**We all know about the ozone layer, don’t we? It’s the thing that stops us all getting skin cancer from exposure to ultra violet light isn’t? And we all know that, back in the eighties, when ‘damaging the environment’ was all the rage, we managed to fill the atmosphere with chemicals that blasted a massive, continent sized hole in the ozone layer and our scientists had to explain to our politicians that if we didn’t stop doing that then they and their children would die along with most other organic life forms on the planet. That seemed to do the trick. Our politicians all agreed to ban the chemicals that were causing the problem. The chemical companies all found a safer alternative to use instead. The hole in the ozone layer went away, and all life on earth was saved. The end.**

**Hello and welcome to Just Have a Think**

**If only life was as simple as I just described it, eh?**

**What I said was partly true, to be fair. Scientists really did identify the chemicals that were causing the ozone problem and politicians really did work together to get them banned. But the rest of it isn’t quite as cut and dried as I made out.**

**Let’s rewind a bit and take another look.**

**Ozone is a gas made up of three oxygen atoms. The majority of it can be found in our planet’s stratosphere, which is an atmospheric layer that starts about 8 miles above the surface and goes right up to about 30 miles high. The really handy thing about ozone is that it absorbs the harmful ultra-violet radiation reaching our planet from the sun. If the ozone layer wasn’t there, then the sun’s rays would effectively sterilise the planet, and all life forms would get fried. And that would be inconvenient.**

**By an unfortunate twist of fate, way back in the early part of the twentieth century, some very clever engineers discovered that they could replace extremely toxic gases like ammonia and methyl chloride in first generation refrigerators and air conditioners with a new class of gases that were apparently completely harmless to living things. Those same gases made excellent propellants in things like aerosols because they could be pressurised into containers and would expand rapidly on exposure to the air. That’s exactly what you want if you’re spraying your arm pits or freshening up your lounge or zapping some bugs, or any number of other applications where a rapid jet of atomised fluid is required. And it turns out there were an awful lot of applications, not just in domestic homes, but in all sorts of industries too. These new wonder gases were called chlorofluorocarbons, or CFCs. As the name suggests, they contained chlorine, and it just so happens that chlorine reacts very readily with ozone.**

**The world wasn’t aware of that at the time though, so as far as we knew there was no need to be particularly careful about the way we filled up our cooling systems or aerosol cans with CFCs, or how we disposed of the units when they reached the end of their operational lifetimes. The result of that collective ignorance was the release of truly industrial quantities of chlorofluorocarbons up into our atmosphere for several decades.**

**Meanwhile… down at the south pole, as winter approaches each year, a very strong wind starts to revolve around the vast continent of Antarctica.**

**It’s a polar vortex just like the one that northern hemisphere weather people are always telling us about above the north pole during the winter time up here.**

**And as Antarctic winter temperatures drop down to about seventy-eight degrees Celsius below freezing, very specific cloud formations begin to bubble up in the polar stratosphere, which are, unsurprisingly, called Polar Stratospheric Clouds.**

**Those conditions are typically still there right into late winter and early Spring as the sun starts coming back around to add it’s UV rays into the mix.**

**So, what’s that got to do with CFCs then?**

**Well, it turns out that the Antarctic polar vortex and polar stratospheric clouds are really good at trapping in large concentrations of those CFC gases which can then be broken down by the strengthening springtime sunlight. The liberated chlorine is then free to steal one of the atoms from ozone molecules, leaving behind oxygen, which doesn’t absorb UV light. That reaction keeps happening as long as those atmospheric conditions persist, until the ozone eventually disappears completely. So, each winter a larger and larger ozone hole was forming above Antarctica.**

**As the seasons progressed into Spring and Summer the polar vortex would break down, the ozone depleted air would drift away to form part of the general planetary atmosphere and the hole would close up again. The ozone depletion didn’t go away though, it just got more spread out.**

**Our nineteen-eighties scientists discovered this localised phenomenon during scientific research expeditions to the south pole. They also found that one chlorine atom can destroy a hundred thousand ozone molecules and that CFCs can survive in the atmosphere for more than a hundred years. So, it was pretty clear that, if immediate action wasn’t taken on a global scale, the entire planet’s atmosphere was at risk of ozone depletion within decades.**

**All of that led to the historic Montreal agreement of nineteen-eighty-seven, which banned the use of CFC gases, and which has now been signed by every single nation on the planet.**

**Within the space of only four years the entire global chemical industry had switched from chlorofluorocarbons to hydrofluorocarbons or HFCs, which contain no chlorine and don’t destroy the ozone layer. There was a slight further wrinkle when we discovered that HFCs are an extremely powerful greenhouse gas, so in twenty-fifteen the Montreal agreement was updated with something called the Kigali amendment which led to the phase out of HFCs as well.**

**But thank goodness the initial problem was discovered when it was, and dealt with quickly because even now decades later, those long- lived CFCs from the twentieth century are still present in our atmosphere and they’re still being released from very old, scrapped refrigerators and other CFC filled containers in badly managed landfills. So, even after more than thirty years we still see a very large ozone hole forming over Antarctica every winter. Imagine what state we’d be in now if our politicians had failed to act back then!**

**This analysis published by the US National Oceanic and Atmospheric Administration, or NOAA in September twenty-twenty-two tells us that the overall concentration of ozone depleting substances in the mid-latitudes has now fallen by more than fifty percent. But the report also finds that the pace of reduction over Antarctica has been much slower, with only a twenty-six percent decline to date. NOAA’s Global Monitoring Laboratory Senior Scientist, Stephen Montzka, said**

**“It’s great to see this progress. At the same time, it’s a bit humbling to realize that science is still a long way from being able to claim that the issue of ozone depletion is behind us.”**

**Which I guess reiterates just how important it was that the world took urgent action when it did.**

**So how come our governments acted immediately and effectively thirty five years ago when they were alerted to the medium and long term consequences of releasing chlorofluorocarbons into the atmosphere, but didn’t act in the same way thirty five years ago when they were alerted to the medium and long term consequences of releasing greenhouse gases into the atmosphere? After all the science of accelerated atmospheric warming due to human emissions of greenhouse gases is just as clear and uncomplicated as the science of ozone layer depletion. It can be measured and quantified just as easily, and its effects are just as scientifically demonstrable.**

**Well firstly the consequence of ozone depletion was very easy for us all to understand…the perception in the collective public psyche at the time was that, without an ozone layer, we’d all get skin cancer. It was an immediate and very tangible existential threat. And of course, as soon as you mention cancer, people tend to stand up and demand action.**

**Secondly, governments could see that the problem was global not local and that unless all nations applied the same remedy, the problem would not go away.**

**Thirdly and probably most significantly, it was easy for industry to find alternatives to CFCs. That meant that manufacturers were able to almost seamlessly move from the old gas to the new replacement with virtually no upheaval and no threat to their long-term business model.**

**By contrast, a warming atmosphere was a much harder concept to convey to people back in the eighties. There was no perception of an immediate threat like skin cancer. Instead, it required the ability and willingness to think ahead logically to a far-flung future time - perhaps as far away as the twenty-twenties, when the runaway effects of climate change would really start to kick in. And that simply wasn’t close enough to home to motivate the public into action.**

**That public inertia wasn’t helped by the fact that our governments simply could not agree on the global nature of the predicament, or the scale of action required to fix the problem.**

**But arguably the biggest difference was that, unlike the relatively easy fix of swapping out one refrigerant gas for another inside the same machines on the same production lines to repair the ozone layer, reversing climate change required the rapid phase out of fossil fuels and a huge ramp up of low carbon alternatives like hydropower, geothermal, nuclear, and renewables like wind and solar combined with a global move away from internal combustion engine vehicles and towards electrically powered replacements. And that scenario was simply not acceptable to the people who ran the fossil fuel industry. So, we got all the false reporting, PR campaigns, billion-dollar political lobbying and professional denialism that are now so well documented. If you’ve got access to the BBCs iPlayer then I would urge you to have a look at their recent three-part documentary on the subject. And if you want an especially comedic potted history of just how insane the fossil fuel propaganda machine was and still is, then you can click up there to watch Rollie Williams video all about it for his channel Climate Town. It’s well worth a watch.**

**So, our global hooliganism continues and the conditions that make our little planetary playground safe continue to worsen. As the cliches goes, it’s very much like a lumberjack using his favourite chain saw to chop off the branch he’s standing on. It’s just not a smart move.**

**Before I go, I just want to give a big shout out to a brilliant NEW YouTube channel called Planet Proof, which casts a critical eye over the brands that we use in our everyday lives, to assess how well or otherwise they’re taking their climate and environmental responsibilities. The videos are extremely well researched and very professionally produced, so I recommend you check them out. Getting a new channel up and running on YouTube is not an easy thing to do nowadays, so if you can give them your support by subscribing to their channel, I’m sure they would be extremely grateful.**

**That’s it for this week though. A massive thank you, as always, to our fantastic Patreon supporters who help me maintain the channel’s independence and keep all my videos completely free of ads and sponsorship messages. And I must also just give a shout out to the folks who’ve joined recently with pledges of ten dollars or more a month. They are**

**David Yaggi**

**Mark Simpson**

**JJ Moran**

**Patrick Kennedy**

**Mark Wetzels**

**Guy Smith**

**Maickel Wand**

**Hans Persson**

**Aaron Willett**

**Manizheh and Nick**

**Randy Moory**

**Lesley Waldron**

**And of course, a big thank you to everyone else who’s joined as well.**

**If you feel you could support my work for about the price of a coffee each month, and if you’d like to watch exclusive extra video updates from me, and have your say in future videos via content polls, then you can find out how to do all that by visiting**

**Patreon dot com forward slash just have a think.**

**and you can really help us too by subscribing and hitting the like buttons and that notification bell if you haven’t already done so. It’s what gets us noticed by the dreaded YouTube algorithm, so your support is hugely appreciated. You can do that completely for free by clicking down there or on that icon there.**

**As always, thanks very much for watching, have a great week, and remember to Just Have a Think.  
See you next week**