, as well as past and upcoming events and information about other “scientifically reliable resources” about climate change.

They have easy-to-understand fact sheets where ‘climate science is fully explained’. And this material is really good in explaining the dominating role of CO₂, and all damages that follow the CO₂ emissions. Another example is their course ‘Climate Litigation 101’, which is very convincing. When lawyers and judges ‘have graduated’ from CJP, they will most likely in court never ever recognize true observation-based climate science and the failure of climate models and attribution methods.

However, there is no doubt that CJP has established a close cooperation with a number of judges, as Anthony Watts writes on his blog on July 18, 2025 under the headline EXPOSED: From

¹⁵ <https://klimatupplysningen.se/sandstrom-nar-domare-blir-aktivister/>

Climategate to Courtroom – How Climate Activists Tip the Scale of Justice¹⁶.

Let's not mince words: What's been unearthed in this Fox News exposé "Unearthed chat sheds light on cozy ties between judges, climate activists, raising ethical concerns" is nothing less than a blueprint for how climate activists have sought to quietly "capture" the American judiciary, in a style remarkably reminiscent of the infamous Climategate affair of 2009, which we first broke here on this very website. If Climategate was the exposure of insular groupthink, manipulation, and data gatekeeping in the scientific community, what we're seeing here is the systematic application of those tactics—this time, targeting the judges who ultimately decide climate-related lawsuits.

At the center of this latest scandal is the Climate Judiciary Project (CJP), an initiative launched in 2018 by the Environmental Law Institute (ELI)—itself a left-wing nonprofit flush with activist funding, some of it allegedly traceable to China. CJP's mission? To provide what it calls "authoritative, objective, and trusted education on climate science, the impacts of climate change, and the ways climate science is arising in the law." What this means in practice is quietly coaching judges on the "consensus" climate narrative, prepping them to be more sympathetic to creative activist litigation—then, lo and behold, those very same funders bankroll the lawsuits that land before these freshly-indoctrinated judges.

As Senator Ted Cruz aptly put it: "This is like paying the players to play and paying the umpire to call the shots the way you want".

The article lays out the mechanics: in September 2022, CJP launched a "listserv"—an email group with direct, ongoing communication between CJP leaders and judges nationwide. By July 2024, there were 29 members, including at least five sitting judges. The forum, innocuously called "Judicial Leaders in Climate Science," included private sharing of climate lawsuits, congratulatory messages for activist wins, and guidance for other judges on how to run similar programs in their states.

One Delaware judge even posted a private YouTube link to a presentation giddily predicting climate lawsuits could one day bankrupt the fuel industry, with the explicit warning: "Please do not forward or use without checking with me. I suspect that goes without saying, but the powers that be will be happier that I said it." The closed-door, chummy dynamic is obvious—and telling.

This is nothing more than indoctrination masquerading as education. CJP and its defenders, of course, insist their purpose is purely educational and objective. They claim their curriculum is "fact-based and science-first, grounded in consensus reports and developed with a robust peer review process". But let's be real: what's passed off as neutral "climate education" is heavily slanted to reinforce a specific worldview, presenting worst-case climate scenarios as settled science, and framing any dissent or nuance as heresy. The program even encouraged judges to go through CJP's repackaged "Climate Science 101" and "Climate Litigation 101" courses, and send feedback to help make them even more effective.

There's a distinctly unseemly aspect here: the very people training the judges are often also involved in crafting and arguing the lawsuits that appear before those same judges. The ELI and CJP's "experts" include university professors and lawyers who have filed numerous amicus briefs in climate litigation. The potential for bias isn't just present—it's the entire point.

¹⁶ <https://wattsupwiththat.com/2025/07/18/exposed-from-climategate-to-courtroom-how-climate-activists-tip-the-scales-of-justice/> (Reprinted with permission from the author)

4. Climate litigation specialists – Our Children’s Trust

Successful climate litigation takes well trained and experienced law project groups. A very aggressive one is Our Children’s Trust. Their mission statement is given below:

Our Children’s Trust is a non-profit public interest law firm that provides strategic, campaign-based legal services to youth from diverse backgrounds to secure their legal rights to a safe climate. We work to protect the Earth’s climate system for present and future generations by representing young people in global legal efforts to secure their binding and enforceable legal rights to a healthy atmosphere and stable climate, based on the best available science.

We support our youth clients and amplify their voices before the third branch of government in a highly strategic legal campaign that includes targeted media, education, and public engagement work to support the youths’ legal actions. Our legal work – guided by constitutional, public trust, human rights laws and the laws of nature – aims to ensure systemic and science-based climate recovery planning and remedies at federal, state, and global levels.

OCT says the future of 2 billion children is threatened by climate change, and they exclusively represent children – free of charge – to “protect their right to a stable climate”.

OCT is nearly everywhere, they are involved in legal actions in Australia, Belgium, Canada, Colombia, France, Germany, New Zealand, The Netherlands, Peru, Philippines, South Korea, Ukraine, USA, United Nations and even in Norway:

On Thursday March 10, 2022, Our Children’s Trust submitted a request to intervene in Greenpeace Nordic and Others v. Norway alongside and on behalf of 100 psychiatrists, psychologists, academics, and professional organizations specializing in children’s mental health. These mental health experts, from 12 different countries, seek to provide the court with information about the body of science documenting the mental health crisis children are suffering due to government actions that perpetuate the climate crisis.

5. Held v. Montana

We will first discuss Held v. Montana and then look briefly at the next and very exciting lawsuit that OCT has initiated, Lightiser v. Trump.

Held v. Montana: The case was filed in Montana in 2020 by 16 youths, aged 5 – 22 at that time. The plaintiffs were represented by Our Children’s Trust and the defendant was State of Montana. The plaintiffs argued that Montana’s promotion of fossil fuels and a state law (the limitation in Montana Environmental Policy Act, MEPA) that barred agencies from considering greenhouse gas emissions and climate change when permitting projects violated their constitutional rights. Note that Montana’s constitution is unusual because it explicitly guarantees “the right to a clean and healthful environment”. Well prepared kids, some of them crying, testified in court that that they had already been hit by wildfires, evacuation, extreme temperatures and drought, and then they had a strong fear for losing control and for a lost future.

The judgement on August 14 2023 came out in favour of the youth plaintiffs. The key rulings were.

- Montana’s fossil fuel-friendly policies and MEPA limitation contribute to climate change and harm the plaintiffs.
- The plaintiffs’ constitutional rights to a clean and healthful environment, dignity health and equal protection were violated.
- The MEPA limitation was declared unconstitutional.

Montana filed an appeal to the Montana Supreme Court, arguing that climate change is a global issue and state policies cannot be directly tied to the plaintiffs' injuries. But in December 2024, The Montana Supreme Court affirmed the lower court's ruling in a 6-1 decision.

The plaintiffs had 7 strong expert witnesses, among them Steve Running PhD, retired climate scientist and previous IPCC lead author. He made the case for the plaintiffs.

This contrasts very much with the State's only expert witness on the stand, Terry Anderson, an economist. However, Dr. Judith Curry, a world class climatologist, was hired and submitted an expert report, but she was not called to testify, and moreover, her report was criticized by other expert witnesses, as relying on flawed methods, cherry-picking data, underestimating human contributions to climate change, etc.

Dr. Edwin X Berry, a theoretical physicist, wrote a science-based Amicus Brief to the court, but Montana's legal team never presented it in court and Berry was never called to testify. This is rather strange, because in a previous case, *Barhaugh v. Montana* in 2011, a strong scientific intervention led by Dr. Berry prevented the Montana Supreme court from ruling in favour of the plaintiffs, that is, the Court rejected the *Barhaugh v. Montana* petition. It seems that states no longer for their defence can use any witnesses or scientific arguments that violate the universal consensus.

So basically the defence only argued that Montana's emissions were too small to matter globally, and the court rejected this, stating that every additional ton of greenhouse gases contributes to climate change, and that the state cannot ignore its constitutional duties just because it is one emitter among many.

6. Lightiser v. Trump

The case was filed on May 29, 2025, in the U. S. District Court for the District of Montana. Our Children's Trust says this is youth-powered litigation, where 22 young plaintiffs sue President Donald J. Trump and several federal agencies, challenging Trumps "Unleash Fossil Fuels" Executive orders, which are "Unleashing American Energy", "declaring a National Energy emergency" and "Reinvigorating America's Beautiful Clean Coal Industry". Says OCT, these orders fast-track fossil fuel expansion in the face of a worsening climate crisis, endangering young people's lives. The plaintiffs argue that Trump's executive orders violate their constitutional rights to life and liberty, and unlawfully exceed presidential authority.

The big question is now, why was this case filed in Montana? Everything indicates that this was a strategic choice by the OCT. They are probably running the new trial with the same organization as the previous one, and have good reason to believe that the judges will again rule in the same way.

In *Held vs. Montana*, the State conducted a very poor defence, and it was inevitable that the state lost. We must hope that the Trump administration will select outstanding expert witnesses, there are a number of independent gold standard scientists that could help win the case for Trump.

The preliminary injunction will be on 16 and 17 September 2025.

7. The NGOs enter stage

The NGOs are mostly overzealous activists collaborating with various groups that would never have been able to bring a lawsuit themselves. Greenpeace is one of the central groups, with activities in many parts of the world. We have, however, some inside information on Greenpeace, from co-founder Patrick Moore. He says that they now have anti-scientific attitudes, they are ideologically locked, are hypocritical about climate change, and they are abandoning the original goal and mission.

A typical Greenpeace stunt took place in November 2024, by Equinor CEO Opedal's private garden in Sandnes, Norway, claiming that Opedal is a "pivotal driving force" who destroys the climate. The activists dumped garbage from a Brazil river into Opedal's garden. The case was reported to the police, who arrived, but did not dare to intervene, they just quietly observed. The police weighed the disadvantage for Opedal with the right to free speech, and probably thought that the "great seriousness of the matter" justified this action.

Greenpeace reuses a standardized package solution and is actually a wholesaler when it comes to climate lawsuits. Over the last few years, some of the Greenpeace cases are mentioned below.

- Greenpeace Norden and Natur og Ungdom vs Norway
- Klimaseniorinnen vs Switzerland
- Greenpeace Netherlands and Citizens of Bonair vs The Netherlands
- Greenpeace vs United Kingdom
- Greenpeace vs Spain
- Greenpeace France vs France
- Greenpeace vs State of the Netherlands
- Milieudefensie et al vs Royal Dutch Shell

Next comes a relatively broad discussion of the case on the top of the list, Greenpeace Norden and Natur og Ungdom versus Norway, which is quite well known to this writer, as being a signatory of an Amicus Brief to the court.

Greenpeace wants to stop oil and gas extraction at three Norwegian fields, the Tyrving, Breidablikk and Yggdrasil fields. Greenpeace claims that extraction is illegal because the resulting damages have not been investigated. The total – gross – emissions over 10 – 20 years are only 464 Mt CO₂. And mind you, this is about emissions from burning the fossil fuels in countries buying the fuels from Norway, so the bookkeeping should be done by the buyers. And these products are needed, so if Norway does not deliver, so will other sellers on the global market.

But let us first look at the unequivocal physical consequences of burning this amount of oil and gas. We start by calculating the resulting increase in global temperature using the standard value of the parameter TCRE, where a 1000 Gt CO₂ increase in the atmosphere is supposed to give a temperature increase of 0.45 deg C. Accordingly, the 464 Mt CO₂ results in a temperature increase, over some 10 years of 0.0002 degrees. However, we must take into account the Airborne Fraction which is about 0.5 so only half of the emissions stay in the atmosphere, so the resulting temperature will be only 0.0001 deg C. This again is only 0.00001 degrees per year, a quantity so small it takes 50 000 years to reach 0.5 deg of warming.

We could now safely say that the case is closed, this warming will not harm anything at all on the globe, so the resulting damages have now been investigated and are ZERO.

However, Greenpeace has found expert witnesses who claim to prove the damages are severe and I will comment on statements from two witnesses, the first being Dr. Wim Thiery. He uses attribution methods to "accurately" calculate heat-driven damages.

Dr. Thiery starts out with the resulting temperature increase, 0.0002 (eg 0.0001) degrees. Based on this temperature increase he replies to four questions before the court. Here only Question no 3 is commented: "How many heat-related deaths are expected world-wide until 2100 due to the emissions?" Thiery boldly says 104 645.

Comment #1. In statistical estimation like this, to give numbers with an accuracy to something like 0.001 % is an absolute scientific NO-NO.

Comment #2. No one, with common sense, can believe that a temperature increase of 0.00001 degree per year can cause this number of deaths. Resulting possible heat-related deaths will drown in possible heat-related deaths from all other causes.

Comment #3: There is no mention of the empirical facts that the number of heat-related deaths is declining and that deaths due to cold is some 20 times the deaths due to warmth.

Comment #4: This writer wrote a message to Dr. Ross McKittrick, a very accomplished statistician and asked him to evaluate Dr. Thiery's expert testimony. McKittrick wrote back, "I am sure the methods are seriously flawed, meaningless at best". McKittrick has worked a lot with detection and attribution, and he has proved that the attribution methods used by the IPCC over the last 20 years are failing.

Comment #5 start:

This is from an unbiased and strictly neutral evaluation given by perplexity.ai, of Thiery et al, "Age-dependent extreme event exposure"

No primary source or observed dataset exists that supports the claim that a temperature increase of 0.00001°C per year (0.0001°C total over 10 years) will cause 100,000 child deaths.

Empirical studies on temperature increases and child mortality (e.g., Baker et al., 2020; Parks et al., 2020) demonstrate negative health effects only at temperature changes on the order of 1°C or more, with weight loss and acute mortality risk increasing significantly above thresholds such as 25°C mean annual temperature. Effects at micro-scale increases, such as 0.00001°C/year, are orders of magnitude below measurement uncertainty and do not correspond to documented epidemiological outcomes. No dataset, peer-reviewed study, or health registry documents a relationship between such a small incremental temperature increase and child mortality at the magnitude specified.

Mortality risk is associated with severe weather events, heatwaves, and extreme temperature spikes, as measured and reported by the World Health Organization, national health agencies, and peer-reviewed studies. These agencies note significant uncertainties and emphasize that the observed effects are not linear at the micro-scale and often appear only at high exposures (e.g., mean temperature increases at or above 0.5–1°C) over years or decades, usually with confounding by socioeconomic variables. No published study supports the proposition that a total temperature increase of 0.0001°C drives mass childhood mortality.

Therefore: No direct, empirical evidence exists for the claim that an increase of 0.00001°C per year over 10 years causes 100,000 child deaths.

Comment #5 end.

Another important witness for the plaintiffs is Dr. Helge Drange, professor, associated by the Bjerknes Centre for Climate Research, who has provided an expert testimony. He has been asked 6 questions which he has answered thoroughly over 33 pages plus an appendix.

Drange's presentation is largely based on the IPCC and the usual notion of consensus, and everything seems plausible and probably very convincing to laypersons and likely to the judges. However, many statements are characterized by exaggerations, omissions and even factual errors. It is very easy to refute essential parts of his presentation. First, we look at a central omission. He does not explain the historic observations of the CO₂ concentration, or the reconstructed temperatures after the last ice age, see Figure 1 below. The left panel shows that the CO₂ concentration is the lowest during the last 140 Mio years, and that we are fairly close to the survival threshold for vegetation. If the current CO₂ level is reduced by some 65 %, most life on earth will probably die.

The right panel shows that after the last ice age, the temperature has been higher than today in more than 50 % of the time, and we see warm periods where Scandinavia had now glaciers, and we see cold periods like the Little Ice age,

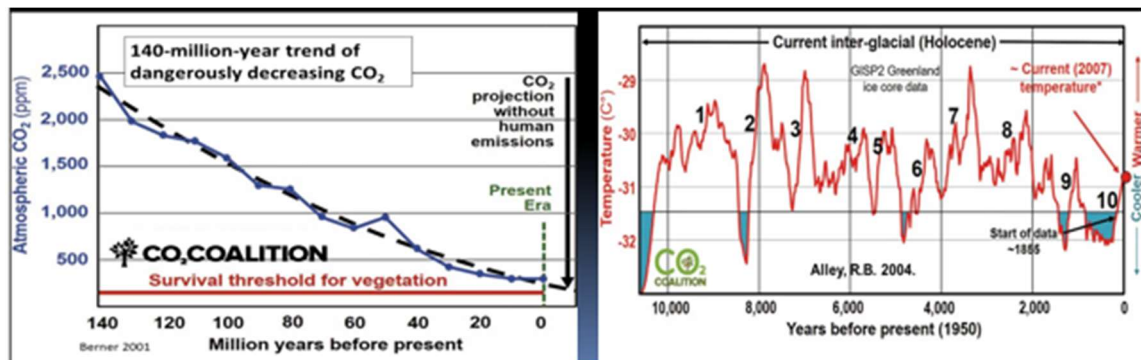


Figure 1. Left, CO₂-concentration over the last 140 million Years. Right, temperatures over the last 11 500 years, showing how natural climate change works, and that we have had higher temperatures than today.

Drange wants to show to the court the massive (CO₂-driven) heating of the earth, by pointing to the accumulated heat content in the oceans. He does not show the average ocean temperature increase, as shown in Figure 2 below (left), but shows instead the heat content counted in exajoules, a frightful number with 23 zeroes. The truth is that the Argo buoy system shows that the temperature has increased only 0.002 deg per year over the last 18 years.

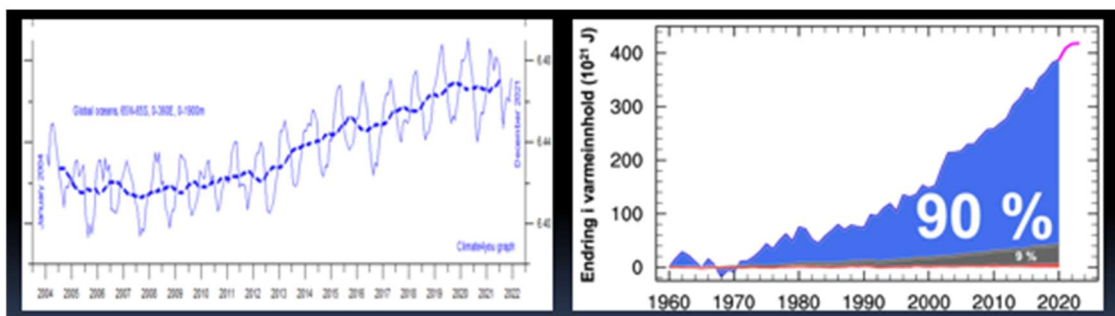


Figure 2. Left, ocean temperatures over the last 18 years as measured by the Argo buoy system. Right, ocean heat uptake since 1960 shown in exajoules.

Moreover, Drange is very careful not to tell the court that the increased ocean heat content is due to shortwave heating from the sun and nothing else. In Drange's context, the heat comes implicitly and only from CO₂. However, back radiated infrared from greenhouse gases to the sea surface only penetrates micrometers below the surface, and leads to evaporation.

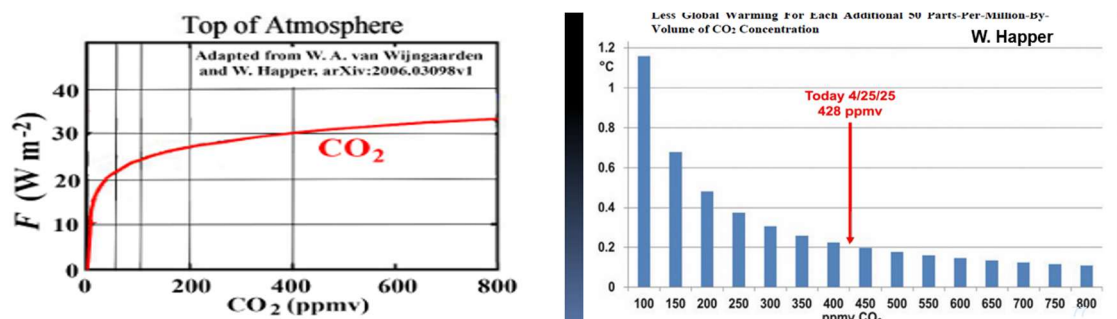


Figure 3. Left: the saturation effect, we see there is a very small increase of radiative forcing, only 3 W/m² for a doubling of the CO₂ concentration. Right: another type of view, showing the ever-smaller contribution from a given quantity of CO₂.

Another ‘important’ statement from Drange is that “Every tonne (of CO₂) counts – Every tonne gives the same warming.” This is simply not true. Every atmospheric physicist knows that absorption follows a logarithmic law and that the forcing effect is now into the saturation region, see Figur 3 below. The logarithmic effect has been known for some 150 years.

We know that a doubling of the CO₂ concentration, which might appear in 50 years or so, will give an increased atmospheric temperature of only about 1 deg C (0,7 deg C, from Stefan-Bolzmans law of radiation). However, IPCC says that feedback from water vapour will increase temperature another 2 – 5 degrees. This is wrong. According to NASA, a temperature increase of 1 deg will increase water vapour with 7 %. And this will give an increased forcing of 0,77 W/m². This again will lead to an increased warming of 0.14 deg, which again will lead to some warming. Conclusion is, the final temperature increase will be only 1.164 deg C.

How Drange uses science, is apparent in his statement “Observations and models are finally good enough to link extremes to human emissions.”

This is wrong for three reasons:

- It is a scientific fact that an observation or a positive correlation says nothing of causality. In science, a theory can only be proven wrong, not right.
- The climate models are failing; they cannot project future temperatures or even correctly reconstruct past temperatures.
- The detection and attribution models used by the IPCC over the last 20 years are faulty.

An evaluation of some of Drange’s statements is given in Table 1 below:

Table 1. Drange vs Facts

Drange	Facts
CO ₂ reduces emission to space and gives warming	True, but the effect is limited and has reached the saturation region
CO ₂ is the most important factor in global warming	Dead wrong, water vapour and clouds are far more important
Very large quantities of CO ₂ are added to the atmosphere	Only 5 % of the yearly carbon cycle is due to our emissions
20 % of the emissions will stay in the atmosphere and contribute to warming in more than 1000 years	Dead wrong, the e-time (or half time) is about 4 years

Finally, a very serious matter is commented, i.e. Drange’s use of “tipping points”. In his written statement “tipping points” is used no less than 20 times. He has very successfully sold this message to the court, because in the ruling from the district court, the term is used 13 times, and the ruling says that “tipping points are far above the threshold for materiality”. And dear reader, please note, that there is no mention in the ruling of the fact that the tipping points are associated with at temperature increase from 1.5 to 2 degrees, while the emissions in question will give a rise of 0.0001 deg.

It is also important to note that in IPCC AR6 SPM “tipping points” are mentioned only 3 times, and only very briefly, as shown below in full text:

1. *There is limited evidence for low-likelihood, high-impact outcomes (...involving tipping points) ...under high GHG scenarios.*
2. *Abrupt responses and tipping points of the climate system, such as strongly increased Antarctic ice sheet melt and forest dieback, cannot be ruled out.*
3. *And finally, a footnote defines the concept: A tipping point is a critical threshold beyond which a system reorganizes, often abruptly and/or irreversibly.*

This is not very alarming, however, Drange’s message to the court is.

8. If you can't beat them – take them to court

In July 2025 a report was released by a Climate Working Group (CWG) set up by the U.S Department of Energy (DOE). The title was “A Critical Review of Impacts of Greenhouse Gas Emissions on the U.S. Climate. Authors were eminent scientists John Christy, Judith Curry, John Spencer, Ross McKittrick and Steven E. Koonin.

The authors were called “contrarians”, and almost immediately, a group of 85 scientists, led by Andrew Dessler and Robert Kopp produced a detailed rebuttal (some 400 pages), that says the DOE report misstates conclusions, cherry-picks and say that it does not meet standards for rigor, peer review and impartiality.

This “rebuttal” was to be expected, since the DOE report challenged the widespread belief that greenhouse gas emissions pose a serious threat to the nation. Koonin has since written that

“Collectively our team brought to the task more than 200 years of research experience, almost all directly relevant to climate studies. The resulting peer-reviewed report is entirely our work, free from political influence, a departure from previous assessments.”

Among the many comments appearing in the blogosphere was this:

“The blatantly false information presented in this so-called report should make everyone reading it embarrassed for the pseudo-scientists who would peddle this garbage for big oil and gas profit at the expense of the health of future generations of Americans and the survivability of our planet.”

But the rebuttal was not enough. The **Environmental Defence Fund (EDF)** and the **Union of Concerned Scientists (UCS)** filed a lawsuit in August 2025, *Environmental Defence Fund Inc v. Wright*. They argue that the report is a violation of the Federal Advisory Committee Act, of illegitimate use of the report and that the report harms the public interest.

The DOE response was to dissolve the Climate Working Group, probably in response to the legal pressure, but it will not withdraw the report, and the authors are independently continuing the work, explaining their findings etc.



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Climate Change is a very Moderate Problem

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Keywords: Poverty; Health; Food production; GDP development; living conditions

Since 1980, the world economy – the combined GDP of all countries – has roughly quadrupled.¹⁷ It is particularly the poorest countries that have experienced remarkable progress in living conditions. This progress is evident in a number of areas:

- Poverty has fallen. The proportion of humanity living in extreme poverty – defined as consumption below 3 dollars per day – has dropped from 47 to 10 percent.¹⁸
- Health conditions have improved dramatically. Average life expectancy has increased from 63 to 72 years.¹⁹ The proportion of children dying before the age of five has fallen from 12 to 4 percent.²⁰ Today, 80 percent of the world's children are vaccinated, compared to 20 percent in 1980.²¹
- Food production has increased more than population growth.²² A global distribution system has also helped ensure that fewer and fewer people are affected by famines.²³
- Security against disasters. Even though there is more extreme weather, the number of people dying in natural disasters is probably lower than ever. The wealthier we become, the better we are at protecting ourselves from nature.²⁴

There are many contributors to this growth. One important factor is stable access to affordable and reliable energy. The Chinese factories need electricity. The Indian farmers need petrol for his moped to transport goods to the market. The African health clinics need light. School buildings require steel and cement.

All this energy use entails increasing emissions. In 1980, the world emitted about 20 billion tonnes of greenhouse gases, CO₂ equivalents. This year, it will be around 40 billion tonnes. In this period, emissions in the West have decreased somewhat. At the same time,

¹⁷ https://www.imf.org/external/datamapper/NGDP_RPCH@WEO/OEMDC/ADVEC/WEOWORLD

¹⁸ <https://data.worldbank.org/indicator/SI.POV.DDAY>

¹⁹ <https://data.worldbank.org/indicator/sp.dyn.le00.in>

²⁰ <https://ourworldindata.org/grapher/global-child-mortality-timeseries>

²¹ <https://ourworldindata.org/grapher/share-of-vaccinated-one-year-olds-globally?time=1980..2015>

²² <https://ourworldindata.org/grapher/food-supply-by-region-kilocalories?time=1961..2013>

²³ <https://ourworldindata.org/uploads/2018/03/Famine-death-rate-since-1860s-revised.png>

²⁴ <https://ourworldindata.org/natural-disasters>

emissions have increased sharply in the poorest parts of the world, especially in China. With 10 billion tonnes per year, China now emits more greenhouse gases than the USA and EU combined. But emissions are also rising in Africa, India, and Latin America.²⁵

This also means that the planet's temperature is rising. In parallel with the increase in prosperity, it has become around 0.7 degrees warmer since 1980, or close to 1.5 degree since "pre-industrial times". The IPCC estimates that if no further climate measures are implemented, the Earth's temperature will rise by an additional 2.5 degrees over the next 80 years.²⁶

In the longer term, this warming is harmful to humanity. At the same time, the sources of emissions – transport, power generation, production of materials – are of great value. We face a trade-off. In order to make a good trade-off, we need knowledge about the consequences of energy usage – both the benefits and the drawbacks.

One issue which will be affected both by climate and climate change, as well as access to cheap energy, is agriculture. The trade-off is well illustrated in the latest IPCC report, which says that the policies needed to prevent global heating to cross the 1.5-degree mark, will entail more hungry people than today's climate policies.

William Nordhaus won the so-called Nobel Prize in Economics for his analysis of the impact of climate change on GDP development. Based on the climate forecasts from natural scientists and Nordhaus's tools, it has been calculated that climate change will harm global welfare as much as a 2–5 % fall in GDP would do, if the global temperature rises by an additional 2 degrees.²⁷ This magnitude is quite standard, and the IPCC refers to similar results in its reports.²⁸

At the same time, prosperity is expected to increase significantly over the next 80 years. Especially in today's poorest countries, the UN's prognosis is that living conditions will improve dramatically.²⁹

If humanity manages to limit fossil fuel use with little or no harm to living standards and living conditions, it seems reasonable to do so. But the "cure", of cutting fossil fuels, could very well prove to be much, much worse than the "disease" of climate change.

²⁵ <https://ourworldindata.org/co2-and-greenhouse-gas-emissions>

²⁶ <https://www.ipcc.ch/sr15/chapter/chapter-3/>

²⁷ <https://www.dallasfed.org/~media/documents/institute/wpapers/2019/0365.pdf>

²⁸ <https://www.ipcc.ch/report/ar6/wg2/figures/chapter-16/figure-16-cross-working-group-box-economic-1>

²⁹ <https://www.sciencedirect.com/science/article/abs/pii/S0959378015000837>



How to avoid talking about inconvenient truths

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Abstract

In this talk I will give a few examples of the usual methods that are used in public debate to avoid giving the general public a truthful picture of the scientific debate (including IPCC WG1). They include biased interpretations, a selection of questions, avoidance of facts, a focus on political and dramatic events, and sometimes outright lies

Keywords: Climate debate; journalism; political debate

<https://doi.org/10.53234/scc202511/09>

Introduction

It is very annoying to see the big difference between the public debate and the scientific debate. The public debate is a discourse taking place in newspapers, public television and radio, and in the political domain in parliaments. The scientific debate is taking place in scientific journals and sometimes in scientific conferences. Although the media often claim that they have a task to inform us about climate and to enlighten people about what is taking place in the real world they utterly fail to do just that. The ignorance in public debate about the mechanisms and history of climate is widespread. We, the readers, listeners and viewers, are never informed about what is taking place in the scientific debate. Not a word about different views and theories that are discussed. Not a word about uncertainties and the complex system that is studied. All these topics are simply avoided.

I will stick to the climate discussion and not include energy. In the public discussion about energy production the green hegemony is not that dominant any more.

1. The argument from authority, 97 %

I will not present these stratagems in any special order. But this argument from authority is the most frequent one. And it is used as an obvious starting point in condemning all sceptics as marginal fools. Then you do not even need to counter their arguments in any factual or objective way. You do not have to discuss various scientific articles, which the journalists have not read or know about anyway.

The claim that 97 % of all scientists agree with the *catastrophic* climate change has been refuted many times. I will not dwell on this well-known discussion here. The purpose with this paper is rather to highlight examples of common methods that are used in the public debate in order to avoid inconvenient truths.

The question of consensus is often mixed up with the question of how many scientists agree with the claim that it is warmer today than it was during the Little Ice age. Obviously most researchers already agree on this (100 %?). But that is not the same as claiming that carbon dioxide has caused most of the warming, or that we can trust the climate models.

How many agree with the claim that *all* warming is caused by CO₂? (50%?)

2. Heat waves dominate the news

Media loves to tell us about all heat records all over the world. But what does it prove? – Not that we would not have very hot days without climate change. Climate history offers many examples of serious heat waves. The repeated reporting about heat waves only illustrates that the media is keen to frighten us with global warming. For a scientific debate about heat waves you need a historic data base.

To counter with a number of cold records would be just as unscientific if it were to be taken as a proof of global cooling.

The double standards in news selection show that media do not take the scientific question seriously.

3. Climate goals

News: "We will not live up to the Paris agreement", or live up to NetZero or to Agenda 2030.

All focus is on these and similar climate goals, and how to achieve them. And what we must do. How the government have failed so far. - Not about if the goals are economically or technical realistic, or even desirable.

I do not recall even one discussion, or an interview, about whether the goals are scientific, needed or helpful. No critics or experts in economy, politics or technology are ever invited.

Why? – Because "Science is settled", and it is claimed that "science" has proved that there is a Climate Emergency. And such "facts" must not be questioned or discussed.

4. Climate crisis

News: Citations from researchers, EU, UN etc – all claiming that we are living in a climate crisis. No critical questions from reporters. This is just repeated again and again.

Why? – Because it has been proved by all extreme weather events (World Weather Attribution).

The way to show this is by comparing present weather happenings to a fictional world made up by models. The models they use are extra sensitive to CO₂ increases and if they are turned backwards in time they do not show much variability or extreme weather. They are "verified" by the temperature rise in modern times. Therefore, the extreme weather events we see today are caused by the increased global warming and CO₂. This is clearly a circular argument.

That we are living in a “climate crisis” is taken as a given, never discussed. And the public have no clue how this is proved.

5. Extreme weather events

News: Reporting about extreme weather events. We never hear about reports of normal weather. That would not be “news”, no drama.

Heavy rain, floods, wild fires, droughts ... all around the world. All events are explained as consequences of global warming. Experts are called in to the studio to agree, never to put critical questions.

The experts are interviewed by breathless and excited reporters and you always know beforehand what their answers will be. Both the reporters and experts seem to be just as surprised and worried.

No discussion of alternative explanations or even what IPCC has to say about extreme events. (Roger Pielke Jr for one is very frustrated about this open ignorance <https://wattsupwiththat.com/2025/08/23/pielke-jr-a-takeover-of-the-ipcc> .)

6. Conflation of weather and climate

Bad weather is usually described in terms of high or low pressures followed by their consequences for cloudiness, winds and precipitation. Climate, on the other hand, is weather over a period of 30 years or more.

This distinction is seldom noted, explained or discussed in the public debate. But it is very important since extreme weather events is not climate and prove nothing as such.

There is also very often a conflation between environment and climate. It often leads to the fallacy: “We want to save the environment; therefore we must stop climate warming.”

7. Exaggeration and simple lies

The Gulf Stream stops. The ice is melting. Coral reefs are disappearing. Ice bears are dying. Just 10 years left ... Etc.

We hear these claims again and again. But no journalist checks the facts.

These announcements work as red herrings in order to make us worried. Not to be checked or discussed, just announced as facts. A fact check would of course have disclosed them as exaggerations and pure lies, and they would not give the wanted effect on the public or hide inconvenient truths.

8. Always blame the climate

For example a recent blackout in Spain.

News: “Aagesen said operators of large gas and nuclear power plants had acted "inappropriately" in not cushioning the power surges on the grid.

But: The blackout had stirred debate over whether Spain's dependence on renewable power like wind and solar was behind the grid failing, which the government has denied.

Spanish Prime Minister Pedro Sanchez has said Spain will not deviate from its energy transition plans. “

<https://www.dw.com/en/blackout-in-spain-and-portugal-caused-by-voltage-surge/a-72954699>

9. Selection of news in general

Deliberate screening of news so that the climate alarmism is included in *every* news broadcast. The editorial staff seems to be programmed to always announce something climate scary. All to preach and caution us to march together into the Great Green Reset.

Other issues are ignored, such as the opposition to wind power, the economic burden (taxes) of the green agenda or the goals mentioned above. Or the news about the DOE Climate Assessment Report which surely also will affect us in Europe. Other issues are raised and one often wonders: why is this or that a news item given a large place in broadcasts without further ado?

Any questioning or serious discussion is dismissed as “climate denial”. Yes, it is even fascist and right-wing extremism and should be forbidden.

By using methods illustrated above one avoids talking about inconvenient facts. Keeping the public ignorant about what has been called the “most important problem in this century”.

It seems that this issue is the one to be avoid at any price.



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The collapse of the green energy transition

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Abstract

The goal of European politicians has for years been to achieve a complete phaseout of fossil fuel use within 2-3 decades. The energy in the future is almost exclusively to be produced by wind turbines and solar cells. A huge capacity has been built by now, but it is running into increasing difficulties. The economic situation, especially for offshore wind, has deteriorated sharply and the hourly prices of electricity fluctuate wildly; sometimes they are even negative. The expansion, particularly for wind, has slowed down to a considerable extent. Meanwhile, the problems of stability of the electrical system became apparent with the Spanish blackout in April. Hydrogen was foreseen to play a major role in the transition, but high costs have brought the development nearly to a standstill, with many projects cancelled or put on hold.

Keywords: Green energy transition; Wind turbines; Solar cells; Grid stability; Hydrogen

<https://doi.org/10.53234/scc202511/10>

1. Introduction

A few years ago, the ambitions for the green transition were enormous in Europe. Within a few years there would be a vast expansion of the capacity of wind turbines and solar cells, and they would power everything electrical and be the source of millions of tons of hydrogen, which could be used for energy storage or as a replacement for fossil fuels in areas where electrification would be difficult – e.g. like heavy transport, shipping and aviation.

2. The expansion

Five leading politicians from Northern Europe agreed in 2022 that Denmark, Germany, Belgium and The Netherlands in the North Sea would have a combined offshore wind-turbine capacity of 65 GW already by 2030 and no less than 150 GW in 2050 [1]. At present it is around 13 GW.

Meanwhile, extensive expansion of the solar cell capacity took place in Germany and Denmark. Germany now has more than 100 GW solar cells installed, which is roughly double the average consumption [2]. Denmark has reached a figure around 4 GW, which is roughly on par with the average load. Besides, Denmark has around 7.5 GW wind turbines, on land and at sea [3]. Germany has some 75 GW wind turbines, most of them on land.

3. The result, power prices

The result of these heavy build-ups has been an electricity market with huge swings in the supplies, ref. Fig. 1. A combination of fossil-fired power plants and import/export to neighbouring countries with alternative power sources, i.e. nuclear or hydroelectric, has been employed to salvage the situation and ensure a stable supply to the consumers.

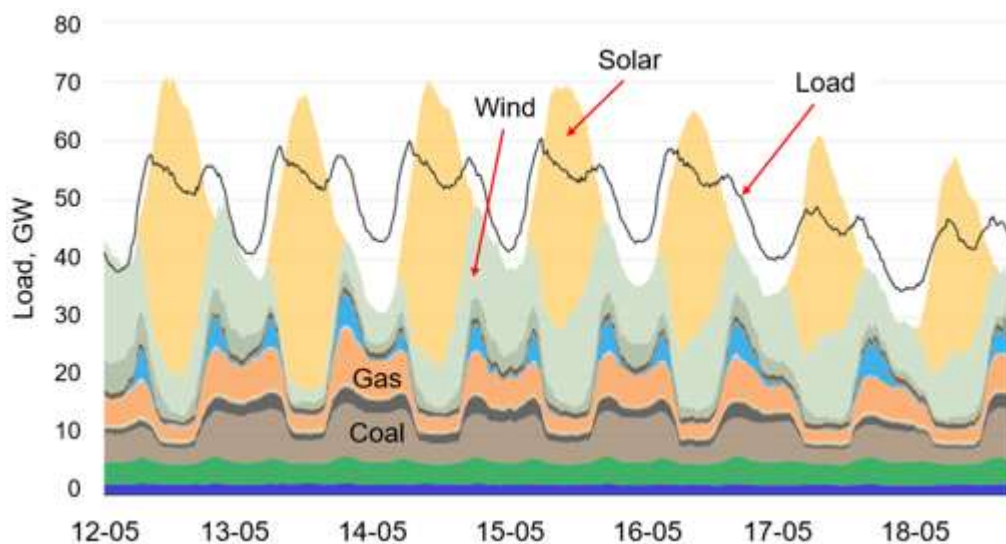


Figure 1: German power production in May, 2025. Diagram: Energy-Charts [4].

But one consequence has been wildly fluctuating power prices, as seen for Denmark in Fig. 2. It is apparent that the power price frequently drops below zero, meaning that the producers have to pay for delivering the power. In 2025 the number of hours with negative prices in the western part of Denmark had by the end of August already exceeded 400.

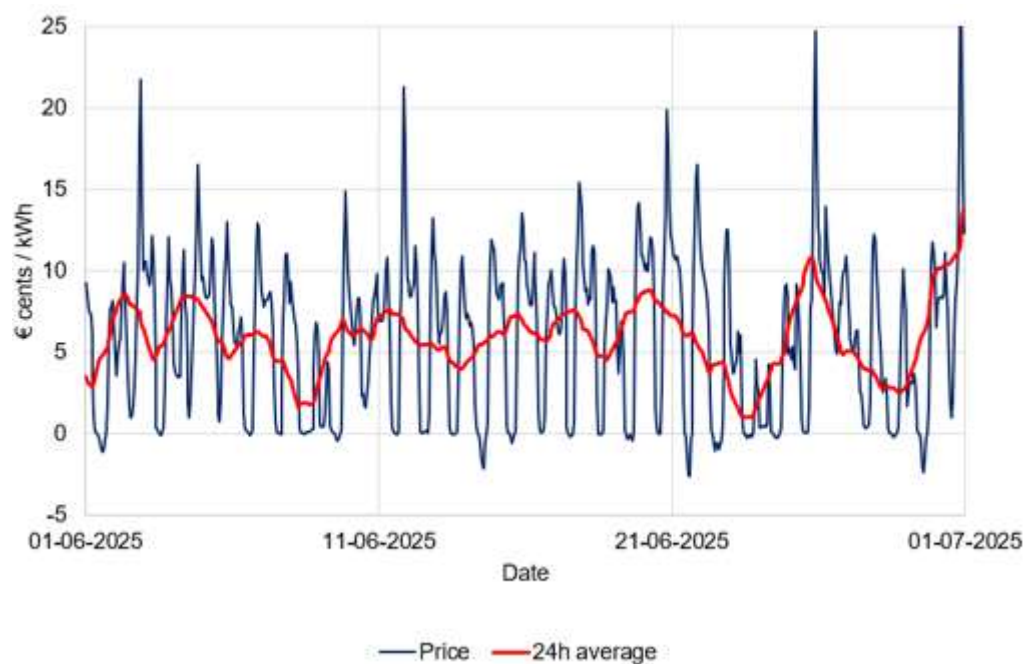


Figure 2: Power prices in Denmark (excl. tariffs & taxes), June 2025. Data from Energinet [5].

The negative or low prices animate some producers to stop their production and the result is that in summertime, around midday, when the solar cells produce vast amounts of electricity, both Germany and Denmark almost daily end up with widespread close-down – or curtailment – of wind-turbine and larger solar-cell parks.

While consumers might be happy with low power prices, they constitute a serious problem for the producers, who lose significant amounts of income, just as their installations produce the most. This phenomenon is known as “cannibalism”.

4. Investor worries

The uncertainty regarding future income has made investors more wary of embarking on new projects. An example was seen in Denmark, in December 2024. 3 GW offshore wind was put up for auction by the Danish government. The terms were strict, no support was offered, on the contrary, the bidders were asked to present their offers for yearly concession payments to the government. To the apparent surprise of the Danish Energy Agency, nobody wanted to bid. Afterwards a consultant investigated the case and interviewed the wind-turbine operators who were expected to bid. What had scared them away was not so much the concession payments, they could always have bid one euro per year. The reason was primarily the market prices of electricity which would not cover the financial and operating costs of the parks, and besides the fear of cannibalism which would further undermine the project economy [6].

The government now intends to hold new auctions and this time it will be with a guaranteed payment for all power, produced or curtailed, to the tune of 10 eurocents or more per kWh.

Thereby, all notions of wind power being among the cheapest sources of electricity are effectively buried.

Denmark is not the only country where offshore wind auctions have ended without bids, table 1 shows a selection of other failures in 2024 and 2025. It is by now clear that the wind capacity by 2030 will be nowhere near the grand visions of 2022.

Table 1: Failed auctions, with planned capacities, 2024-25.

Country	year	GW
UK ("AR5")	2023	4
UK ("AR6")	2024	6*)
Denmark	2024	3
The Netherlands	2025	2
Germany	2025	2.5

★) Bids for 3.4 GW, no bids for 6 GW

5. Grid stability and the blackout in Spain

Another manifestation of the problems with the green transition is the growing worries about the stability of the power supply. The basic philosophy of an electric grid is that the consumers draw whatever amount of power they need, and then it is the task of the producers to keep up the supply, and to fine tune it to the variations in the consumption. This was manageable with a supply based on power plants fired with fossil fuels. Now the situation is reversed. Solar- and wind-produced power is generated completely independently of the consumption and introduces major variations in the supply. These variations then have to be smoothed over by other means. This is a major headache for the energy distributors. So far, they have been successful in Northern Europe, but according to the reports there has been some close calls [7]. However, Spain, which has had big ambitions with wind turbines and especially solar cells, ended up having a serious incident in April 2025.

The country was boasting that its electricity supply almost entirely was based on solar and wind. This was also the case in the morning of April 28th, where growing instabilities in the frequency and voltage of the power occurred, and remediation proved increasingly difficult, see Fig. 3. The system finally crashed right after noon, resulting in a major blackout and 50 million people were

left without power [8], which unfortunately also caused some fatalities. The conclusion upon thorough investigations was that Spain had too few spinning power plants (i.e. gas or nuclear powered) in operation [9], and the inverters of the solar or wind-turbine parks could not ensure the stability. Ever since the blackout, the country has kept far more spinning capacity in operation.

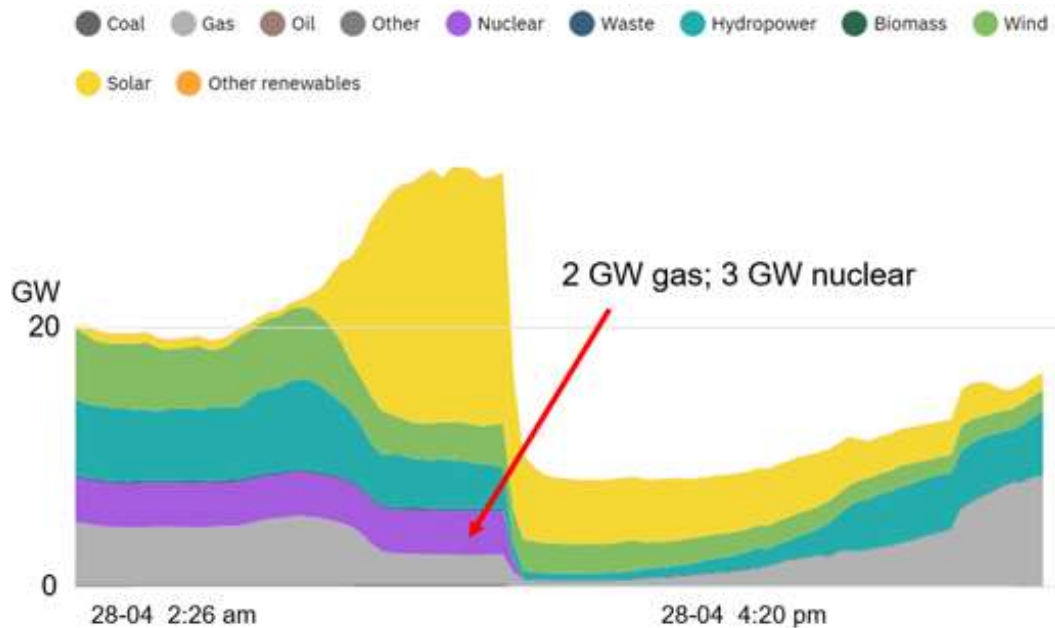


Figure: 3: Power production in Spain on the day of the blackout. Diagram: Energy Monitor [10].

By now it is being realised, that solar and wind never will be able to provide 100% of the electricity. Germany in fact is still relying heavily on its coal- and gas-fired plants, also to cater for periods without sunshine or wind. The result is that the country has seen no reduction in its CO₂-emissions from power production since 2018, in spite of the heavy build-up of wind and solar [11].

6. Hydrogen

The vision of the various countries is, as mentioned, invariably centred on the notion that vast amounts of electric power will be used for hydrogen production. It has, however, for long been apparent that the hydrogen produced by electrolysis of water will be very expensive, and not at all competitive with hydrogen made from natural gas. What is worse, the “green” hydrogen is even less competitive with the natural gas itself, which e.g. is used for heating processes in the industry [12].

Hence, there is very little interest, e.g. among industrial energy users, in switching over to hydrogen. As a result, a number of grand schemes for building hydrogen manufacturing plants and pipelines for transport of the gas have been cancelled or postponed indefinitely [13]. In Denmark, a company which was to manufacture the electrolyzers recently went bankrupt. There was simply no interest in the machines [14].

At present only a handful of hydrogen plants are in operation in Europe, most of them just of pilot scale. They produce hydrogen or the derived Power to X fuels, intended to replace petrol, diesel, bunker oil etc. Needless to say, these fuels are horrendously expensive; the plants are dependent on government subsidies, or rich client companies wishing to flag a “green” profile.

7. Conclusion

The green energy transition in Europe has slowed down, almost to a halt, and any further progress depends on governments still willing to throw more taxpayer money into the abyss. The situation is in no way improved when looking at the world outside Europe, where Asia, South America and Africa keep increasing their use of fossil fuels, and the U.S., under Donald Trump, is doing its best to stop the transition in its tracks.

Europe is now at a crossroad. The decision is whether to continue along a path leading nowhere or to abandon the belief in solar and wind as saviours of the climate and humanity, and instead adopt a more sober approach to the issue of our future energy supply.

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On the increase of CO₂ in the atmosphere

And the CO₂ residence time confusion

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Abstract

There is a lot of discussion between Climate Realists about the origin of the CO₂ increase in the atmosphere. Some think that it is mostly natural and others that it is mostly human caused. The carbon mass balance, supported by all available observations, shows that humans are the primary sources of the increase.

Related discussions are driven by confusion about the interpretations of the term “residence time” for CO₂ in the atmosphere: turnover time (for a single molecule), adjustment time (for an extra mass of CO₂ above equilibrium), or long-tail lifetime (for the last remaining extra CO₂).

In this work we will try to show the difference between the three definitions.

Keywords: Carbon mass balance; residence time; turnover time; adjustment time; lifetime.

<https://doi.org/10.53234/scc202511/11>

1. Introduction

In the period 2000-2010, there were several discussions with climate realists in several countries about the cause of the increase of CO₂ in the atmosphere, including the Norwegians Segalstad and Goldberg, in the Netherlands a group around the late Arthur Rörsch, in the UK Richard Courtney, and others. That was the motivation for creation of a comprehensive website [Engelbeen, 2007], where the evidence of a human cause of the CO₂ increase was catalogued. In 2024 a more elaborated overview [Engelbeen et al, 2024] was published for the CO₂ Coalition.

Based on my knowledge of chemical processes, in my opinion the carbon mass balance was already sufficient proof that the human emissions of fossil fuel burning were the cause of the CO₂ increase in the atmosphere.

A closely related issue is the speed at which the human releases of CO₂ are removed from the atmosphere by natural processes, which is what determines the effect of current CO₂ emissions on future atmospheric CO₂ levels.

From these discussions, it was clear that there was a lot of confusion about the term “residence time,” as that was used for quite different definitions for the fate of human emissions as individual molecules (turnover time), as extra carbon mass (adjustment time), or as theoretical residence time based on models (lifetime). That was discussed in a workshop, organized by Clintel in Athens, September 2024 [Engelbeen, September 2024]. The combination of these two discussions was highlighted at the end of the recent Scandinavian Climate Realists Conference in Oslo,

August 31, 2025 as a discussion piece between Hermann Harde and me. Here follows the main points of my point of view.

2. The carbon mass balance, the $\delta^{13}\text{C}$ changes and the oxygen balance

2.1 The carbon mass balance.

The human use of fossil fuels each year causes a certain amount of CO_2 emissions. These amounts are rather well known, based on sales (taxes!) and burning efficiency of the different fuels. They might be somewhat underestimated, due to the human nature to avoid taxes and for political reasons for some countries, but certainly not overestimated.

100% of human CO_2 emissions go directly into the atmosphere, and are reflected in both its total mass and its isotopic composition. The rate at which the amount of CO_2 in the atmosphere is increasing averages only about half the rate of human emissions, which means that “nature” (defined as the net sum of all natural CO_2 sources and sinks) is removing half as much CO_2 as humans are adding. Since nature is removing CO_2 , rather than adding it, nature cannot be causing the ongoing increase in the amount of CO_2 in the atmosphere.

Most of the carbon emitted by humans is “fossil” carbon. However, that doesn’t mean most of the extra carbon (in CO_2) in the air is fossil carbon. Based on isotopic analyses, we know that about 2/3 of the original fossil CO_2 molecules in the air have been replaced through exchanges of carbon between the atmosphere and other “carbon reservoirs,” such as the oceans and the terrestrial biosphere.

Figure 1 shows the CO_2 increase in the atmosphere and the summed human emissions from fossil fuels only, not including the more uncertain emissions of land use changes. That shows that fossil fuel emissions are about twice the increase in the atmosphere. While one must be aware that upgoing variables in many cases cause spurious correlations, in this case, cause and effect are quite certain. The influence of rising sea surface temperatures on CO_2 levels is quite small, as can be calculated with the formula of Takahashi, based on near one million seawater samples.

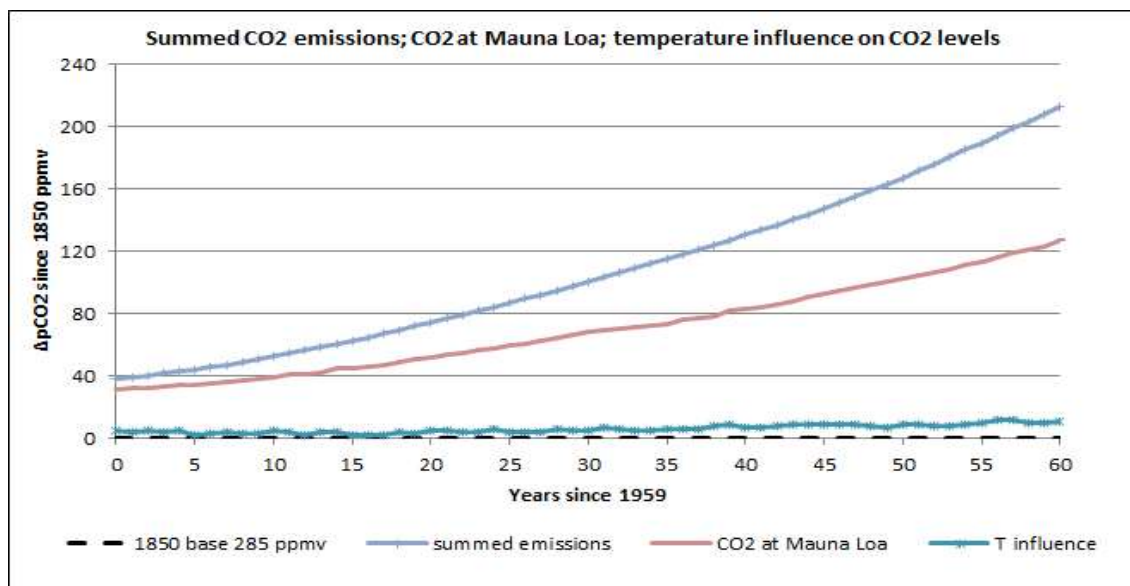


Figure 1: Increase of CO_2 in the atmosphere compared to fossil fuel emissions without land use change and theoretical influence of sea surface temperatures since 1850.

All the available observations point to fossil fuel emissions as the main cause of the CO_2 increase in the atmosphere. That is reflected in a comprehensive report of the CO_2 Coalition (Engelbeen

et al, 2024). The carbon mass balance calculations are the main proof that human emissions are the main cause of the ongoing increase in atmospheric CO₂, and the isotopic evidence corroborates that proof.

2.2 The ¹³C/¹²C balance

Fossil fuels emissions have low ¹³C content, compared to the atmosphere. Inorganic carbon on earth has a ¹³C/¹²C ratio, expressed as δ¹³C, of around zero ‰ (which is defined as a ¹³C/¹²C molar ratio of 0.0112372). Organic material has slightly less ¹³C relative to ¹²C (i.e., negative δ¹³C), due to the discrimination between ¹²C and ¹³C during the incorporation of CO₂ in living material by photosynthesis and other biological processes. Fossil fuels, being of ancient organic origin, likewise have a negative δ¹³C.

Over the past 170 years there is a direct correlation between CO₂ level and δ¹³C in ice cores, firn, and direct measurements of ambient air and fossil fuel emissions (Rubino et al, 2013):

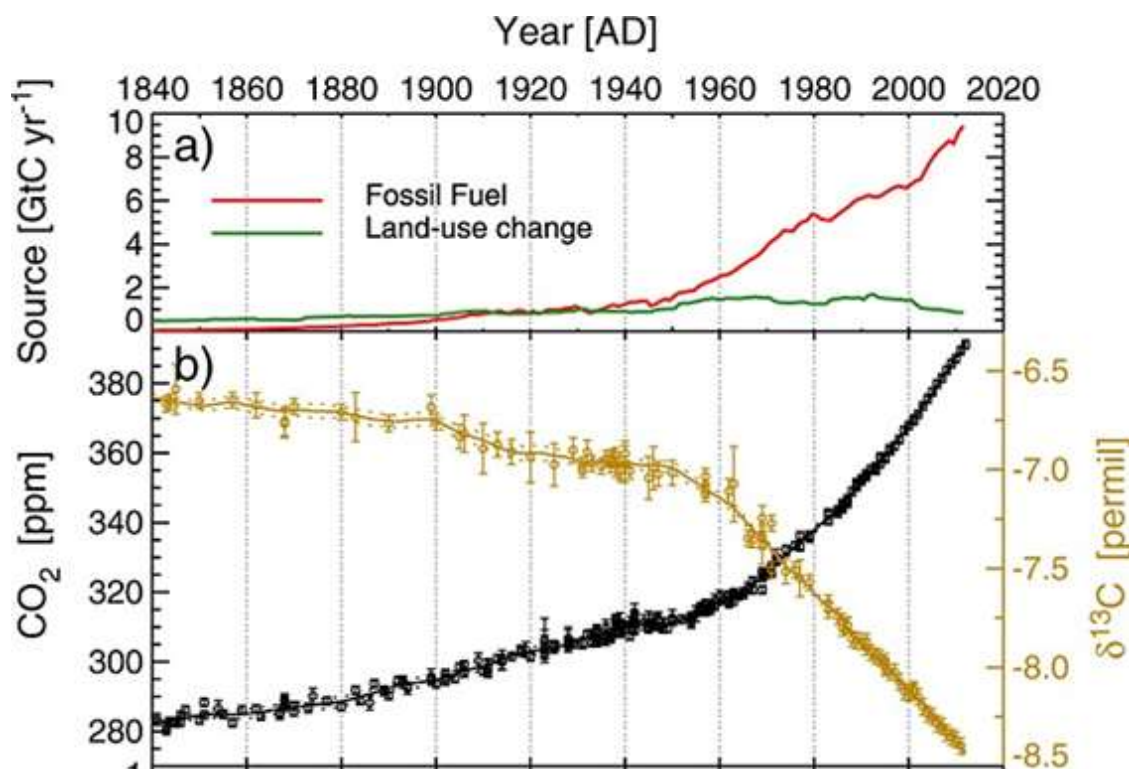


Figure 2: CO₂ and δ¹³C in ice cores, firn and air compared to fossil fuel emissions.

2.3 The oxygen balance

Each type of fuel uses specific quantities of oxygen when burned, and the total oxygen use can be calculated from the sales and burning efficiencies. Sufficiently accurate measurements of oxygen are only recently available to measure the drop in oxygen over time. The oxygen balance shows that less net oxygen was used than calculated from fossil fuel burning. That implies that the biosphere is a net producer of oxygen and thus a net absorber of CO₂. The remainder of the oxygen and CO₂ balance then is what the oceans absorbed as CO₂:

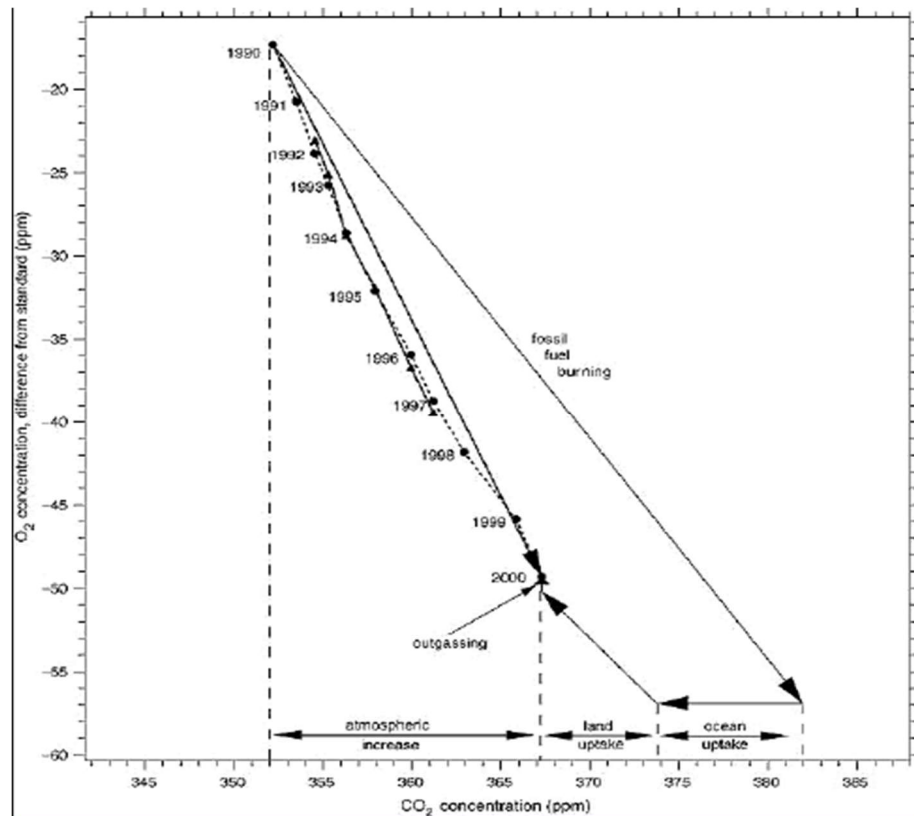


Figure 3. O_2 and CO_2 balances from fossil fuel use.

The O_2 balance shows the partitioning of the CO_2 absorption between the biosphere and the oceans and is a clear indication of the increase of biomass in the world: the earth is greening...

3. The differences in the definitions of residence time

3.1 The turnover time.

There is a lot of confusion on this topic: the main definition of residence time is the time that a single particle or molecule resides in a reservoir. That is also called the turnover time. For CO_2 in the atmosphere, the residence time for a single molecule is about 4 years:

$$RT = \text{Mass} / \text{Output}$$

Or:

$$RT = 890 \text{ PgC} / 215 \text{ PgC/year} = 4.14 \text{ years}$$

The residence time or turnover time refers to how long (on average) a single molecule of CO_2 (of whatever origin) remains in the atmosphere, before it is either removed from the air, or replaced by a CO_2 molecule from another reservoir (oceans or biosphere). One-way removal, temporary removal (cycling back and forth), and exchanges of carbon with carbon from other reservoirs all “reset” the residence time.

About 95% of all CO_2 that leaves the atmosphere is recycled in the same year, mostly independent of the total amount of CO_2 in the atmosphere, as these are caused by processes that depend on temperature, sunlight and pressure difference processes, not the absolute CO_2 pressure in the atmosphere.

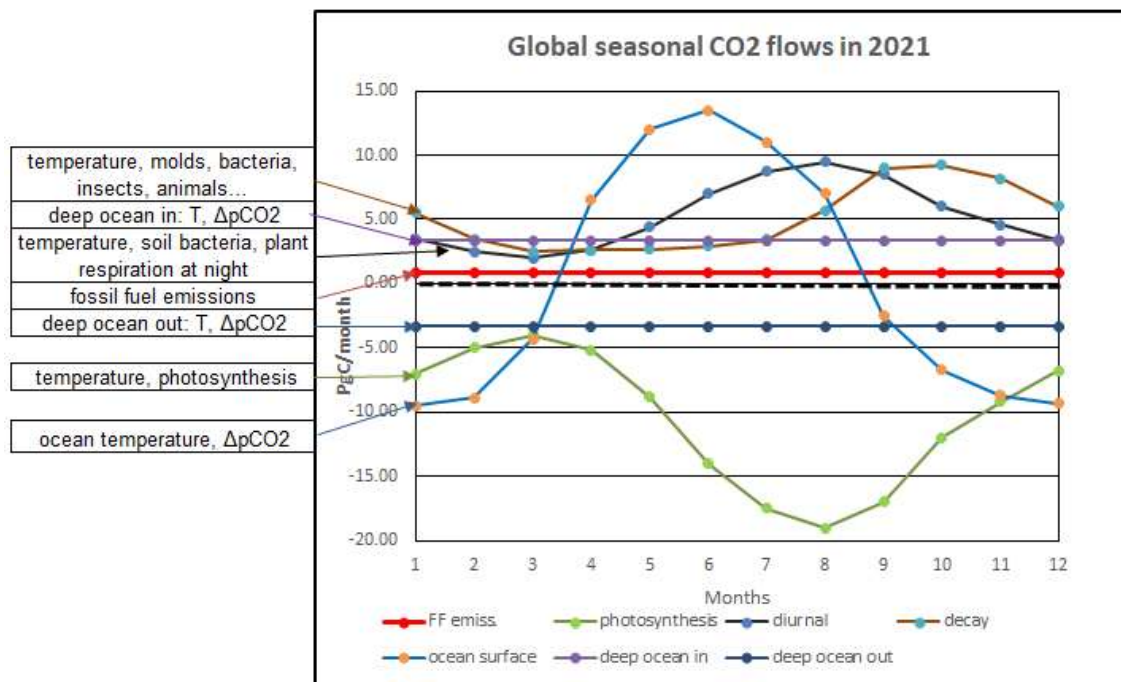


Figure 4. Seasonal and continuous CO₂ flows in and out of the atmosphere.

The residence time only shows how much CO₂ over a year is cycling in and out of the atmosphere and doesn't give any indication on how fast an extra injection of CO₂ into the atmosphere above equilibrium is removed out of the atmosphere.

3.2 The adjustment time

The adjustment time is the time needed to reduce a disturbance in one of the inputs to a reaction of mass or volume or concentration back to 1/e (~37%) of the initial disturbance. For a linear reaction the formula is quite simple:

$$\tau = \text{Disturbance} / \text{Effect}$$

Or (using 2020 figures):

$$\tau = (415 \mu\text{atm} - 295 \mu\text{atm}) / 2.35 \mu\text{atm}/\text{year} = 51 \text{ yrs}$$

Where 295 μatm (ppmv) was the 2020 equilibrium between ocean surface partial CO₂ pressure (pCO₂) for the average sea surface temperature and the atmosphere, according to the formula of Takahashi. 415 μatm was near the observed year 2020 CO₂ level in the atmosphere and 2.35 $\mu\text{atm}/\text{year}$ was the observed net removal rate of CO₂ out of the atmosphere, based on the polynomial through the net removal rates per year, which is quite variable.

That means that the higher the CO₂ level in the atmosphere goes, the faster nature removes CO₂ from the atmosphere. Quantitatively, for each 50 μatm rise in the CO₂ concentration, the rate of natural CO₂ removals accelerates by about 1 $\mu\text{atm}/\text{year}$. That makes the effective lifetime of CO₂ added to the air (the "adjustment time") about 50 years, and the half-life of added CO₂ is $50 \times \ln(2) \cong 35$ years.

That fact was mentioned in the IPCC's Second Assessment Report (SAR 1995), but it is omitted from subsequent IPCC Reports. The SAR [WGI TS, B.1, p.16] notes that, "Within 30 years about 40-60% of the CO₂ currently released to the atmosphere is removed." That implies an adjustment time of 33-59 years, and a half-life of 23-41 years.

3.3 The long-tail lifetime

The lifetime of CO₂ in the atmosphere, according to the IPCC, occurs quickly in the first about 31.6% into the ocean surface layer, but slower and slower for other reservoirs. Moreover, according to the Bern and similar models, each reservoir has its own restrictions in maximum uptake, meaning that the last remaining extra CO₂ will stay in the atmosphere for hundreds to thousands of years:

$$\frac{1}{\tau} = \frac{0.316}{\tau_1} + \frac{0.270}{\tau_2} + \frac{0.253}{\tau_3} + 0.152$$

Where τ_1 is 2.57 years, τ_2 is 18.0 years and τ_3 is 171.0 years according to the IPCC (2001) description of the Bern model coefficients for the different sinks and 0.152 is the remaining fraction “forever” in the atmosphere...

The saturation of the different reservoirs is only true for the ocean surface, as chemical reactions indeed restrict the uptake of CO₂ in the ocean surface layer, but there is no restriction up to 1,000 ppmv for the CO₂ uptake by the biosphere for most (C3-cycle) plants and no restriction at all, up to the far future, for the deep oceans. That gives, based on observations, roughly following overall coefficients for the different reservoirs:

$$\frac{1}{\tau} = \frac{0.1}{\tau_1} + \frac{1}{\tau_2} + \frac{1}{\tau_3}$$

Where τ_1 is less than a year for the ocean surface but restricted to about 10% of the increase in the atmosphere. That is called the Revelle/buffer factor. τ_2 for the biosphere is about 100 years and τ_3 for the deep oceans is about 125 years and there is no remaining fraction.

This formula is not the mathematical calculation for the real adjustment time, but illustrates that three independent processes are at work, each with their own adjustment times, based on observed or calculated uptakes.

The rate of carbon uptake by the ocean and biosphere are chiefly governed by the elevation of atmospheric CO₂ concentration above its equilibrium level (Knorr 2009). The higher the CO₂ level rises, the faster natural processes remove CO₂ from the air.

Conversely, if CO₂ levels were falling, those natural removal processes would slow, and eventually reverse. Just as rising CO₂ levels have caused “global greening” (Zhu 2016), falling CO₂ levels would eventually cause “global browning” (Burton 2024), and the terrestrial biosphere would become a source of CO₂ rather than a sink. But the deep oceans are so far from saturation that they will continue to remove CO₂ from the atmosphere, albeit at a slower pace, even if atmospheric CO₂ falls to the levels of the early 20th century.

The combined processes removing CO₂ from the atmosphere together make the observed adjustment time about 50 years, but in a hypothetical future in which CO₂ levels are falling rather than rising the projected “long tail” lifetime is much longer.

3.4 Bern model problems

The main problem of the Bern model is that it completely isolates the deep oceans from the atmosphere and any extra CO₂ that is absorbed by the deep oceans must pass the chemical and physical restrictions of the ocean surface.

The Bern model sees the pCO₂ difference between atmosphere and ocean surface as one average over the whole surface, while in the real world, there are large differences between the equator

where upwelling deep waters emit a lot of CO₂ and the poles where a lot of CO₂ and O₂ sinks directly into the deep oceans.

Next picture shows the difference between the Bern model and the observations at two stations: one near the equator and one in the North Atlantic (Bates et al, 2014):

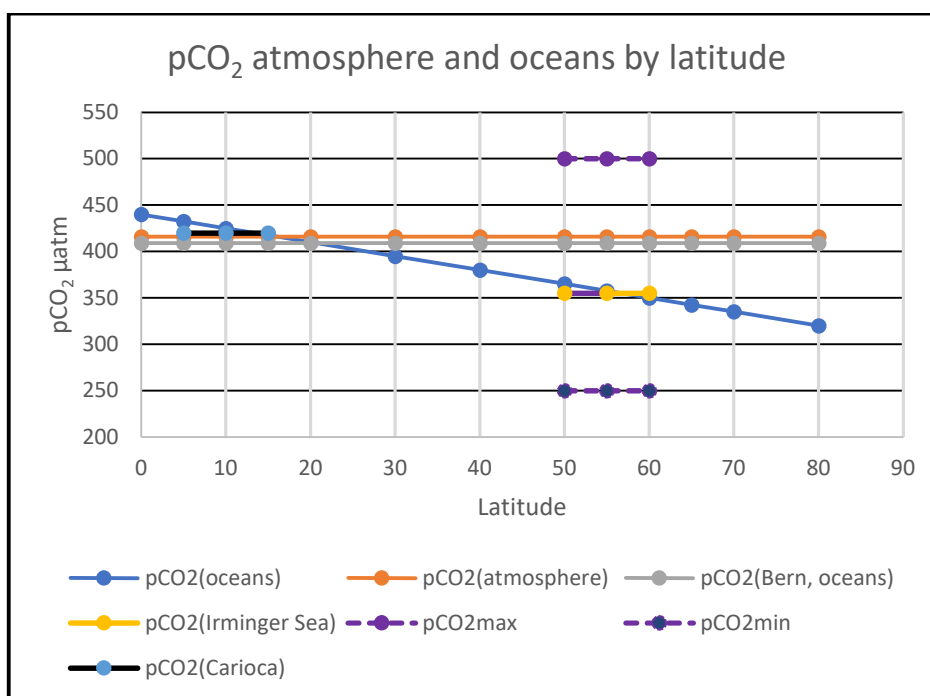


Figure 5. Observed vs. Bern model pCO₂ difference between atmosphere and ocean surface.

Based on several investigations (Yashayaev et al, 2007), lots of oxygen are sinking directly into the deep oceans. The solubility of CO₂ in seawater is a lot higher than that of O₂, that deserves far more investigation than is currently done...

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Atmospheric CO₂: What Physics Dictates

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Abstract

Despite dramatic temperature changes of more than 10°C over the Phanerozoic and 15x higher CO₂ concentrations than today, with the inception of the Industrial Era for many climate scientists, in first position for the IPCC, but also for some climate sceptics, natural impacts no longer exist. Instead, we hear, almost only fossil fuels and land uptake are responsible for an increasing atmospheric CO₂ concentration, and the IPCC additionally alleges, 90 % of the temperature increase is only caused by this greenhouse gas, which makes this discussion so important.

In this contribution, we only concentrate on the first claim and examine to what extent anthropogenic emissions alone can be made responsible for the observed CO₂ increase over the Industrial Era and how far this thesis contradicts basic physics, especially the Conservation Law.

Keywords: Atmospheric CO₂; native and anthropogenic CO₂ emissions; airborne fraction

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1. Introduction

All climate experts agree that the basis for calculating changes of the CO₂ concentration in the atmosphere is the balance equation or Conservation Law, which sums up all in- and outfluxes of the atmosphere. However, significant differences exist, how strongly fluxes from anthropogenic sources affect this balance and how far also natural emissions have to be considered. One central claim is, as long as the growth rate of CO₂ in the atmosphere is less than human emissions and thus, their ratio as so-called Airborne Fraction *AF* is smaller one, there is zero net contribution from natural sources and sinks to the increase in the atmosphere.

This lecture summarizes, how far such suppositions are substantiated or must be made responsible for significant misinterpretations. Based on the Conservation Law, own calculations will be presented, reproducing all details of the measured atmospheric CO₂ concentration over the Mauna Loa Era, including the seasonal cycles. They allow to deduce an upper limit of 15 % for the anthropogenic contribution to the observed increase of CO₂ over the Industrial Era, and under conditions of an increasing imbalance between troposphere and extraneous reservoirs of only 9%, which are not more than 3 % of the atmospheric CO₂ concentration. The importance of only one unitary time scale for the removal of anthropogenic and natural CO₂ emissions from the atmosphere, characterized by an effective absorption time, is discussed.

2. IPCC's Explanation of Increasing CO₂

The IPCC [1] and the CO₂ Coalition team (CO₂-C) [2], assume, before 1850 the carbon cycle was in balance with an atmospheric concentration of about 280 ppm and in- and outfluxes of approxi-

mately 80 ppm/yr. But over the Industrial Era this cycle has come out of balance, actually with 425ppm and with an additional flux of 32 ppm/yr, only caused by fossil fuels and land uptake.

Meanwhile human emissions $e_A(t)$ increased to 5.7 ppm/yr (Global Carbon Budget, GCB-2024 [3]), which are 5.1 % of the total emissions. From these emissions 54 % are directly absorbed by the oceans and land, the rest, the Airborne Fraction (AF) with about 46 % is cumulating in the atmosphere. This is made responsible for the rapidly rising CO_2 concentrations C_{CO_2} over the Industrial Era with about 145 ppm.

IPCC assumes, the removal of this additional CO_2 from the atmosphere takes up to a few hundred thousand years and is described by different adjustment times τ_A . On the other hand, the turnover time, we call this the residence time τ_R , as ratio of the concentration to the total emission or absorption, is only 3.8 yrs. What IPCC uses as a simplified description, and well suited for policy makers, is summarized again in Fig. 1a by the so-called Airborne Fraction Model.

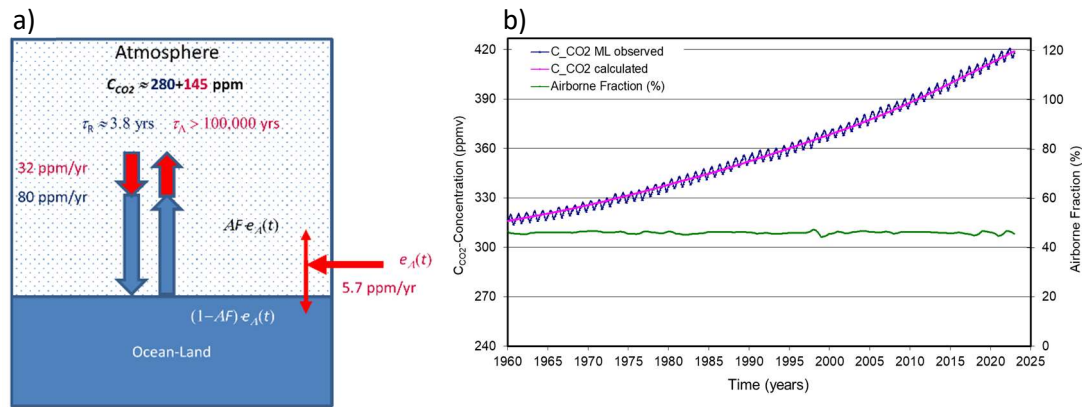


Fig. 1: a) Airborne Fraction Model and b) comparison of calculated CO_2 concentration over time (Magenta graph) with observations at Mauna Loa [4].

Somewhat strange is that the constant natural contribution of 280 ppm and the continuously increasing human injections of 145 ppm together are circulating with the residence time of 3.8 yrs and at the same time 54 % of the new anthropogenic emissions are directly sequestered, while the other part is accumulating in the atmosphere for ever. Some people even believe, only the natural part is oscillating as a closed cycle [2], and the anthropogenic emissions are not involved.

The respective balance equation for the yearly changes $\Delta C_{CO_2}/\Delta t$ then takes the form:

$$\frac{\Delta C_{CO_2}}{\Delta t} = e_A(t) - (1 - AF) \cdot e_A(t) = AF \cdot e_A(t) \quad (1)$$

The incident human emissions are reduced by the absorbed part, and the concentration is increasing with the airborne fraction AF . Year-to-year summation gives the rising concentration over time (Fig. 1b, Magenta graph), which is in good agreement with the averaged measurements at Mauna Loa (ML) [4] for an airborne fraction of 46 %.

A more advanced model, the so-called Bern Model [5] and especially favoured by the IPCC, considers a time dependent airborne fraction, now called pulse response function $R(t)$ with 5 different adjustment times between 3.4 yrs and infinity. Each emission e_A is supposed to contribute with that pulse response, yielding a convolution integral. Year-to-year summation – with a smaller correction – also shows good agreement with the measurements at Mauna Loa (see: Harde 2019 [6], Fig. 6). But apparently, there are some inconsistencies in this interpretation with observations:

- A constant natural cycle and neglect of additional native emissions contradicts paleoclimatic and actual observations.

- 46 % of all new emissions – in the Bern model 18 % – are cumulating for ever in the atmosphere, the other fraction is instantaneously absorbed, but no uptake of previously cumulated emissions. This violates the Equivalence Principle; and for a constant emission rate the system never reaches a previous or new equilibrium.
- The absorption is considered to be proportional to the emission, not to the concentration. This is in dissent to native decay processes and the ^{14}C -decay after the Nuclear Test Ban Treaty.
- The total CO_2 content in the atmosphere, or only the native part, is exchanged within about 4 yrs like an inert gas, but no real absorption and emission is considered at the surface; this contradicts observations with different compounds in sea water or in the biosphere. On the other hand, 54 % of new anthropogenic emissions disappear instantaneously.
- The more elaborate Bern-Model considers even 5 different absorption channels, again proportional to the emission, and even worth, working at least partially in series. It contradicts the observed parallel uptake by different reservoirs (see Harde 2019 [6], Subsec. 5.5)

3. Approach of the CO_2 Coalition Team

The model favoured by the CO_2 -C team [2] and some others overcome some of these deficits, now indeed presuming an absorption proportional to the concentration, but still separated into a closed native cycle as in preindustrial times with native emissions $e_{\text{N}0}$ and a concentration $C_{\text{N}0}$, on the other hand the anthropogenic emissions $e_{\text{A}}(t)$ and an excess concentration $C_{\text{A}} = C_{\text{CO}_2} - C_{\text{N}0}$. The respective balance equation (Conservation Law) assumes the form:

$$\frac{\Delta C_{\text{CO}_2}}{\Delta t} = e_{\text{N}0} - \frac{C_{\text{N}0}}{\tau_{\text{N}}} + e_{\text{A}}(t) - \frac{(C_{\text{CO}_2} - C_{\text{N}0})}{\tau_{\text{A}}}. \quad (2)$$

The first two terms in the balance, representing the native cycle, compensate each other for $e_{\text{N}0} = 77 \text{ ppm/yr}$, $C_{\text{N}0} = 270 \text{ ppm}$ and a native residence time of $\tau_{\text{N}} = 3.5 \text{ yrs}$. Thus, again only human emissions determine the balance, which now is controlled by the anthropogenically caused concentration C_{A} and a second, independent time scale τ_{A} . Some people call τ_{A} adjustment time, but in reality, it is nothing else than a second residence time, separated from the native cycle to explain all atmospheric changes only by anthropogenic emissions of CO_2 .

Now, instead of an infinite accumulation, the excess concentration is decaying with the e-folding time τ_{A} , or at a constant emission rate approaches an equilibrium level $C_{\text{N}0} + e_{\text{A}} \cdot \tau_{\text{A}}$.

Also, this gives good agreement with the averaged ML measurements (Harde 2019 [6], Fig. 7; Harde 2023 [7], Fig. 2b), but native emissions are circulating with 3.5 yrs, the rest stays for 50 yrs and longer? This also violates the equivalence principle; and claiming only anthropogenic emissions contribute to an increasing concentration, while assuming a closed native cycle, looks like circular reasoning.

4. Own Approach to the Carbon-Cycle

So, there are different reasons for a more realistic approach to the carbon cycle, which is in agreement with all observations and physical causalities. First own studies go back to 2017 [8] and 2019 [6]. In succeeding years there was established a close cooperation with the late Murry Salby from Macquarie University Sidney (see Harde & Salby [9]; Salby & Harde [10 – 12]).

4.1 The Modified Balance Equation

Our approach includes temperature dependent natural emissions $e_{\text{N}}(T, t)$ and anthropogenic emissions $e_{\text{A}}(t)$ over the Industrial Era. The absorption rate $a(t)$ is proportional to the CO_2 -concentra-

tion C_{CO_2} in the atmosphere, not the difference to pre-industrial times, and is characterized by a unitary residence time, or here further called *effective absorption time* τ_{eff} . This gives the balance equation or the Conservation Law as CO_2 -changes per yr, caused by the native and anthropogenic emission rates, minus the absorption rate (for a similar approach, see also Berry [13, 14]):

$$\frac{\Delta C_{CO_2}(t)}{\Delta t} = e_N(T, t) + e_A(t) - \frac{C_{CO_2}(t)}{\tau_{eff}} = e_N(T, t) - \frac{C_N(t)}{\tau_{eff}} + e_A(t) - \frac{C_{CO_2}(t) - C_N(t)}{\tau_{eff}} \quad (3)$$

As confirmation of this Law and a deeper understanding of increasing CO_2 it is worthwhile to look closer to measurements of radiocarbon, which is an ideal tracer for the uptake of atmospheric CO_2 by the biosphere and oceans.

4.2 Radiocarbon

Carbon 14 is formed in the upper atmosphere by incident cosmic rays, when a neutron is colliding with a nitrogen nucleus and kicks out a proton. ^{14}C is rapidly oxidized and has a concentration of about 1.2×10^{-10} % relative to the stable isotopologues. Its radioactive decay time as e-folding time is 8 265 yrs and thus, much longer than our considered observation times.

Due to nuclear bomb tests up to 1963 this concentration was doubled, but with the stop of these tests it was possible to measure the uptake by the extraneous reservoirs. Typically measured is the ^{14}C -anomaly $\Delta^{14}C$ as relative deviation from a reference $(^{14}C - ^{14}C_R)/^{14}C_R \times 1000$ [‰], called the Δ -permille value. This is a direct check of the Conservation Law.

Fig. 2 shows the normalized ^{14}C -anomaly at Vermunt-Austria (Levin et al. 1994 [15]) as Yellow Graph. It is characterized by an exponential decay with seasonal emissions over the first 5 to 6 years due to the Brewer-Dobson circulation from the stratosphere to the troposphere, particularly at boreal winters. Often these oscillations are neglected, but they give a much deeper insight for the fast absorption behavior.

We consider a 3-volume system with the stratosphere as the source of ^{14}C [10]. When a mass fraction Δm^{14} is injected to the troposphere, the concentration in the stratosphere reduces by ΔC_{St}^{14} as the ratio of this fraction to the total mass in the stratosphere m_{St} . At the same time the tropospheric concentration increases by ΔC_T^{14} as the ration of this fraction to the mass in the troposphere m_T . Something similar happens between the surface and troposphere with the respective mass ratio.

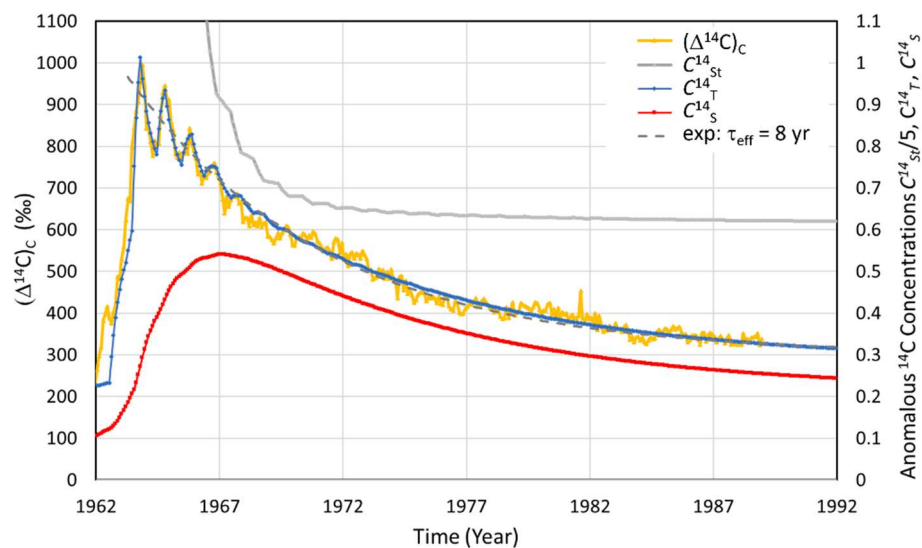


Fig. 2: Comparison of $\Delta^{14}C$ (normalized) at Vermunt-Austria (Yellow) with calculations of anomalous ^{14}C concentrations in the stratosphere (Gray), in the troposphere (Blue) and in the surface (Red).

The solution for the concentrations in the stratosphere, shown as Gray Graph, for the troposphere displayed in Blue, and for the surface in Red, gives good agreement for the troposphere with the observation. It shows a very fast uptake with a direct absorption time τ by the surface of only 8 months and slows down with increasing observation to an effective absorption time $\tau_{\text{eff}} = 8$ yrs.

This effective absorption considers that with increasing ^{14}C -concentration in the surface layer re-emission from the surface to the troposphere takes place, which is proportional to the actual surface layer concentration and can be expressed in good approximation as a fraction β of the tropospheric concentration, yielding an effective absorption time $\tau_{\text{eff}} = \tau / (1 - \beta)$ [7, 9 – 12].

The final decay is determined by the surface concentration and the removal of ^{14}C to the final stores. What we find for ^{14}C as tracer also holds for the total CO_2 cycle.

4.3 Anthropogenic Emissions

Applying the same 3-volume calculation for anthropogenic emissions over the Mauna Loa Era, we can calculate the concentrations caused by anthropogenic emissions (see Fig. 3) in the stratosphere C_{St}^a , displayed as Orange graph, in the troposphere C_{T}^a as Blue, and in the surface C_{S}^a as Red, and how they develop over time. The emission $e_A(t)$ is based on the GCB-2024 data [3].

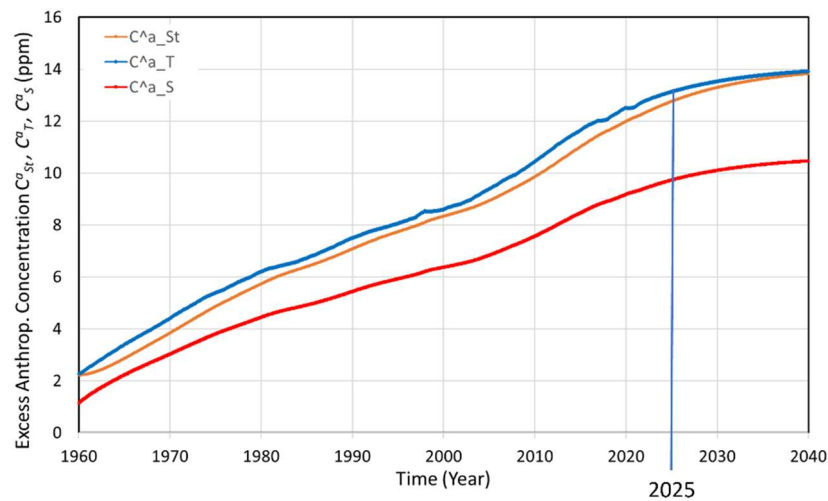


Fig. 3: Calculated anthropogenic excess concentrations in the stratosphere (Orange), in the troposphere (Blue) and the surface (Red).

Different to ^{14}C the slightly increasing emission occurs continuously and directly in the troposphere. While the troposphere and stratosphere are close to equilibrium, this magnifies the disequilibrium between the troposphere and surface, and thus, inhibits a larger offset of direct absorption by re-emission.

This results in effective absorption, that can even be faster than the mean decline of ^{14}C . With a quite conservative mass ratio of the troposphere to the surface layer with one quarter, up to now anthropogenic emissions wouldn't have contributed more than 13 ppm to the atmospheric concentration, which is only 9 % of the increase over the Industrial Era and not more than 3 % of the total CO_2 concentration. A further constant emission over successive years can only increase the concentration by one additional ppm.

4.4 Thermally Induced CO_2 Emissions

But how can the much larger increase of CO_2 over recent decades be explained? From many observations we know: Surface processes like emission and absorption of CO_2 depend intrinsically upon the temperature. This is documented:

- in seasonal emissions and uptake, almost 6x larger than anthropogenic emissions,
- in soil respiration - even increasing exponentially with temperature, or
- in the emission and uptake by the oceans.

Therefore, different to the IPCC we don't ignore such temperature dependent processes, not in the biosphere, not in the oceans or by permafrost. And we remind to the volcanic activities under water. Experts estimate, there are about 1 Mio. submarine volcanoes, thousands of them are expected to be active.

Looking closer to the CO₂ concentration at Mauna Loa as a worldwide reference, the seasonal modulations are obvious (see Fig. 1b). They are more or less regular from one year to the next and not systematically changing. This is different for emissions over longer time periods, as they become visible, when inspecting the derivative of the deseasonalized concentration C'_{CO_2} , low-pass filtered as average over one season. This gives the well-known Conservation Law, determined by the natural and anthropogenic emissions and their uptake.

$$\frac{dC'_{CO_2}}{dt} = e_N(T, t) + e_A(t) - \frac{C'_{CO_2}}{\tau_{eff}} = E_{net}(t) \quad (4)$$

The difference we call the net emission (Fig. 4, Blue graph), which shows characteristic spikes over 2 – 7 yrs that coincide well with El Niño events.

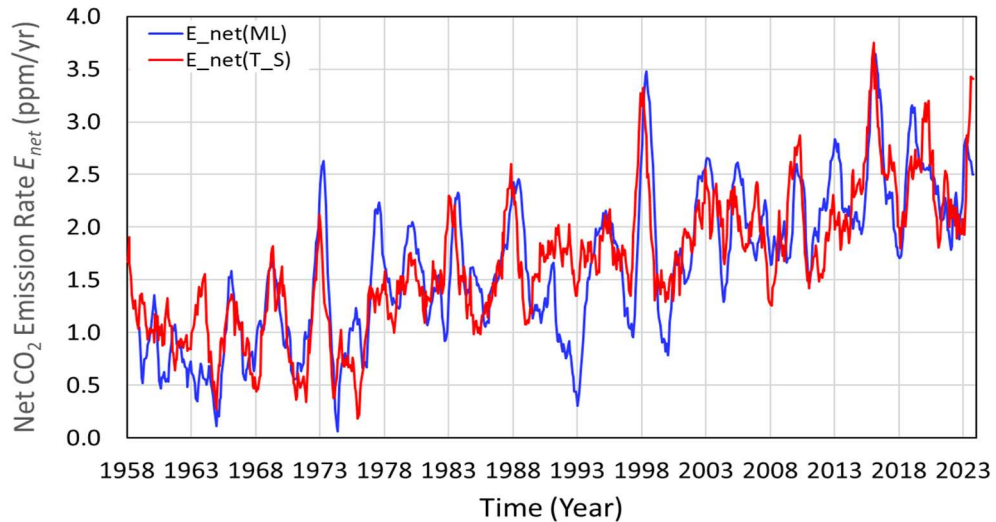


Fig. 4: Net CO₂ emission observed (Blue), low-pass filtered to periods longer than a year, along with its thermally-induced component (Red), calculated from the observed record of tropical temperature.

The mean increase of this net emission rate with about 2 ppm/yr over 65 years seems very small and is even less than the anthropogenic emissions with about 3.5 ppm/yr over this period. But this should not be mixed with the direct emission rates – native or anthropogenic –, as the net emission rate represents the difference between the total emission rate and absorption. And with a fast absorption rate this only gives a relatively small incline over time.

With this net emission in mind we also look closer to the monthly Sea Surface Temperature Anomaly (SSTA–HadSST4 [16]). While over mid and high latitudes there is almost no systematic temperature increase, in the tropics we find a continuous increase over land and sea (see, Salby & Harde 2022 [12], Fig. 2), and also the spikes coincide with El Niños. These are good reasons to explain the observed emissions by an increasing temperature.

Generally these emissions are expected to originate from sea and land. But outgassing of CO₂ with temperature from oceans is relatively low with a temperature sensitivity of only 3 %/°C. This

is more than one order of magnitude lower than soil respiration, which is particularly large in tropic areas, where we also observe the largest temperature increase over the last decades.

So, when calculating the net emission from the temperature record and soil respiration of tropical areas, additionally considering a slightly exponential increase with temperature, the simulation (Red) tracks the observation quite well with a correlation of 80 %.

Note: the emission is in phase with temperature, while the concentration as integral of the emissions has a phase delay of 90°. This has already been described by Humlum et al. [17] and Salby [18] in 2013. Therefore, CO₂, at least for this warming, cannot be the reason for a *T*-increase.

4.5 Comparison of Calculation and Measurement

Finally, to compare the measured CO₂ concentration at Mauna Loa (Fig. 5, Blue Triangles) directly with the respective calculation, we have to integrate the total emission, consisting of the thermally induced and anthropogenic contributions and also including the seasonal oscillations:

$$C_{\text{CO}_2} = \int (E_{\text{net}}^s(T, t) + e_A) dt \quad (5)$$

The calculation as Magenta Diamonds almost exactly tracks the measurement. The Green Dots represent the natural fraction to the concentration, and the Aqua Triangles display the anthropogenic fraction for a tropospheric to surface mass ratio of 1:4 (see right ordinate).

As considered earlier, this corresponds to 13 ppm, caused by human emissions and is not more than 9 % of the increase over the Industrial Era, or compared to the total concentration only 3 %.

The lower Violet line shows the anthropogenic emissions, actually with 5.1 % of the total flux; and we see from these graphs that for a further constant emission the atmospheric CO₂ concentration is only further increasing by about 10 ppm within less than one decade. This is our personal Representative Concentration Pathway.

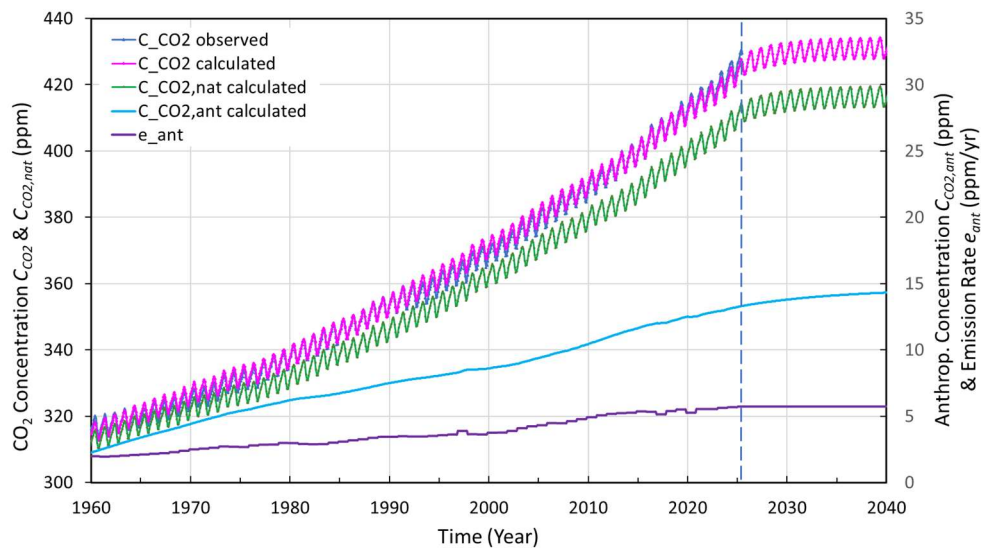


Fig. 5: Observed monthly CO₂ concentration at Mauna Loa (Blue Triangles) together with a calculation for anthropogenic and thermal emissions at a tropospheric to surface CO₂ mass ratio of 1:4 (Magenta Diamonds). Also plotted is the concentration $C_{\text{CO}_2,\text{nat}}$ (Green Dots) only caused by natural emissions $e_N(t)$, and $C_{\text{CO}_2,\text{ant}}$ (Aqua Triangles) caused by the anthropogenic emissions $e_A(t)$ (Violet).

But even excluding an increasing disequilibrium between troposphere and surface due to continuous human emissions, as an upper limit we can expect that the anthropogenic contribution is determined by this ratio, actually 5.1 % or 22 ppm of the total concentration of 425 ppm.

5. Nature as a Net Sink

As already outlined in Sec. 3, the CO₂ Coalition Team assumes a closed cycle for native emissions, thus only anthropogenic emissions contribute to an increasing CO₂ level C_{CO_2} . Any uptake is only determined by the excess concentration to 1750 with $C_{CO_2} - C_{N0}$, and with an adjustment time $\tau_A = 45$ yrs this is in good agreement with observations (Ref. 7, Fig. 2b). Dividing (2) by $e_A(t)$ gives the AF :

$$AF = 1 - \frac{(C_{CO_2} - C_{N0})}{\tau_A \cdot e_A(t)} \quad (6)$$

From this the CO₂-C research team follows:

For $AF < 1$, nature cannot have contributed to any rise, nature is a net sink.

But first excluding native emissions and then such conclusion looks like circular reasoning.

We consider the whole balance equation with one unitary cycle for native and anthropogenic emissions and with one absorption time τ_{eff} of 3 - 4 yrs.

To demonstrate the discrepancy to the CO₂-C's statement ($AF < 1 \Rightarrow$ no native emissions), for a moment, we assume constant anthropogenic emissions e_{A0} . Then, the last two terms in (3) cancel, and any changes can only be determined by nature. For a linear increase $e_N(t) = e_{N0} + \delta \cdot t$ from quasi-equilibrium conditions e_{N0} and with $e'_N = \delta$ as derivative of $e_N(t)$ this gives:

$$\frac{\Delta C_{CO_2}}{\Delta t} = e_{N0} - \frac{C_{N0}}{\tau_{eff}} + \delta \cdot t - \frac{C_{CO_2} - C_{N0}}{\tau_{eff}} \leq \delta \cdot \tau_{eff} \quad (7)$$

The first two terms on the right side compensate each other, and bearing in mind a delayed uptake of the previous emissions over the residence time, as good approximation and upper limit of the growth rate the last two terms can be expressed as $\delta \cdot \tau_{eff}$. This can be derived from the response of the Earth-Atmosphere-System to some perturbation Δe_N to attain a new equilibrium at an increased level $\Delta C_{CO_2}^{eq} = \Delta e_N \cdot e_{eff}$ as solution of the balance equation (see also [12], eq. (B4)).

With $\delta = 0.443$ ppm/yr² and $\tau_{eff} = 3.8$ yrs integration of (7) over the Mauna Loa Era gives a straight line, shown in Fig. 6 as Magenta Diamonds. As average it fits with the observations (Blue Triangles). Dividing (7) by e_{A0} , gives the airborne fraction $AF = \delta \cdot \tau_{eff} / e_{A0}$, which for $e_{A0} = 3.7$ ppm/yr as average over the ML Era, becomes 45 % (Orange Dots). The natural emissions are rising from 80 to 110 ppm/yr (Green Squares), while the anthropogenic emissions stay constant.

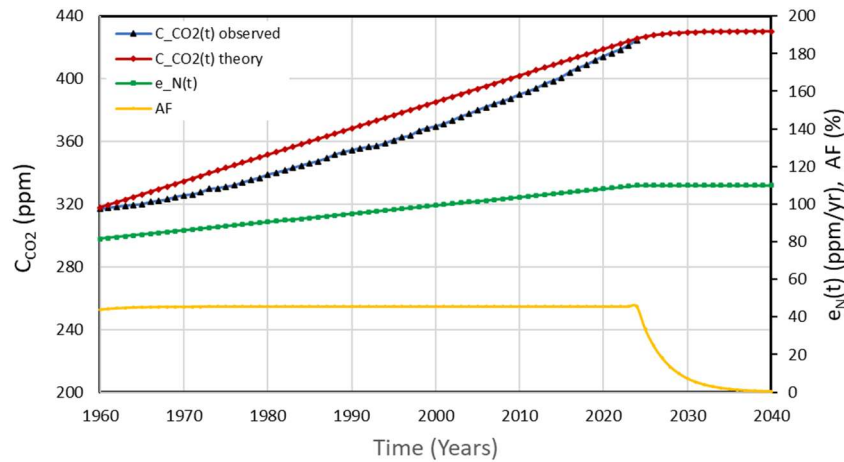


Fig. 6: Measured CO₂ concentration at ML (Blue Triangles) and calculation (Magenta Diamonds) for a linearly increasing natural emission rate e_N (Green Squares) and a constant human emission rate. The airborne fraction is shown as Orange Dots.

This example demonstrates: The CO₂ increase per year is controlled by the derivative $e'_N(t) = \delta$ of the native emission rate (see eq. (7)), and AF as ratio of this increase to the anthropogenic emission rate e_{A0} is smaller 1, this despite growing natural emissions over this period of 30 ppm/yr. So, apparently a statement: *For $AF < 1$ nature cannot have contributed to any rise*, can no longer be held upright, and is falsified.

Fig. 7 displays a simulation (Magenta Diamonds) with anthropogenic emissions $e_A(t)$ according to the GCB-2024 data, and the thermally induced emissions $e_N(t)$, as derived from the tropical SSTA data, similar to Fig. 5, but averaged over the seasons. We find excellent agreement with the ML measurements (Blue Triangles) and again an AF around 45 % (Orange Dots), which now is well approximated by the sum of the derivatives $e'_N + e'_A$ over the residence time.

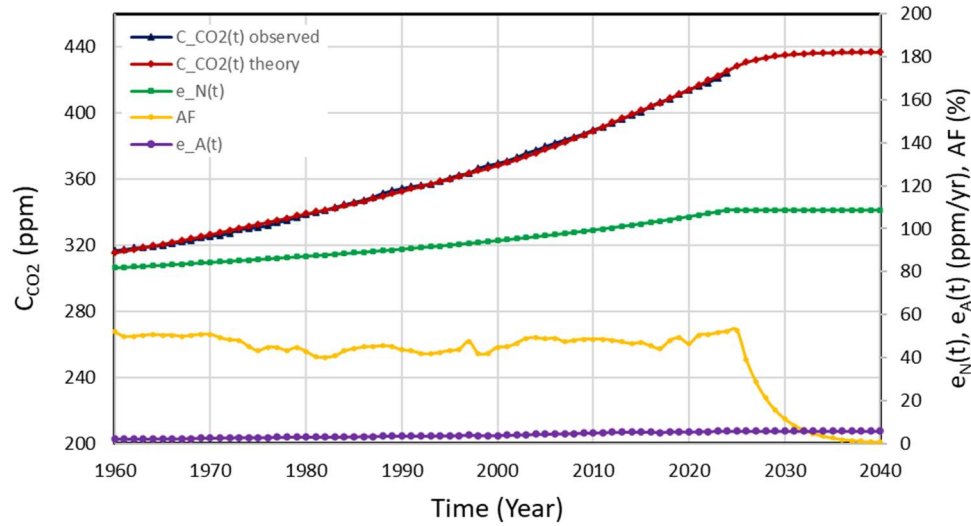


Fig. 7: Measured CO₂ concentration at ML (Blue Triangles) and calculation (Magenta Diamonds) for increasing natural (Green Squares) and anthropogenic (Lilac Dots) emission rates. The airborne fraction is shown as Orange Dots.

The increase of the native emissions (Green Squares) with 27 ppm/yr over this period is almost 8x larger than the increase of human emissions (Lilac dots). So, again, despite a substantial increase of the natural contribution, AF remains smaller 1. Nevertheless is nature a net sink.

This is obvious, as often considered in this context, when shifting $e_A(t)$ in (3) to the left side. With the native impact again expressed as $e'_N(t) \cdot \tau_{\text{eff}}$, and with $C_A = C_{\text{CO}_2} - C_N$ as the anthropogenically caused fraction to the concentration, the balance equation becomes:

$$\frac{\Delta C_{\text{CO}_2}}{\Delta t} - e_A(t) = e_N(t) - \frac{C_N(t)}{\tau_{\text{eff}}} - \frac{C_{\text{CO}_2}(t) - C_N(t)}{\tau_{\text{eff}}} = e'_N(t) \cdot \tau_{\text{eff}} - \frac{C_A(t)}{\tau_{\text{eff}}} \quad (8)$$

So, as long as the native growth rate $e'_N(t) \cdot \tau_{\text{eff}}$ is smaller than the uptake of anthropogenic emissions with $C_A/\tau_{\text{eff}} = e_A(t) - e'_N(t) \cdot \tau_{\text{eff}}$, or in other words, when $e_A(t) > \{e'_N(t) + e'_A(t)\} \cdot \tau_{\text{eff}}$, both sides of (8) are negative. Since up to now any uptake is a pure native process – including the human emissions –, under these conditions *Nature is a net sink*. This, and an airborne fraction smaller 1, is the case despite increasing natural emissions.

Critics often forget that with the increasing CO₂ level in the atmosphere also the uptake is rising to adapt to a new quasi equilibrium; and due to the short residence time, there is only some smaller gap, which even under growing native emissions is less than the anthropogenically caused concentration C_A . Without anthropogenic emissions and their respective uptake nature would be a net source. *Thus, this human fraction finally determines, if Nature is a net sink or source.*

6. Conclusion

In this contribution we oppose the IPCC's and CO₂-C's interpretation of the carbon cycle to our own approach, in particular we discuss the mass balance of atmospheric CO₂ and show that by no means this is such a "*compelling and easily understood line of evidence*" as assumed by the CO₂-C research team [2]. Only looking to the yearly CO₂ increase relative to the anthropogenic emission rate and to conclude, as long as this ratio—the so-called airborne fraction—is smaller one, "*there is zero net contribution from natural sources and sinks to the increase in the atmosphere*", leads to wrong conclusions.

With one unitary residence time for native and anthropogenic emissions of 3 – 4 yrs and based on both, the thermally induced soil respiration in the tropics as well as human emissions according to the GCB-2024 data, the observed CO₂ increase over the Mauna Loa Era can be reproduced in all details. Despite an 8 times larger native increase than the human growth rate over this period the airborne fraction stays around 45 %, and the anthropogenic fraction contributing to the CO₂ increase over the Industrial Era, is only 5 % or even less of the actual total CO₂ concentration.

For any changes, both the anthropogenic and natural emission rates, are responsible and are summing up over time. As long as the native increase $e'_N(t)$ over the absorption time τ_{eff} is smaller than the uptake C_A/τ_{eff} of the anthropogenically caused emissions, *the Earth is still a net sink*.

Therefore, a statement as expressed in [2]:

Anthropogenic emissions of fossil CO₂ are much larger than the measured increase in the amount of CO₂ in the atmosphere. Therefore, the natural CO₂ "sinks" are nearly always larger than natural CO₂ "sources."

can well be accepted, as only natural sinks exist, which also absorb any contributions of human emissions. But a further conclusion:

Any theory that leads to a substantial increase of CO₂ in the atmosphere due to natural factors violates the mass balance and thus cannot be correct.

is more than questionable and is falsified. A more differentiated interpretation and integration of the mass balance just shows the opposite.

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