

Climate Change at the International Court of Justice

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Human-caused climate change is poised to be the greatest injustice in history. The reach of climate change is global. The scope of climate change, within the lifetime of a young person today, will be monumental and tragic, if governments are allowed to persist on a path of pretense and denial. Climate change is intergenerational injustice, as innocent young people and their children will suffer the most severe consequences. Equally, it is international injustice, as nations that have done the least to cause climate change stand directly in the path of the gathering climate storm.

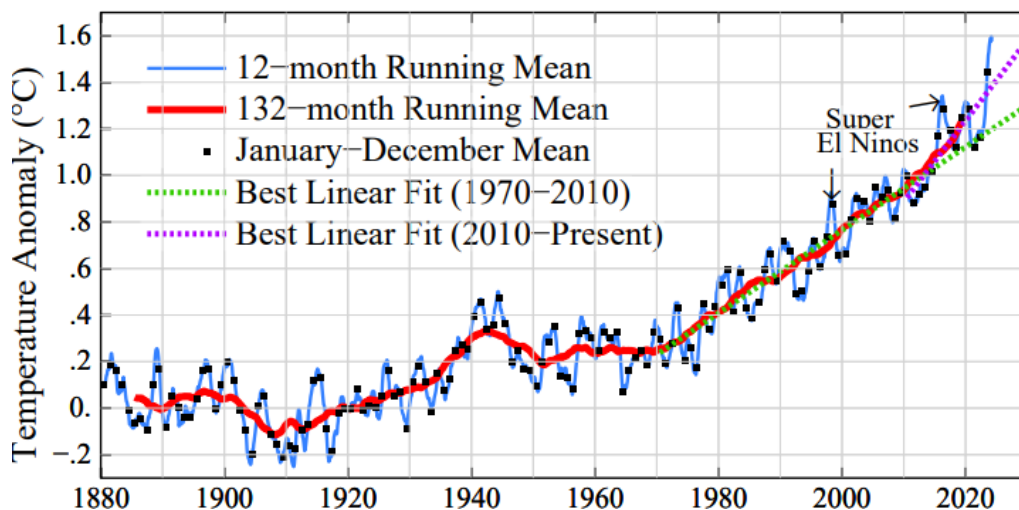
Climate change must be brought to the International Court of Justice because young people, developing nations, and indigenous people have nowhere else to turn. The nation states have failed the most vulnerable people, leaving them at the mercy of the most powerful members of the global community, who turn deaf ears and blind eyes to the well-being of the public.

Nations of the world meet at annual COP meetings (Conferences of the Parties), where they promise to reduce emissions to “net zero” at some distant date, an almost meaningless pledge. There is no plan to *actually* stabilize climate. Instead, there is dickering over potential payments to the most affected nations. Such illusory payments seem more immediate than long-term climate change, so they are dangled out front, like a carrot, as a bribe to continue business-as-usual. Meanwhile, real world emissions remain at a level driving climate inexorably toward conditions out of humanity’s control, leaving a global community increasingly unjust and ungovernable.

[Omit in oral presentation: Reality of the global situation is not lost on young people, developing nations, indigenous people, and the astute public; thus, many begin to despair of the world paying attention. Young people feel anxiety about climate change and their future. A survey¹ of 10,000 16-to-25-year-olds in ten nations found that 60% were “very worried” or “extremely worried.” Two-thirds of them felt that governments are failing them, and, specifically, that governments are not acting according to science. They see growing wars, changing climate, suffering of innocent people, and governments that concoct only ineffectual responses.]

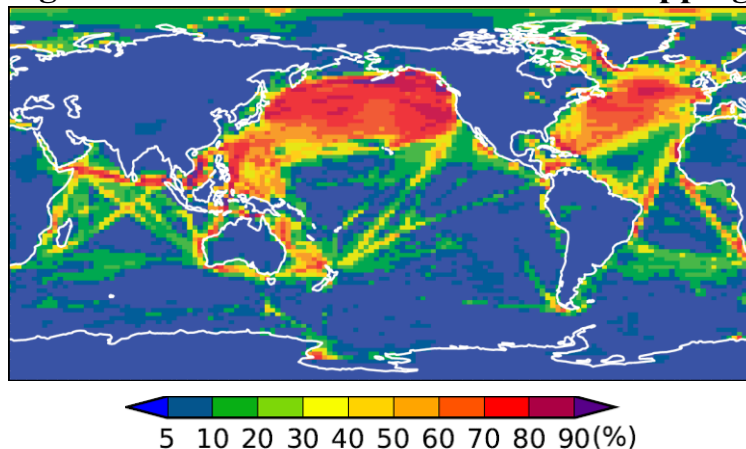
Young people recognize the fecklessness of the current business-as-usual treadmill. They have faith in science and they want to work toward a bright future, but they need help. A clear opinion of the Court just might provide a jolt to the consciousness and the conscience of global leaders.

Figure 1. Global surface temperature change.²



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Figure 2. Percent of total sulfate from shipping.

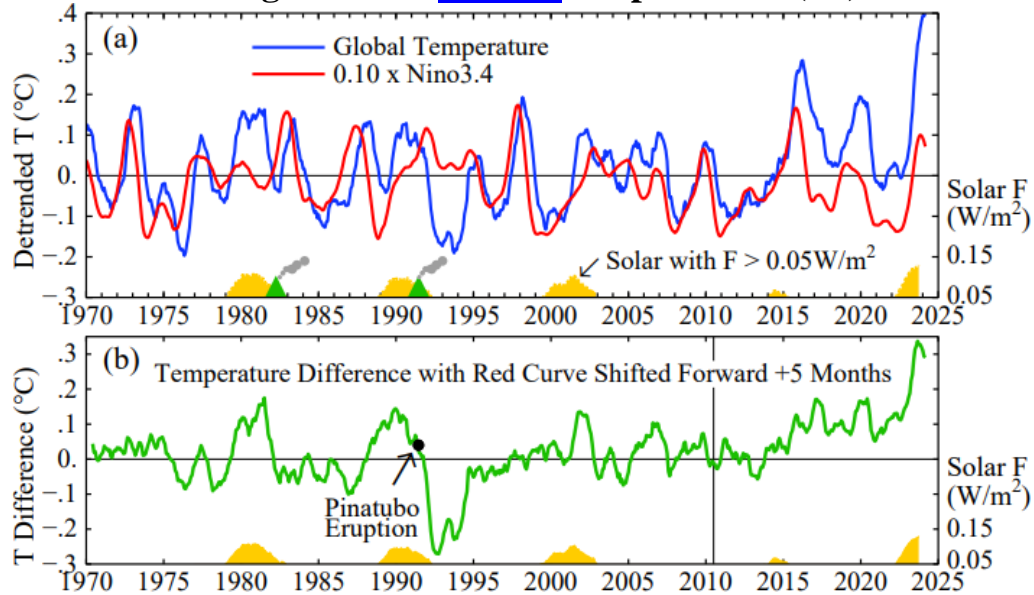


But where is scientific advice? The UN is served by a huge scientific apparatus, but we hear little scientific objection to the farcical climate “strategy” at COP meetings. Voluminous IPCC³ reports contain good data, but what good are data alone? Scientists are the physicians of the planet. We have a moral obligation for diagnosis and advice. My comments here are based on a paper⁴ published a year ago in *Oxford Open Climate Change* and a paper⁵ accepted for publication in *Environment*, which my coauthors and I expect to be in the January 2025 issue.

Global temperature (Fig. 1) took an unprecedented leap of half a degree Celsius in the past two years, which confounded the climate research community. The warming coincided with an El Nino, but the El Nino was weak and could cause warming of only a quarter of a degree, half of the observed warming. Another big factor had to be involved, which we suggested in the *Oxford Open* paper was the “Great Inadvertent Aerosol Experiment” caused by restrictions on the sulfur content of ship fuels (Fig. 2), imposed in coastal regions in 2015 and on the global ocean in 2020.

Emissions from ships include aerosols that produce a negative forcing, a cooling, by reflecting sunlight, mainly via increased cloud cover, as aerosols serve as condensation nuclei for clouds. Thus, conventional pollution control results in fewer aerosols, which causes a positive forcing, a warming, by reducing cloud cover and enabling more solar radiation to reach Earth’s surface. We evaluated the forcing stemming from controls on maritime emissions as 0.5 W/m^2 based on satellite observations of increased absorbed sunlight in the North Pacific and North Atlantic.⁶ That forcing of half a watt is just what is needed to explain the anomalous warming, as shown in Fig. 3. After the El Nino contribution to global warming is removed, there is still anomalous warming of 0.3°C in 2023 and 2024 (the green curve in Fig. 3b). The ongoing solar maximum contributes 0.1°C warming and decreased aerosols contribute 0.2°C , both as follows from a simple forcing-response calculation,⁷ so the entire warming is accounted for. Confirmation is provided by the geographic distribution of the warming (Fig. 4). Warming occurs, beginning especially in 2020, at the latitudes in the Northern Hemisphere where the aerosol forcing occurs. Temperature increase in the North Pacific and North Atlantic already contributes as much to global warming as does the El Nino in the tropics (Fig. 4), and the response to aerosol forcing is still growing.

Figure 3. Detrended global and Nino3.4 temperatures (°C) and difference⁸



Implications of the aerosol effect are staggering. Warming of the ocean surface will not go away. We are now living with an ocean that provides increased drive for strong storms and extreme flooding. Global temperature will decline a bit as the tropics goes into its La Nina phase, but we are now living in the +1.5°C world, averaged over the Nino cycle, and we are headed higher. An even more important implication is that climate sensitivity is not 3°C for doubled CO₂, which has been IPCC's best estimate. When aerosol effects are accounted for, observed global warming implies a climate sensitivity of 4-5°C for doubled CO₂. This high climate sensitivity, combined with steady or declining aerosol cooling implies that global warming will accelerate more – unless the growth of greenhouse gas forcing declines rapidly. Thus, an honest assessment of the growth of greenhouse gas forcing is in order. Is the world making progress toward stabilizing climate?

Figure 4. Zonal-Mean Sea Surface Temperature Anomaly

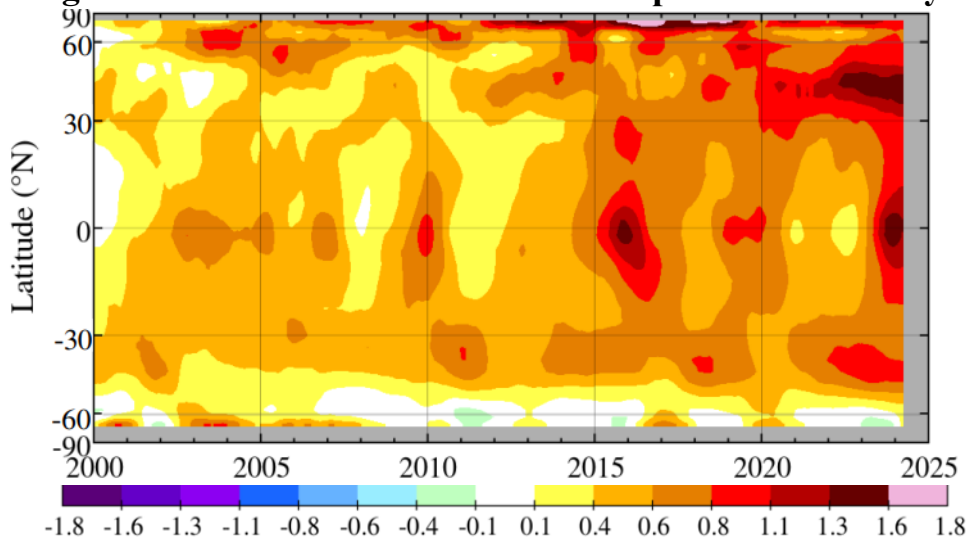


Figure 5. Annual Growth of Greenhouse Gas Forcing and Various IPCC Climate Forcing Scenarios⁹

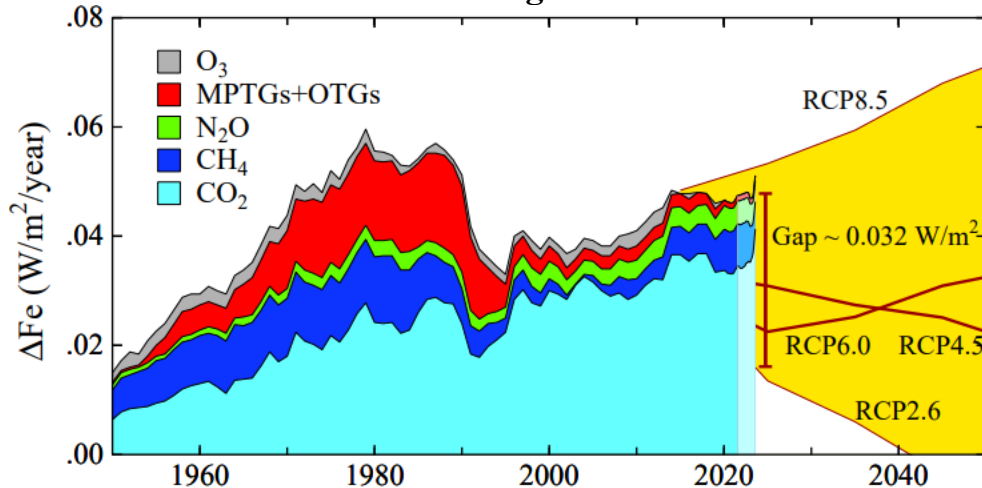


Figure 5 shows the annual growth of greenhouse gas climate forcing. It is enormous, almost half a watt per decade. A decade ago, IPCC concluded that we needed to follow a path close to RCP2.6, if we wanted to keep global warming under $2^\circ C$. But we have not reduced emissions growth at all; it is still almost half a watt per decade. The huge gap between reality and the $2^\circ C$ scenario could be closed by drawing CO_2 out of the air and sequestering it, but the *annual* cost of that has now reached \$3.5-7 trillion.¹⁰ It will not happen. We are headed to global warming greater than $2^\circ C$.

Why are we not focusing more on this situation at the COP meetings? Why do we pretend that we are still on a path to keep global warming under $2^\circ C$? Why do we not have realistic analysis of the situation? The reason greenhouse gas forcing continues to increase is that fossil fuels provide most of the world's energy, as shown in Fig. 6a. Fossil fuels are an amazing, condensed, form of energy that has raised living standards in much of the world. There is little merit in painting the fossil fuel industry and nations that contain abundant fossil fuels as evil. Whether they are liable is a question before the World Court right now.

All nations give priority to the economic well-being of their citizens. Fossil fuels have been a great benefit to humanity, but fossil fuels emissions are also the main cause of climate change. We need to work together – all people, nations, and industries, on a realistic path to a bright future.

Figure 6. Global energy consumption (a) and CO_2 emissions (b)

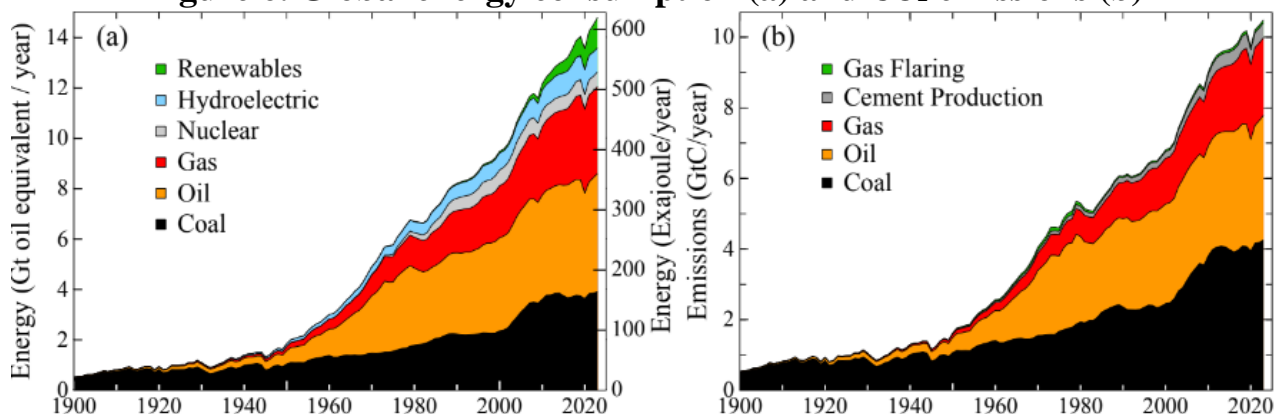
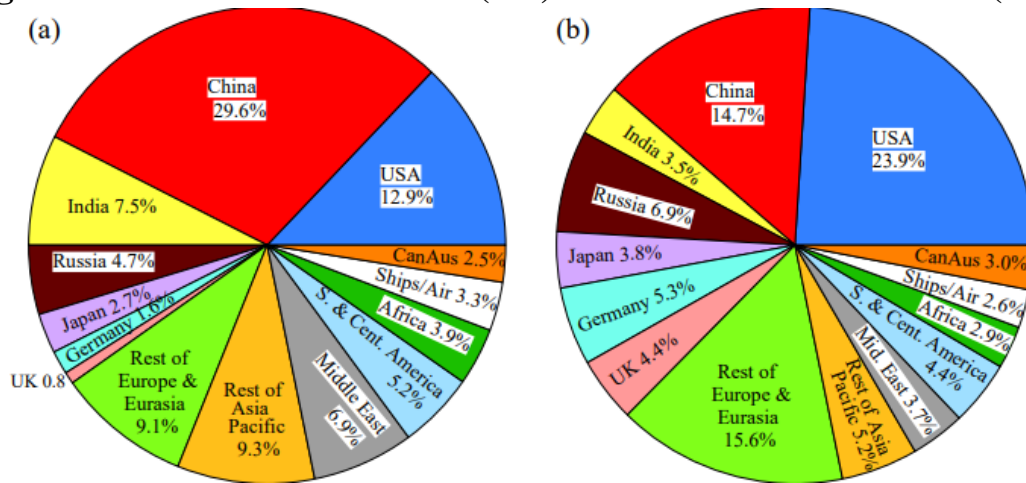


Figure 7. CO₂ emissions in 2022 (left) and cumulative 1750-2022 (right)



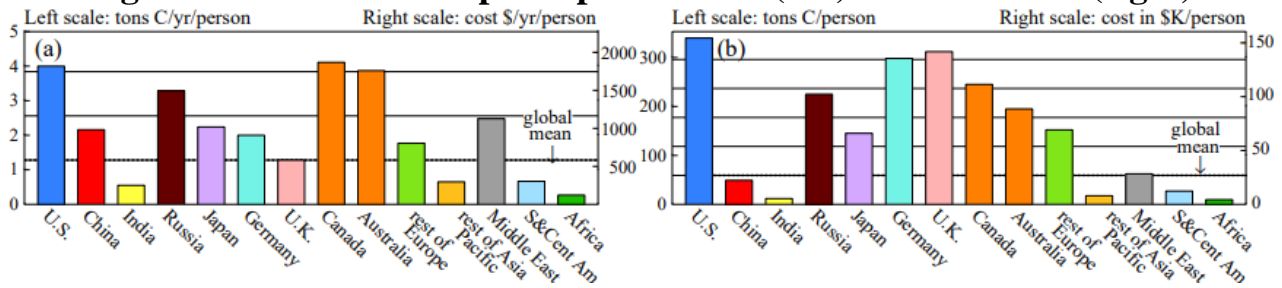
Development of cheap renewable energies is useful, but not a panacea – it will not cause fossil fuels to go away any more than fossil fuels caused wood burning to go away. We are still burning as much wood and biomass as at any time in history. At long last, in just the past couple of years, the United Nations¹¹ says, “oh, we need the help of nuclear power, we should triple nuclear power.” Well, alas, that is easier said than done. It takes time. Renewables had several decades of unlimited subsidy via renewable portfolio standards. Why did we not, instead, have clean energy portfolio standards? Here, we scientists should accept part of the blame. We were well aware that nuclear power has the smallest environmental footprint of the major energies and even old-technology nuclear power saved millions of lives.¹² Nuclear power also has the potential to be inexpensive. But we were too passive, perhaps because we knew that we would be criticized because of unfounded fear and disinformation about nuclear power spread by a gullible media.

That brings me to my final point, the most important point. We understand why things are going haywire, why climate is a threat, why we are not reducing greenhouse gas emissions. The science is clear, but the COP meetings don't even talk about it. Economists agree that CO₂ emissions will not decline as long as the waste products of fossil fuels can be dumped in the air without charge.

It is straightforward for any nation to collect a fee from its small number of fossil fuel sources: domestic mines and ports of entry. The funds should be distributed uniformly to the nation's citizens. This can be done readily via monthly or quarterly additions to debit cards. Most citizens will come out ahead. Wealthy people, with a large “carbon footprint.” would lose some money, but that would help address the universal problem of wealth disparity. The carbon fee can be set to rise at a rate that allows the fossil fuel industry time to invest in clean energies, carbon capture, or other alternatives. In this basic “carbon fee and dividend” system, no funds enter or leave a nation.

However, in addition, justice requires that payments be made to citizens of nations that suffer climate damage that they did little or nothing to bring about. Human-made climate change is caused not by today's instantaneous emissions, but by cumulative historical emissions,^{13,14} as shown in Figures 7b and 8b. These facts must be considered in our search for justice.

Figure 8. CO₂ emissions per capita in 2022 (left) and 1750-2022 (right)



¹ C. Hickman, E. Marks, P. Pihkala et al., “[Climate anxiety in children and young people and their beliefs about government responses to climate change: a global survey](#),” *Lancet Planet Health* 5 (2021): e863-73

² Temperature is from the Goddard Institute for Space Studies analysis described by N.J.L. Lenssen et al., “[A NASA GISTEMPv4 Observational Uncertainty Ensemble](#),” *J. Geophys. Res. Atmos.* 129, (2024) e2023JD040179, and J. Hansen et al., “[Global surface temperature change](#),” *Rev. Geophys.* 48, (2010): RG4004

³ The United Nations Intergovernmental Panel on Climate Change.

⁴ J.E. Hansen et al., “[Global warming in the pipeline](#),” *Oxford Open Clim. Chan.* 3 (1) (2023): doi.org/10.1093/oxfclm/kgad008

⁵ J.E. Hansen, P. Kharecha, M. Sato, G. Tselioudis, J. Kelly, S.E. Bauer, R. Ruedy, E. Jeong, Q. Jin, E. Rignot, I. Velicogna, M.R. Schoeberl, K. von Schuckmann, J. Amponsem, J. Cao, A. Keskinen, J. Li, A. Pokela, “Global warming has accelerated: are the United Nations and the public well-informed?” *Environment*, in press

⁶ J. Hansen, M. Sato, P. Kharecha, “[Global Warming Acceleration: Hope vs Hopium](#),” 29 March 2024

⁷ The warmings are obtained by multiplying the forcing by the response function (Fig. 14 in our *Environment* paper or Fig. 4 in our *Oxford Open Climate Change* paper.)

⁸ Nino3.4 temperature ([equatorial Pacific temperature used to characterize El Nino status](#)) is multiplied by 0.1 so that its variability about the zero line averages the same as the global temperature variability (Figure 19a)

⁹ The light shaded region has less than 60 months of data and thus the result will change as additional data are added, as the graph is nominally based on 60-month running-mean data is inadequate in the most recent 30 months. We are indebted to NOAA Global Monitoring Laboratory for continually updating and making available the greenhouse gas data, e.g., Lan, X., K.W. Thoning, and E.J. Dlugokencky: Trends in globally-averaged CH₄, N₂O, and SF₆ determined from NOAA Global Monitoring Laboratory measurements. Version 2024-

11, <https://doi.org/10.15138/P8XG-AA10> The forcings are calculated with formulae of Table 1 in reference 1.

¹⁰ Hansen J, Kharecha P: [Cost of carbon capture: Can young people bear the burden?](#). *Joule* 2018;2:1405-7

¹¹ The same organization that denied nuclear power the benefits of classification as a clean development mechanism.

¹² P.A. Kharecha, J.E. Hansen, “[Prevented mortality and greenhouse gas emissions from historical and projected nuclear power](#),” *Environ. Sci. Technol.* 47, (2013): 4889-95, doi:10.1021/es3051197

¹³ J. Hansen, M. Sato, R. Ruedy et al., “[Dangerous human-made interference with climate: A GISS modelE study](#),” *Atmos Chem Phys* 7, (2007): 2287-312

¹⁴ H.D. Matthews, N.P. Gillett, P.A. Stott et al., “[The proportionality of global warming to cumulative carbon emissions](#),” *Nature* 459 (2009): 829-32