**There’s an app for everything nowadays isn’t there. There are even apps to calculate how many tons of carbon dioxide your lifestyle is responsible for each year. Most of them give you a few tips on how to reduce your carbon footprint and then offer you an offset option like paying a few pounds a month to help save a forest in Asia or buy cookstoves in Africa.**

**I’m quite sure the proprietors of these apps are acting in good faith, but the concern with offset schemes like these is that they don’t tend to drive the right behaviour in us consumers. Too many of us skip over the ‘how to reduce your carbon footprint’ section and go straight for the sacrificial offering option, safe in the knowledge that it’s perfectly affordable, and it allows us the opportunity at the next dinner party to tell all our friends how many trees we’ve personally planted somewhere in the middle of South America.**

**It’s a tricky moral maze for anyone to navigate on a personal domestic level, but when you scale that mind-set up to the world’s vast behemoth corporations, the risk is that those companies realise that rather than spending millions or in some cases billions of dollars doing the right thing and fundamentally rearranging their operating structures to genuinely reduce their carbon emissions, they can spend far fewer millions of dollars on huge carbon offsetting schemes that not only get them off the hook with regulators but also score them some valuable free PR brownie points. So many companies are now jumping on this bandwagon that according to the Intergovernmental Panel on Climate Change and a new report recently published by Greenpeace, the world may soon have allocated all the remaining land on the planet that can be used for carbon reduction schemes like afforestation and reforestation. Once that happens, and the big companies haven’t actually reduced any of their own emissions, then what do we do?**

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

**The IPCC tell us that to achieve the 1.5 degrees Celsius goal that everyone keeps talking about, the world would need to reach net zero carbon no later than 2050. Given that we currently spew out forty billion tonnes of the stuff every year, that seems like a pretty tall order!**

**There’s a wide range of possible pathways that the IPCC have set out for the coming decades. All of them rely on atmospheric carbon dioxide removal to a greater or lesser extent and the IPCC seem to particularly favour a technology called Bioenergy with Carbon Capture and Storage, or BECCS . Pathway number one is a sort of best-case scenario where we all find religion and mend our ways immediately. Pathway 2 assumes a moderate shift towards sustainable behaviours and international cooperation.**

**The third pathway assumes that societal and economic trends follow historical patterns, with the resulting growth in energy demand being offset mostly by BECCS.**

**And the 4th pathway is a bit of an unmitigated disaster resulting in us not achieving 1.5 degrees at all.**

**So the spotlight has fallen upon the world’s largest corporations to get their act together and implement plans to get them to net carbon zero no later than the 2050 target date.**

**According to this latest briefing paper from Greenpeace, more than three hundred companies have now signed something called the ‘Business Ambition for one point five degrees pledge’, and initiatives involving more than a thousand companies are now part of the UN Race to Zero campaign.**

**Of course, it’s a lot harder for a company like an airline to reduce it’s emissions than it is for, say a power company that can switch to renewable technologies, so the IPCC and the International Energy Agency provide a simple guide to how much CDR offsetting should be allowed for a given industrial sector relative to their current emission levels, ranging from twenty percent for car manufacturers through to forty five percent for the chemicals industry**

**But the general consensus is that aggressive emissions reductions should always be the first option pursued by businesses and that carbon dioxide removal schemes should only ever be utilised to off-set emissions that are the most difficult to eradicate at source.**

**Some of the very forward-looking companies, even in the hard-to-abate sectors have committed to targeting the most carbon heavy areas of their business to reduce their impact as quickly as possible.**

**Heidelberg Cement plans to offer CO2 neutral cement by 2050 rather than relying on carbon offsets.**

**Steel maker ThyssenKrup aims to be directly carbon neutral in their operations by 2050.**

**Shipping giant Maersk has committed to net zero operations by 2050 without offsetting, including a fleet of net zero ships by 2030.**

**Unilever, who have a hundred and fifty thousand employees and 400 brands in a hundred and ninety countries, already source all their grid purchased electricity from renewable sources and are committed to sourcing a hundred percent of the company’s total energy usage from renewables by 2030.**

**And there are plenty of other examples.**

**At other end of the scale though we’ve got companies like Royal Dutch Shell who seem intent on buying up every tree on the planet to salve their conscience, and good old British Airways, who plan to be offsetting ninety five percent of their current emissions even in 2050.**

**So what do these CDR schemes look like?**

**Well, the simplest and cheapest form of Carbon Dioxide Removal is growing trees. It’s a natural process that doesn’t rely on new technologies. In total, there are about five hundred million hectares of previously-forested and currently unused land around the world that could be available for reforestation without necessarily impacting food or biodiversity. That amount of land could potentially remove about three point seven billion tonnes of CO2 per year. But the amount of CO2 removed from the atmosphere depends on the stability of any new forest, the mix of different tree species that are planted and on what the land was previously used for. If, for example, a huge tract of land that already had a rich ecosystem was planted with a single species of tree, then the net effect could be to increase emissions rather than decrease them. Plus, there’s a growing proportion of land around the world that’s already becoming vulnerable to the worst ravages of climate change. Planting in those areas without very intensive nurturing and intervention may result in the trees dying, as has already happened in some areas. And of course, there’s always the risk that human conflict or just plain greed might motivate someone to come along and burn the whole thing down, releasing all the carbon dioxide straight into the atmosphere in one big dump.**

**Shell’s proposal involves planting fifty million hectares worth of trees. That’s an area of land the size of Spain and ten percent of the overall available total. Italian oil and gas giant Eni are planning something similar, with a target of offsetting an amount of CO2 equivalent to another six percent of available land, and if British Airways do get their way then that’s another six percent gone. So just between three companies almost a quarter of all suitable reforestation land has already been theoretically earmarked.**

**And that brings us back to Bio Energy with carbon capture and storage, or BECCS, which is that strategy that we looked at in those IPCC charts earlier. The basic principle is to grow lots and lots of very fast-growing trees, then chop them down, burn them, capture the CO2 in the smoke and shove it underground. It’s pretty expensive, at an estimated cost of one to two hundred dollars per ton of CO2 by 2050. But perhaps more concerning than that, many industrial-scale monoculture plantations cause severe social and environmental impacts in the areas where they’re situated. They’re also a lot less effective at carbon mitigation than genuinely nature-based approaches. One study found that natural forests store six times as much carbon as agroforestry and 40 times as much as plantations.**

**The IPCC’s middle of the road projection is for BECCS to be removing twelve billion tonnes of CO2 a year by 2100. Well you can’t achieve that using just the land available for reforestation, so you’d have to start commandeering existing wild land or farmland. And the area you’d need could be as much as twice the size of India, or about forty six percent of the planet’s total crop growing space. You don’t need a calculator to realise that that would have a catastrophic effect on food prices and availability that would cause mass starvation for hundreds of millions of the world’s most vulnerable people and even, God forbid, jeopardise food security for us rich comfortable western types.**

**An alternative is carbon capture and storage, or CCS. It’s a geological storage solution that most scientists believe can theoretically be safe and more permanent than forestry land if it’s done properly. The idea here is that you bolt an extra system onto the chimneys of fossil fuel power plants and heavy industrial emitters, extract the CO2 from the exhaust gases and once again shove it very deep underground where it can be locked up in the bedrock. But the extraction kits add about twenty percent to the cost of operations, so enthusiastic proponents of the scheme among the polluting fraternity are about as easy to find as rocking horse do-do.**

**As a consequence, only twenty-one commercial-scale plants exist worldwide today, capturing forty million tons of CO2 each year, or about zero-point one percent of total global CO2 emissions. All but five of them send their CO2 to be used for enhanced oil recovery rather than dedicated storage, and no systems exist that capture CO2 from bioenergy combustion.**

**Direct Air Carbon Capture or DACCS has gained a lot of media attention in recent years. It uses far less land than afforestation, reforestation or BECCS but it’s incredibly energy intensive. It’s also extremely expensive at somewhere between six hundred and a thousand dollars per tonne. The fifteen plants currently operating worldwide have a combined capture capacity of only about ten thousand tonnes a year, which equates to 0.00000025% of total global CO2 emissions. Ramping up those operations to capture three quarters of present CO2 emissions would require fifty percent of the entire world’s electricity and heat generation.**

**There are only three companies currently involved in DACCS, Climeworks in Switzerland, Carbon Engineering in British Columbia and Global Thermostat in the States. And only Climeworks have technology to permanently store the captured CO2 underground using the vast basalt rock formations in Iceland. The other two outfits plan to reformulate the gas back into hydrocarbons that can be burnt as fuel, which is genius!**

**No doubt some of you will be shouting words like rewilding, enhanced weathering and biochar at the screen right now, and sure enough those are completely valid carbon sequestration systems, along with some others. Greenpeace provide this table to assess the relative merits of all the generally accepted methods for capturing CO2, and they apply a red-amber-green scoring system to each one. Clearly the two most environmentally friendly practices are Ecosystem restoration and rewilding and soil capture, but they don’t score so well on potential volume of CO2 captured or on the permanence of that capture. Biochar is a great way to store CO2 more less permanently but again not in huge volumes. And no single strategy is without its disadvantages.**

**But many argue that as long as it’s environmentally and socially undamaging to do so, we should be implementing all these options anyway, as a matter of course, not as a get out clause for big business.**

**Greenpeace have suggested this checklist that any potential investor should now be using to interrogate the climate plans of a company before making and new funding available to them.**

**However responsibly the business community engages in carbon dioxide removal schemes, the bottom line is that genuine rapid emissions reductions are the only way to make any of the IPPC models work, and power generation is the key sector that must be fully decarbonised by 2050 instead of being offset somewhere else.**

**This is obviously a huge and incredibly complicated subject and we’ve really only scratched the surface in this video. I’ll leave a link in the description section below to the Greenpeace briefing paper and all the other supporting documents that I used to prepare the program. I’m quite sure there’ll be very strong views one way or another on the future of carbon dioxide removal, so as usual, dive down to the comments section below and leave your thoughts there.**

**That’s it for this week.**

**A big thank you to the channel’s Patreon supporters who keep us independent and ad-free and I must just give a quick shout out to the folks who’ve joined since last time with pledges of ten dollars or more a month. They are**

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