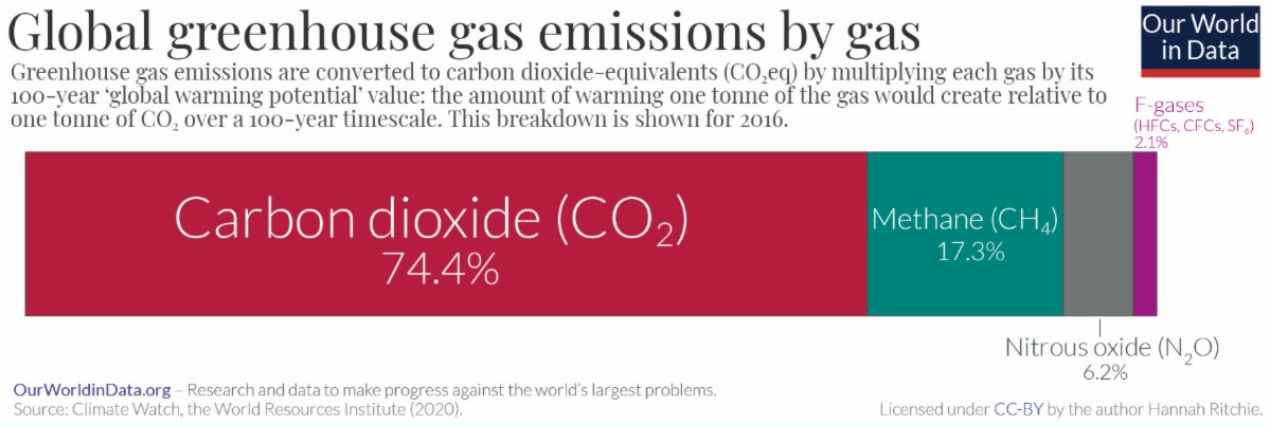
the weekly anthropocene

Dispatches From The Wild, Weird World Of Humanity And Its Biosphere

February 16 2022

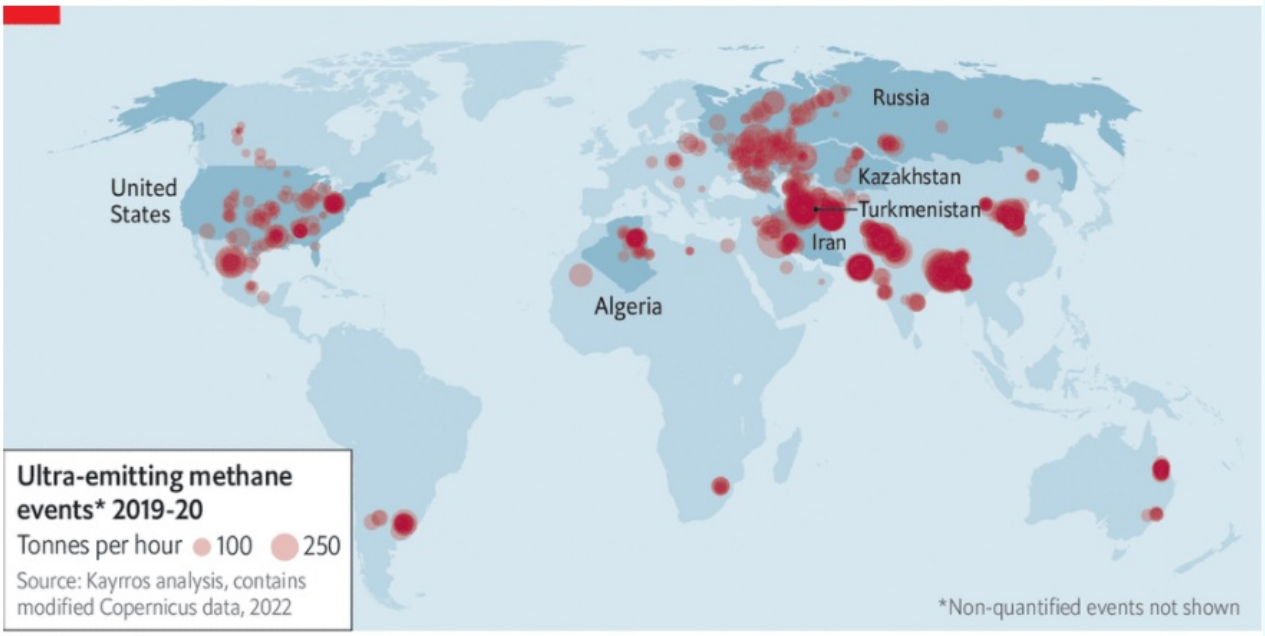
Methane



All greenhouse gases are not created equal, and there are a lot of differences between carbon dioxide (the most commonly emitted greenhouse gas) and methane (the second most common) in particular. Human civilization emits a lot more carbon dioxide than methane (see the breakdown above), *but* methane traps over twenty times as much heat per molecule over a 100-year period, *but* methane only stays in the atmosphere for about ten years, while CO_2 stays in the atmosphere for about 300 to 1000 years. And methane emissions have been increasing even faster than CO2 emissions **passing 1,900 parts per billion in 2021**, nearly triple preindustrial levels. For context, CO_2 levels are now at 418 parts per million (note the *million* there, one part per million is 1000x more than one part per billion), up from 280 ppm in the 1800s.

Now, new research is suggesting than methane is even more important than we thought. For example, did you notice anything odd in that last paragraph? Methane traps over 20 times as much heat as CO2 over a 100-year period, but it only stays in the atmosphere for about ten years. This discrepancy in time period terminology is because the US EPA compares greenhouse gases, like CO2, methane, and more minor ones like nitrous oxide, based on their effects over a 100-year period. However, using this as the yardstick means we "average out" methane's impact per unit of mass over a longer period, during much of which it's not even in the atmosphere, so we pay less attention to the dramatic short-term impact of methane. Researchers are increasingly calling for the EPA to measure methane's effects based on a 20-year period, over which methane traps ***81 times***

as much heat as carbon dioxide, or a 24-year period, over which it traps 75 times as much heat. The 100-year timeframe isn't *wrong*, per se. Because methane does go away faster, it does have less of an impact when you look at it in a hundred-year timeframe. But when you zoom in on the next few decades, a critical period for changing our emissions trajectory and determining Earth's future climate, methane looks more important.



Furthermore, a new study in *Science* (here's the paper available for free) used satellite data to find 1,800 "ultra-emitting" events in 2019 and 2020, where 25 tonnes or more of methane were emitted per hour. (Pictured above: a map of those events). These were mostly from oil and gas wells or pipelines, many from accidents or leaks, and added up to 8 million tonnes of methane per year, with a climate impact about equal to the carbon footprint of 18 million Americans. A shockingly large amount of these ultra-emitting sources, emitting 1.3 million tonnes of methane per year, were in Turkmenistan, a tiny Central Asian dictatorship (probably due to *really* poorly maintained Soviet-era pipelines and wells). This study shows that fixing a few broken oil and gas wells and pipelines might be a cheap way to cut emissions quickly, and also that the world should pay a lot more attention to aging infrastructure in Turkmenistan.

In sum, in addition to decarbonizing our electricity sector and industry to reduce carbon emissions, plugging leaks in fossil fuel wells, pipelines, and mines (as well as reducing emissions from the other major source of methane, agriculture) will be key to stopping a short-lived but powerful greenhouse gas pollutant. (The ever-underrated Biden Administration has already devoted $1.15 billion from the Bipartisan Infrastructure Bill to capping abandoned methane-emitting oil and gas wells in the United States!). The good news here is that unlike burning carbon-dense fuels, no one's making money off "waste" methane leaks, so it should in principle be easier to stop. Keep an eye out for methane-related news in the future-it's important, and an opportunity for substantial, relatively painless climate progress!

Renewables Revolution: Dispatches

Reliance Industries (the massive multi-industry conglomerate led by Indian billionaire Mukesh Ambani, the richest man in Asia) has announced plans to invest $76 billion over the next 15 years in clean energy projects in the Indian state of Gujarat. This will include a wide array of classic renewables projects as well as supply-chain efforts like new factories making solar modules and storage batteries.

Georgia Power, a major American utility that provides electricity to 2.7 million people and has historically been a major coal power advocate, announced that it will close all of its coal plants by 2035. It also announced plans to double its renewables generation capacity, adding 6,000 megawatts of new renewables by 2035, and to operate a 1,000 megawatt energy storage facility by 2030. One more chapter in the epic saga of the fall of coal and the rise of renewables in America!

Right on the heels of the Georgia Power announcement on January 31, major utility **Duke Energy** (serving much of North Carolina and parts of Florida and the Midwest) made an almost identical commitment on February 10th, declaring that they would close their 11 remaining coal plants by 2035, spend over $100 billion on renewables projects, investments, and grid overhauls in the next ten years, and increase their solar and wind capacity from 10,000 megawatts today to 24,000 megawatts by 2030.

The **U.S. Army** released its **first-ever climate strategy**. Their plans include electrifying non-tactical Army vehicles (i.e. supply trucks, not fighter jets), analyzing Army supply chains for vulnerabilities to climate risks, attaining net-zero

emissions from all Army procurements by 2050, installing a self-contained microgrid on every army installation (which has security benefits as well) by 2035, and generating or procuring enough renewable energy for all Army installations' power needs by 2040. (Pictured above: solar panels of the currently in construction renewable microgrid at Fort Hunter Liggett in California). Here's their summary report.

And **Eastern Pacific Shipping**, a commercial shipping company, announced that they will not carry coal in any of their vessels. They haven't even had the occasion to do so since 2020-they're just making it official!

Furthermore, the tech just keeps on getting better!

The US Department of Energy is building the country's first large-scale facility to extract key renewables-revolution minerals like nickel and cobalt from coal ash. It should be operational by 2028.

Decarbonizing steelmaking, with electric-arc furnaces replacing coal-fired blast furnaces, is taking off in Europe. This was unproven tech just a few years ago, now it's on the way to becoming the industry standard!

And companies ranging from established shipping company Maersk to startups Oasis Marine Power are working on how to turn proliferating offshore wind farms into charging stations for electric ships and boats, using newly invented "charging buoys." (Pictured above: Maersk concept art of their Stillstrom buoy in use).

Any of the above news items would have been shocking and epoch-making in, say, 2014, and now a bunch of them fly under the radar every week. This writer has been following renewables news since 2009, and is continually amazed by just how fast the pace of progress has gotten. In sum, despite some short-term concerning indicators like energy price shocks leading to local upticks in fossil fuel use and continued lack of progress by the US Congress on the next steps for

renewables, there is still an incredible confluence of investment, technological advancement, and smart decision-making moving forward the renewables revolution!

Postscript: two more articles worth reading. A great summary of how the renewables revolution has already put us on track to avoid the RCP 8.5 "worst-case" warming pathway, and a study finding that ending all extreme poverty worldwide would increase global emissions by less than 1%!

Kerguelen Islands

On the sub-Antarctic islands of Kerguelen, ecologists are affixing electric sensors to southern elephant seals (*Mirounga leonina*, pictured with sensor). Each of the little antenna-bearing boxes has a host of sensors, gathering data on everything from water salinity to oxygen levels to sea ice formation nearby. “If we know what’s happening in the High Antarctic Ocean, we have a much better grasp of global climate processes,” said researcher Dr. Clive McMahon.. “Obtaining high latitude observations is critical. Elephant seals can dive up to 2000 meters [6,600 feet] and have the fantastic ability to access platforms like coastal shelves that other platforms are unable to easily reach.” The sensors do not hurt the seals and are attached only to their hair, which they shed every year.

This is just....*so cool.* Elephant seals are using their amazing natural abilities to unknowingly gather data on their changing ecosystem, and help humanity better understand the future of the world! Awesome work.