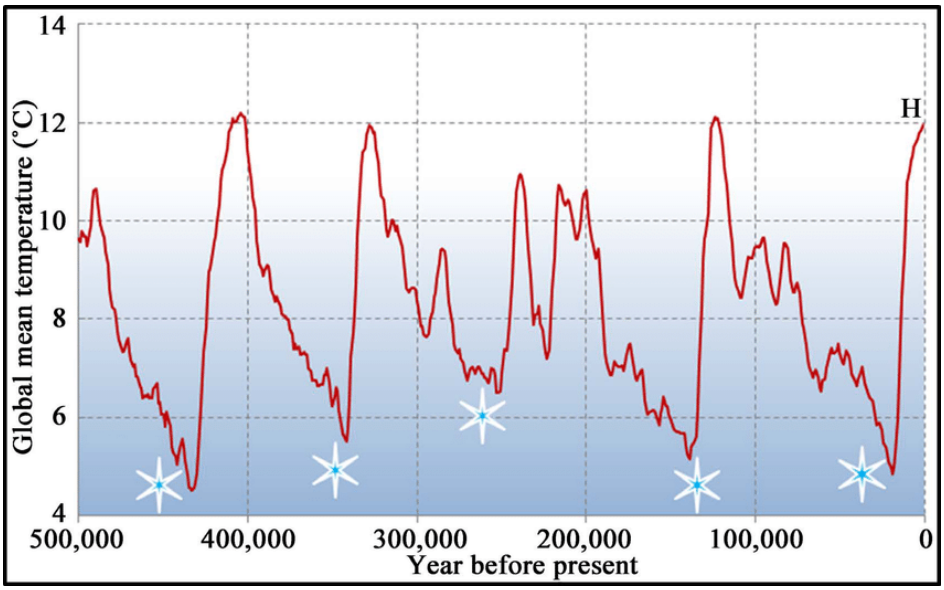
AozoraStep

August 17th 2024

How the climate crisis could be solved instantly

I've been a "climate sceptic" for a long time and had to take a lot of offense for this. But few people actually hear me out on why; everyone is so emotional about this topic. The green house gas effect makes a lot of sense, including to me, but I do think we should continue to be open for other reasons and not forget important influences to climate, such as natural climate change, the movement of the poles, tectonic plates, the earth & sun, volcanic eruptions and even what appears like silly ideas such as the impact of moving resources around the world to build mega cities, even if the probability appears low – always remember, we once used to agree that the earth was flat. However, what makes me most interested in other ideas are the political actions and the Paris Climate Agreement that do not make much sense in tackling this issue and rather lead to failure. Because if it was such a problem, why not solve it? What are the reasons for not going ahead with it? I don't think it would really lead to job losses, but it would definitely be a problem for emerging countries such as China and India and it could be the prime reason for being unable to solve it. It also could be driven by competition for leading technologies or perhaps even by special interests. This note begins by taking a look at the political solution, the problem and an alternative solution, which could solve the climate crisis instantly.

Ice ages over time



Source: Panchuk, K. (2019) Glaciation over Earth's History. Section 4, Chapter 17 of the Book (Physical Geology)

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The problems with the Paris Climate Accord

The Paris Climate Agreement is a mostly non-legally binding agreement that aims to reduce CO2 emissions to hold global temperature increase below 2 degrees Celsius above pre-industrial levels[1]. It has led to a lot of controversy with the U.S. officially withdrawing from the agreement in 2020[2], before re-joining it in 2021[3]. The agreement is mostly based on a "name & shame" philosophy for those countries that do not fulfill their nationally determined contributions (NDCs)[4]. However, it has already led to some major litigations, such as:

1. State of the Netherlands v. Urgenda Foundation: A case that the Dutch government lost in 2019, because of not fulfilling the goal of reducing greenhouse gas emissions (GHGs) by 25% by 2020, which was ruled under Human Rights laws. The Dutch government has since sought to reduce annual flights that is impacting Schiphol[5] and is seeking to spend €1.5bn to buy out farmers in order to reduce emissions[6]
2. Neubauer, et al. v. Germany: A case that the German government lost in 2021, because their goal of cutting GHG emissions by 55% until 2030 from 1990 was deemed insufficient to meet its Paris Climate Agreement targets. The German government then set a new goal to cut 65% in GHGs from 1990s levels by 2030.
3. Milieudefensie et al v Royal Dutch Shell: A case that is still pending and building on the prior win of Urgenda Foundation against the Dutch government. Shell is asked to reduce its CO2 emissions by 45% by 2030 compared to 2010 levels and to zero by 2050, to be in line with the Paris Climate Agreement. The Hague District Court ordered Shell to reduce its emissions by 45% at end of 2030, relative to 2019, and while Shell appealed, the Court made its decision provisionally enforceable.

[1] https://www.un.org/en/climatechange/paris-agreement
[2] https://2017-2021.state.gov/on-the-u-s-withdrawal-from-the-paris-agreement/ , https://trumpwhitehouse.archives.gov/briefings-statements/statement-president-trump-paris-climate-accord/ , https://www.nera.com/content/dam/nera/publications/2017/170316-NERA-ACCF-Full-Report.pdf
[3] https://www.state.gov/the-united-states-officially-rejoins-the-paris-agreement/
[4] https://www.climatechangenews.com/2017/11/02/paris-climate-deal-legally-binding-not/
[5] https://www.businesstravelnewseurope.com/Air-Travel/Dutch-government-to-cut-night-flights-at-Schiphol-and-ban-loud-aircraft
[6] https://www.euronews.com/green/2023/11/30/dutch-farmers-could-be-paid-to-close-their-livestock-farms-under-new-scheme

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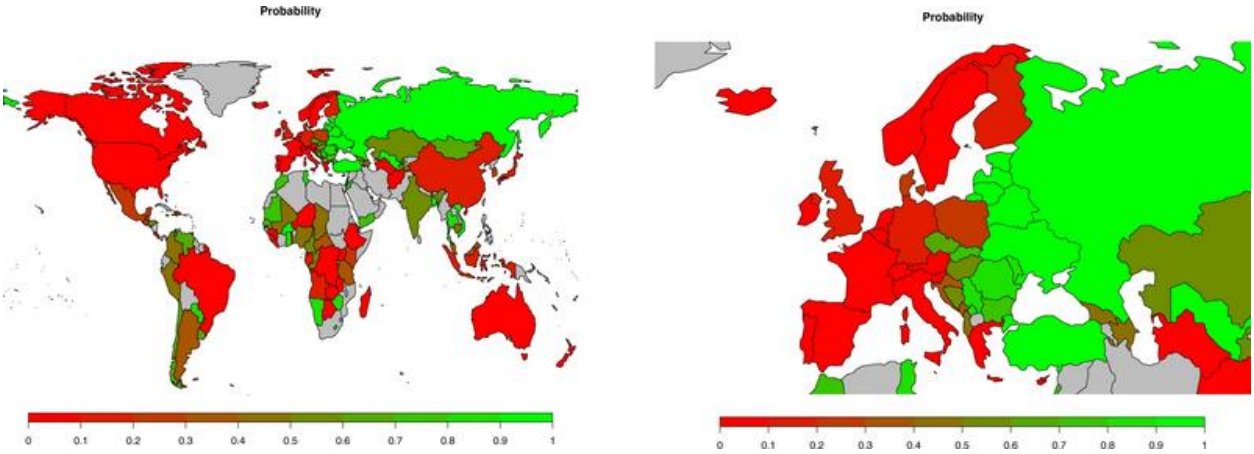
There are hundreds of other pending cases running globally[7] and in the U.S.[8], which could have a profound impact on how business is being done in the years ahead. Ultimately, the Paris Climate Agreement sets the world up for conflict and shifts power away from developed nations towards developing/emerging nations. What the solutions are to reduce GHG emissions peacefully and how the Paris Climate Agreement goals can be met on a global basis will be looked at in the passage.

Probability that countries achieve their Paris Agreement Goals according to their NDCs



Source: https://www.nature.com/articles/s43247-021-00097-8

How CO2 emissions are a function of costs

Nearly 75% of all CO2 emissions are generated through electricity & heat (33%), transport (17%), manufacturing and construction (13%) and agriculture (12%). At the same time, around 94% of the world's CO2 emissions are being generated by coal (41%), gas (32%), and oil (21%). Coal emits nearly 30% more CO2 compared to oil and nearly double the amount compared to natural gas. China is by far the largest CO2 emitter with roughly double the output compared to the United States. However, on a per capita basis China is roughly at half the CO2 emissions compared to the United States, but China has overtaken Europe on a per capita basis in 2015. The reason for this is that China is heavily reliant on thermal coal to generate over 60% of its power[9]. The reason for this is clear: Coal is the cheapest source of electricity in

[7] https://climatecasechart.com/non-us-climate-change-litigation/
[8] https://climatecasechart.com/us-climate-change-litigation/
[9] https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/energy-transition/013124-coal-still-accounted-for-nearly-60-of-chinas-electricity-supply-in-2023-cec

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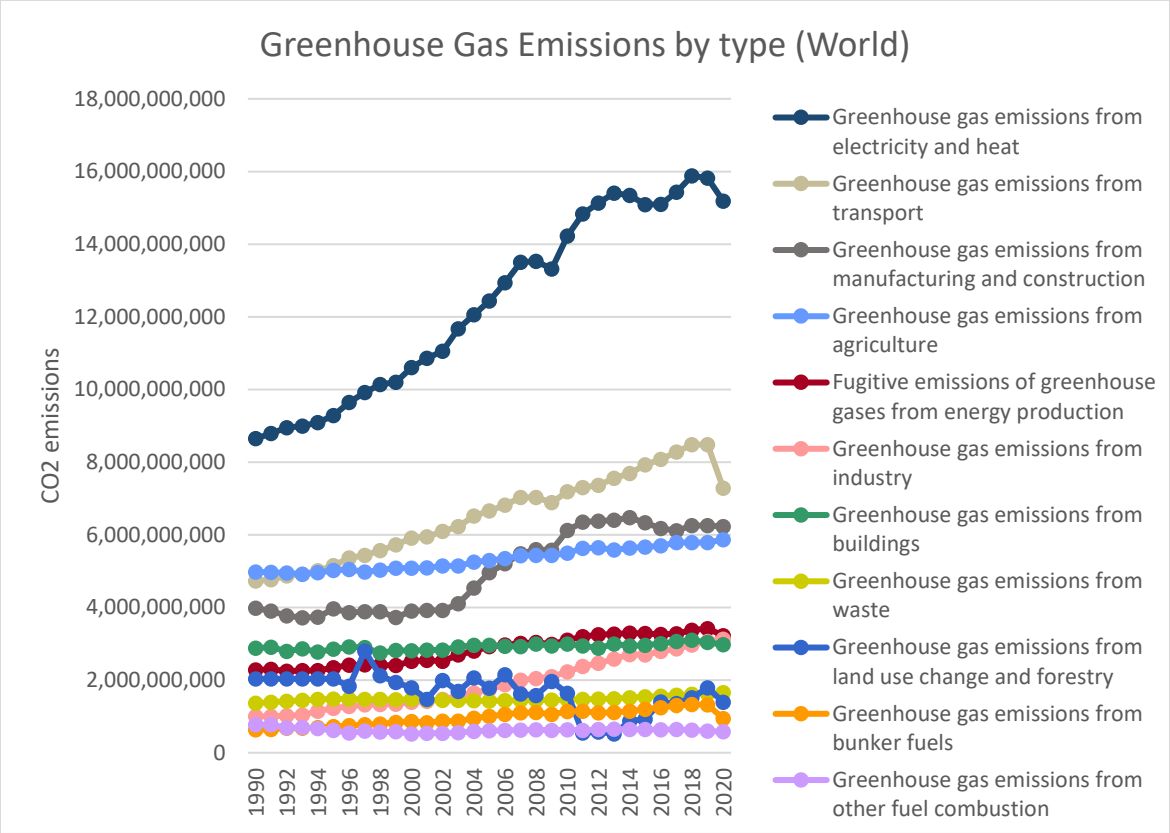
Asia at $0.075 per kWh compared to $0.098 per kWh for LNG. At the same time, the current market price for natural gas in the U.S. amounts to only $0.017 per kWh ($2.15/MMBTU) due to depressed market prices from overproduction in the U.S. shale basins. Hence, the fastest and cheapest way to reduce emissions would be to focus on natural gas production and eliminate thermal coal as an energy source, thereby reducing emissions by half. (All prices are based as of 9th August 2024)



Source: Our World in Data

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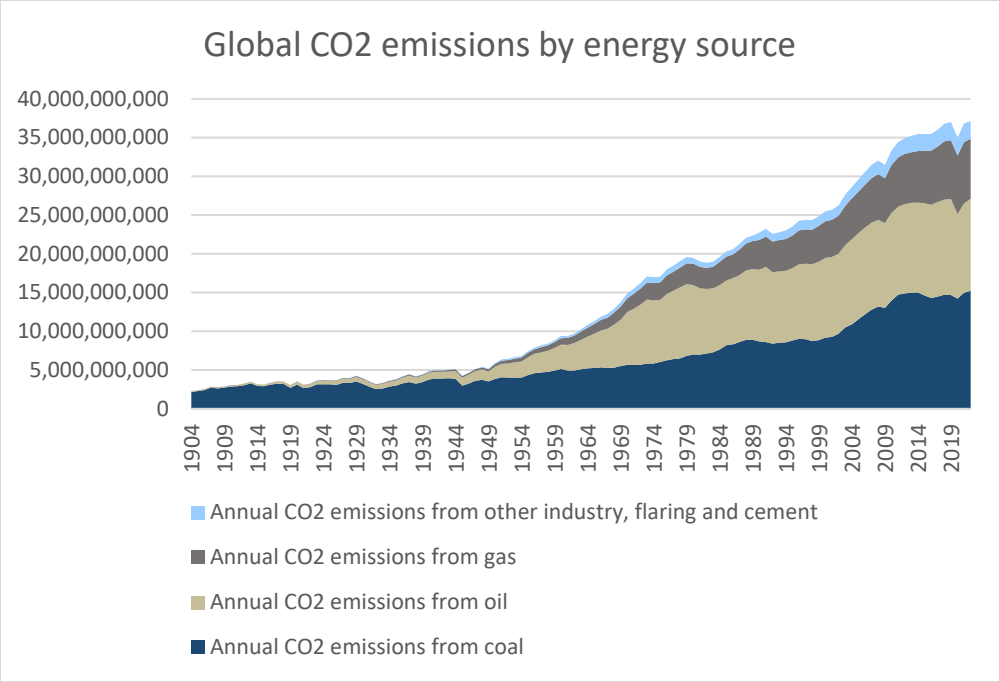

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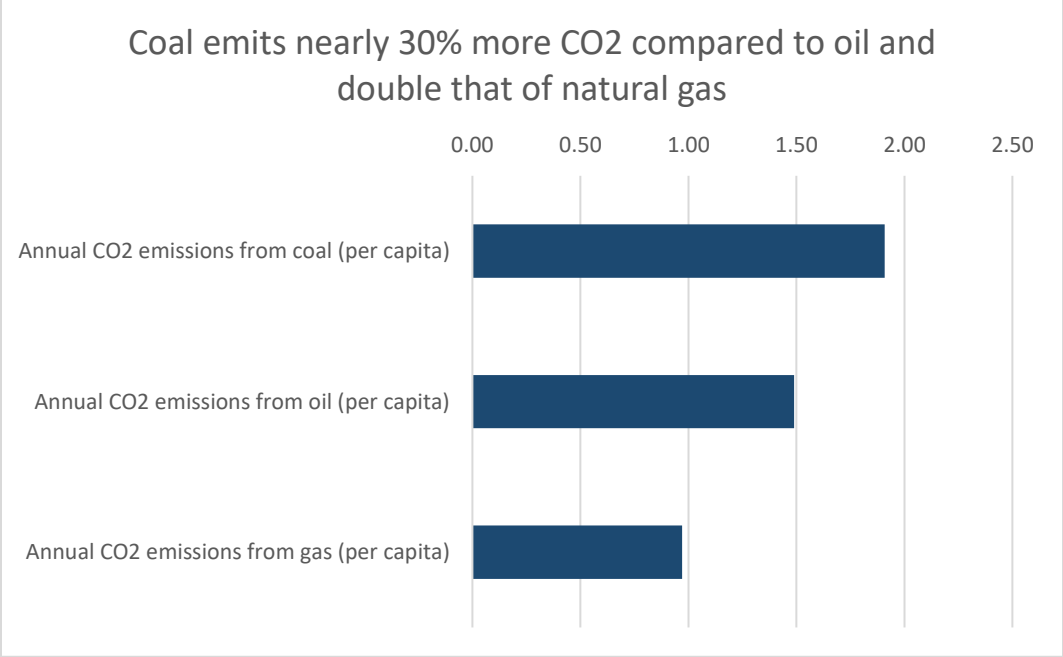

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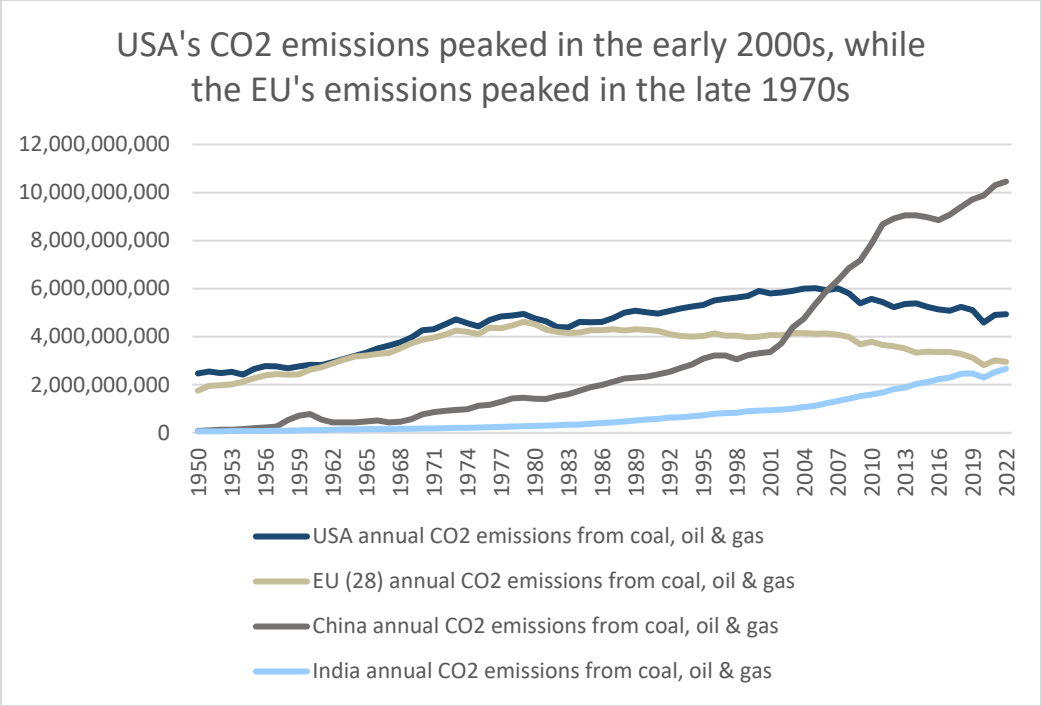

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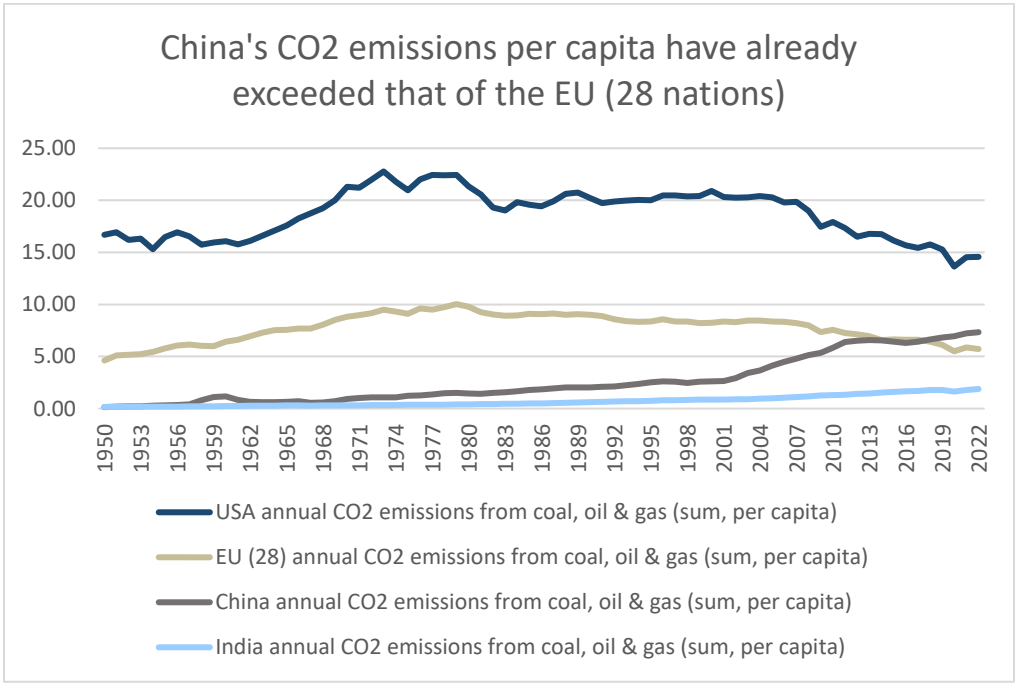

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Energy costs in Asia per kWh by source

Energy source	Power per unit	Current market price in Asia	Conversion	$ Unit price per kWh
Coal	0.88 kWh/pound	$146/MT	2,204.62 pounds	0.075
Natural gas	0.13 kWh/cubic foot	$12.8/MMBtu	1,000 cubic feet	0.098
Petroleum liquids	12.9 kWh/gallon	$1.07/liter	0.2642 gallons	0.314
Petroleum coke	1.18 kWh/pound	$200/MT	2,204.62 pounds	0.077

Source: https://www.eia.gov/tools/faqs/faq.php?id=667&t=6# , market prices from multiple sources[10], as of 9th Aug 2024

How electric vehicles will lead to more CO2 emissions, not less

Numbers don't lie. Therefore, the best way to reduce emissions would simply be by focusing on getting rid of the most pollutant one: Thermal coal. As thermal coal is the largest energy source on the planet, it would require a mixture of natural gas, wind and solar to replace this energy source. Currently, we are focusing on reducing emissions for all sectors, from electricity & heat to transportation to manufacturing and construction and all the other sectors that are displayed in one of the first charts above. Each industry is looking to decarbonize individually to meet the Paris Climate goals, and this could ultimately lead to failure. The biggest mistake I see in this is by moving from the Internal Combustion Engine (ICE) to Electric Vehicles (EVs). Because we already need to replace 41% of CO2 emissions from coal with a lower carbon intensive energy source, hence by seeking to reduce emissions from oil (21% of CO2 emissions) at the same time would require even more natural gas, wind and solar energy. The supply and demand dynamics of this would ultimately lead to more coal being used to drive your EV. Electrifying the energy grid only makes sense where coal is no longer part of the energy system. However, the most populous and growing nations of the world, such as China, India, Indonesia and South Africa all have the vast majority of their energy needs coming from coal. The same would be true for Germany, the United States or Australia – all major driving nations.

[10] https://tradingeconomics.com/commodity/coal, https://www.reuters.com/business/energy/asia-spot-lng-prices-remain-7-month-high-amid-russian-supply-concerns-2024-08-09/, https://www.globalpetrolprices.com/China/diesel_prices/, https://www.echemi.com/productsInformation/pd180810140706-coke-petroleum.html

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Top 25 Coal Power Countries

Ranking of countries by coal generation (TWh) in 2020

EMBER

Rank	2019-2020	Country	Coal generation (TWh)	Percentage of electricity production	Change 2015-2020 (TWh)
1		China	4631	61	
2		India	947	71	
3		United States	774	19	
4		Japan	274	29	
5		South Korea	192	36	
6		South Africa	191	86	
7	▲*	Indonesia*	168	60	
8		Russia	155	15	
9	▲	Vietnam	141	53	
10		Australia	135	54	
11	▼	Germany	134	24	
12	▲	Taiwan	117	44	
13	▼	Poland	110	70	
14		Turkey	99	34	
15		Kazakhstan	72	70	
16		Malaysia*	67	41	
17		Philippines	49	50	
18		Canada	45		
19		Ukraine	38	28	
20	▲	Thailand	35	20	
21	▼	Czechia	32	40	
22		Pakistan	29	20	
23	▲	Serbia	25	70	
24	▼	Brazil	22		
25		Israel*	22	33	

Source: Ember Global Electricity Review 2021 • *For Indonesia, Malaysia and Israel, 2019 is used as no 2020 data exists.

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How to get rid of coal as a source of energy

The realistic way of reducing CO2 emissions would be to use new wind and solar installations including battery storage for intermittency solely for reducing emissions for electricity use in buildings and manufacturing, natural gas for heating and once these targets are met to export this less carbon intensive energy to countries with more carbon intensive energy sources for these sectors. The problem is again supply & demand dynamics, as it would make thermal coal even cheaper, incentivizing its use. Therefore, the Paris Climate Accord should have its first goal to eliminate coal as an energy source and prohibit countries from shifting back to coal due to economics. Those countries that have already eliminated coal as an energy source, should not look at transitioning to EVs. Instead, the focus should lie on gasoline powered hybrids and rather seek to decarbonize the energy grid with renewables first. Transportation should come as the very last industry to decarbonize, as it is the industry where the most energy efficiencies can still be gained, and most importantly, it could jeopardize the whole decarbonization of all other industries by boosting electricity demand way above supply due to oil not being a suitable substitute for use in electricity. This essentially means that we replace coal with natural gas and almost our entire energy demand growth comes from renewables, including nuclear, wind, solar and biofuels, while oil consumption continues to grow at an average which is similar to the last 5 years, which included the pandemic. Take a look at the charts below with figures from 2024 being modelled/forecasted under these assumptions. The result is first class, as under these scenarios we would instantly reduce CO2 emissions and the share of energy from renewables would double, while natural gas would increase by 60% and oil decline by nearly 20% and coal being completely eliminated.

Energy consumption by source as % of total share

Year	Oil consumption - % of total	Coal consumption - % of total	Gas consumption - % of total	Renewables, incl. hydropower, nuclear, wind, solar, biofuels and other renewables consumption - % of total
2023	31.7%	26.5%	23.3%	18.5%
2050*	25.9%	0.0%	37.0%	37.1%

Source: Our World in Data, * = estimated under above described assumptions

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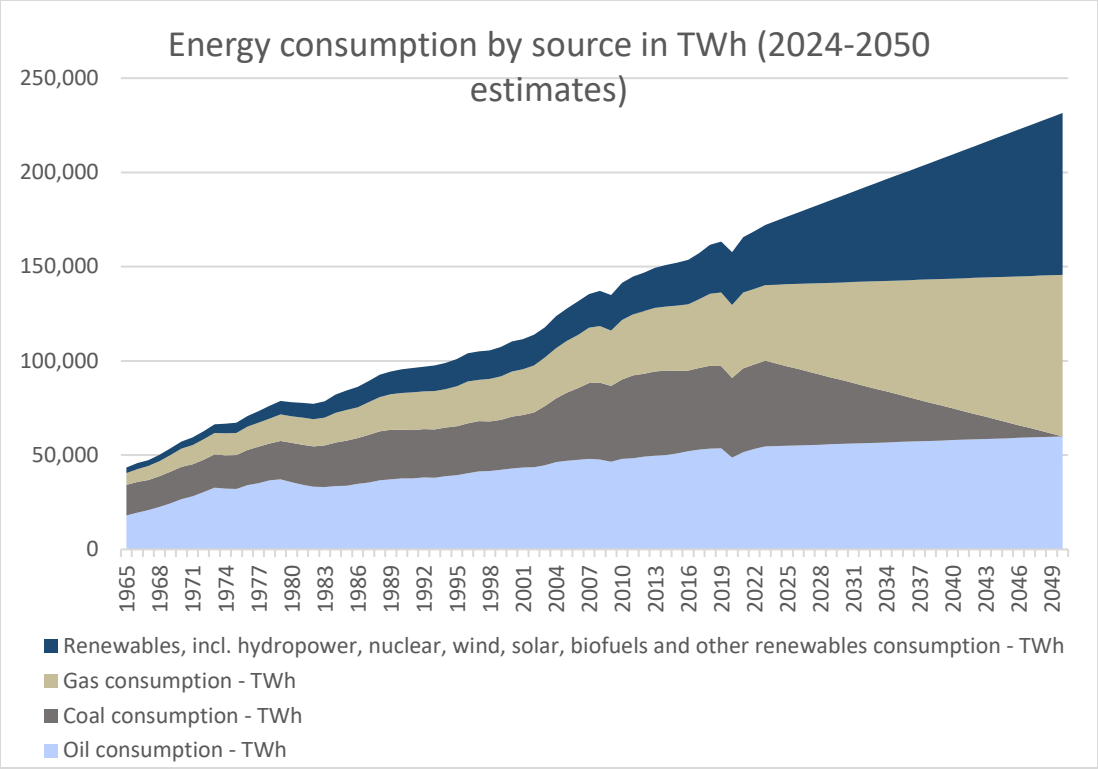

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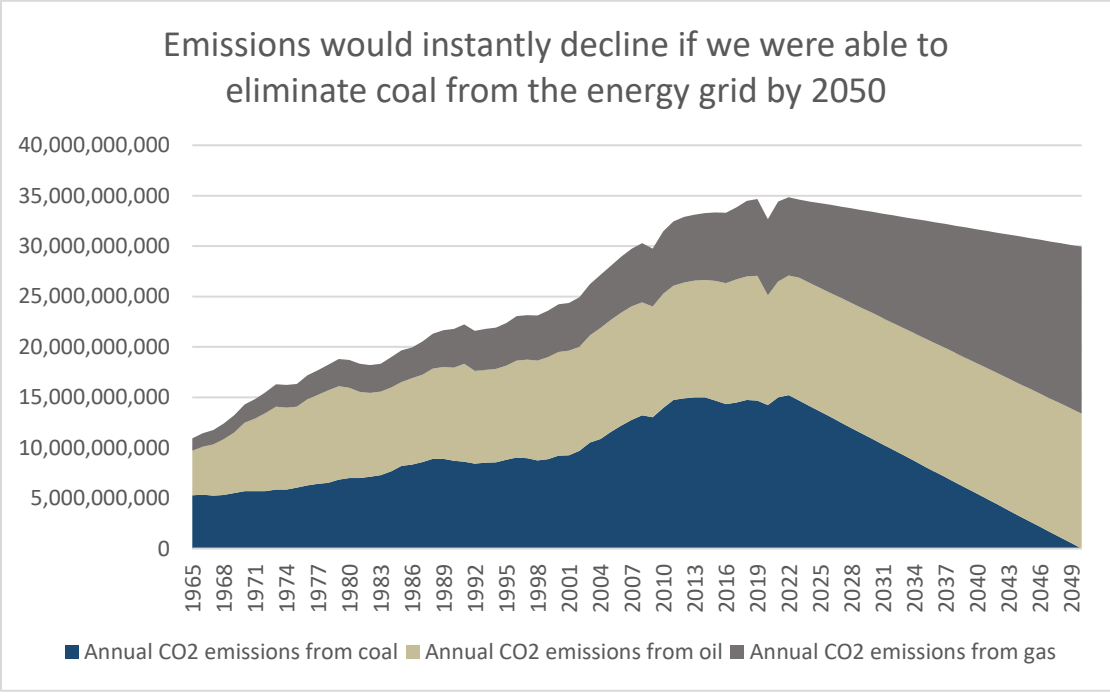

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Energy consumption by source as % of total share

Year	10-year energy consumption growth
1975	55%
1985	26%
1995	20%
2005	27%
2015	19%
2025*	16%
2035*	12%
2045*	11%

Source: Our World in Data, * = estimated under above described assumptions

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