**A couple of questions for you…have you got solar panels on your roof? If you have, how you getting on? Have they paid for have you watched with a mixture of happiness and envy how the unit prices have dropped off a cliff in recent years?**

**I had my system installed in twenty-seventeen when my three-hundred-watt panels cost me almost three hundred pounds each.**

**Nowadays I can get a much more efficient four-hundred-and-thirty-watt panel for seventy quid at my local DIY superstore.**

**How times have changed, eh!**

**Perhaps you’ve been thinking about putting solar panels up, but you’re still not sure whether it’s worth doing?**

**Well, if the now almost blindingly obvious economic benefits of a rooftop solar PV system haven’t yet convinced you, maybe a new bit of research from some clever folks at various institutions in Germany and China might help you make the decision. Because they’ve calculated the potential impact on our climate of a global roll out of rooftop solar in the coming years, and they reckon it could turn out to be the single largest contributor to climate mitigation by twenty-fifty.**

**So, if you want to know how you can directly help the climate right from your own back yard, while at the same time lowering your domestic energy bills for about five years and then getting FREE electrons for decades after that, keep watching…**

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

**Before we get stuck in, it’s time for a shameless plug on behalf of my good friends over at the Fully Charged and Everything Electric channels. I’m delighted to say that they’ve invited me back to be a moderator for several of the discussion panels at the Everything Electric LIVE show being held at Excel London from Wednesday the sixteenth to Friday the eighteenth of April. All the usual attractions will be there, from home energy generation and storage solutions right through to the latest EV models AND electric COMMERCIAL vehicles. Plus, there’s loads of fun stuff to keep the kids occupied. Ticket prices have been slashed this year as well, to make the event as accessible as possible to as many people as possible. AND if you use the Just Have a Think discount code at the bottom of the screen now, you’ll get an extra twenty percent off that already reduced price. Absolute bargain! So, follow the link in the description to the Everything Electric tickets sales page, pop the dates in your diary, and I look forward to seeing you there.**

**Now then, back to solar panels. I did see a social media post recently from someone in a Spanish hardware store who was about to buy a solar panel for less than the cost of the fixing kit to mount it to his roof. And that is ridiculous.**

**Back in twenty-seventeen, the projected payback time for my fully installed three-kilowatt rooftop system based on a UK electricity unit price of fourteen pence (remember those halcyon days?), was about 9 years. Today a similar system could be installed for half the price and replace electrons that cost twice as much, so the payback times are significantly shorter.**

**In my view, after insulation, rooftop solar is one of the best investments you’ll ever make in your home.**

**But if you quite like the idea of doing your bit for the climate as well, then this new research paper has some good news for you.**

**The researchers wanted to establish what the energy saving potential of globally adopted rooftop solar panels might be.**

**There had been a previous study that looked just at China and found that the carbon mitigation potential of solar PV there was as much as four gigatonnes, equivalent to seventy percent of that country’s emissions from the electricity and heating sectors. But data for the rest of the planet was not readily available, so the researchers on this latest paper had to devise a way to calculate it with some reasonable degree of accuracy.**

**To do that, they first had to work out how many roofs there were in the world, or least get a decent approximation, anyway. That’s something that would have been pretty much unthinkable even just a few years ago when I put my solar panels up. But of course, we’ve got all sorts of clever global monitoring devices now, haven’t we.**

**The team cross referenced data from nine separate systems that form what’s known as the Coupled Model Intercomparison Project Phase 6 or CMIP6 and then integrated all that data with the inevitable artificial intelligence to estimate the global rooftop area down to a resolution of 1 km.**

**That involved what the researchers call top-down and bottom-up analysis.**

**Top-down essentially meant training a deep learning AI model using something called Vision Transformer architecture so that it could apply high-resolution remote sensing imagery of about one-point-two metres to pin down what was really a rooftop in each 1 kilometre square. ‘Bottom-up’ meant modelling how those rooftop areas related to various other geospatial variables using an AI technique known as random forests, which is industry jargon for a massive bunch of decision trees that the model crunches through, either to output a class that is the mode of all the classes analysed, unsurprisingly known as classification, OR to find the mean prediction of all the decision trees, which is known as regression.**

**Anyway, having trained the model on benchmark datasets covering about two and a half thousand square kilometres, it had learnt enough visual recognition to go off and extrapolate an estimate for the area of rooftops across the entire globe.**

**It was all tested and validated on known areas of course to make sure it wasn’t bulls\*\*tting or hallucinating or whatever it is these AI things occasionally do, but thankfully that testing provided positive affirmation of the model’s accuracy.**

**also checked it against other reference datasets, including the Google building footprint or GBF, the Microsoft building footprint or MBF, the global human settlement layer, or GHSL and the world settlement footprint 3D, or WSF3D, and again found very good agreement with all those resources as well.**

**All told, the total global rooftop area was estimated to be just under two hundred and ninety thousand square kilometres, which is an area almost the size of Italy. About thirty percent of that was in East Asia and twelve percent was in North America.**

**The next job was to work out how much energy could realistically be generated by solar panels on rooftops with all sorts of different slope angles and all pointing in different directions in different parts of the world.**

**Tricky one, that!**

**The team looked at existing reported cases around the world and calculated that roughly thirty percent of the total available roof space was viable. Then they applied twenty percent panel efficiency and eighty percent overall system efficiency as their benchmarks.**

**Carbon mitigation potential was defined as the CO2 reduction from replacing grid electricity with rooftop solar electricity calculated using baseline grid emission factors previously developed by technical working groups of large international financial institutions. And THEN they waded through all the solar radiation intensity factors for every region at every latitude across the entire planet.**

**Which must have been a real barrel of laughs!**

**I won’t go through all those numbers here, but they’re all in the paper which I’ve linked in the description – and its free access too, which makes a refreshing change.**

**The number that fell out of the bottom of all that**

**6:58 was an estimated potential annual electricity generation just from rooftop solar panels of well over nineteen thousand terawatt hours, which equates to about two thirds of all the electricity consumed globally in twenty-twenty-three!**

**To get from solar rooftop energy produced to global warming mitigation achieved, the team used a well-established method called the transient climate response to cumulative emissions of CO2, , which quantifies the linear relationship between cumulative carbon emissions and global temperature.**

**Once they crunched all that lot, and also factored in future decarbonisation of electricity grids under the three IPCC scenarios called STEPS, SDS and NZE, the researchers arrived at a final temperature mitigation estimate ranging from zero-point-zero-five to zero-point-one-three degrees Celsius by twenty-fifty.**

**Now, that might not sound like a large impact, but bear in mind that the average global surface temperature has already risen to almost one point five degrees Celsius above pre-industrial levels, which is the limit beyond which the UN tells us really bad things like climate tipping points will start to kick in, so anything that keep us close to that increase and as far away from two degrees Celsius as possible, has to be worth having, don’t you think?**

**Plus, the research showed that rooftop solar mitigation could be at its most substantial in regions with high climate sensitivity, where irreversible impacts on society and ecosystems are likely to occur once those tipping points are reached. So, getting large amounts of foreign aid support to those regions to help them transition to renewables, and bypass the reliance on fossil fuels that got us into this mess in the first place must surely be a top priority, mustn’t it? If someone could just tell that to the people running our western governments right now, that would be lovely.**

**Take Africa for example. Despite having no less than sixty percent of the best solar resources on the planet, Africa accounts for only one percent of solar PV installations.**

**That’s bonkers.**

**This study shows that rooftop solar development could provide substantial energy and environmental benefits in most African countries, serving as a key driver of that continent’s sustainable development.**

**And in countries with large populations like China and India, a widespread adoption of rooftop solar would not only help their own energy transition, but it could also play a pivotal role in helping other regions around the globe combat climate change, especially places in higher latitudes or at high altitudes.**

**Just like the domestic home investment strategy that I outlined right at the start of the video – a global roll out of rooftop solar looks like it could be one of the best investments the human species could make in its own future and the future of all the other species we share this little blue-green marble with.**

**Now of course, there will be critics who point to things like the carbon cost of mining and processing raw materials like quartz and complain that there’s not currently enough recycling of solar panels going on.**

**But seriously, compared to the enormous global greenhouse gas emissions from the extraction, transportation and processing of fossil fuels, not to mention the burning of them in combustion engines and power stations, absolutely none of which is recyclable, I would suggest it really is no contest.**

**You may have other views of course, and at least at the time of producing this video we do still live in a free society, so you are most welcome to jump down to the comments section below and express your thoughts there.**

**That’s it for this week though.**

**Thanks, as always to the amazing folks over at Patreon, who help me keep this channels content completely independent and free of ads and sponsorship messages. If you find these videos useful and interesting and you feel you could support the work I do here each week at Just Have a Think then jump over to Patreon dot com forward slash just have a think to find out how you can join the team and have a look at all the exclusive perks you can get there, including additional Patreon-only videos and monthly content polls.**

**Don’t forget to visit the Everything Electric LONDON website to check out what’s on and get your discounted tickets using the Just Have a Think code.**

**And of course, you can really hugely support the channel completely for free simply by hitting the subscribe button on YouTube and clicking on all notifications to help us get noticed by the YouTube algorithm so that you get to see more videos like this each week. That’s just a couple of clicks away, either down there or on that icon there.**

**Most important of all though, thanks very much for watching! Have a great week, and remember to just have a think.**

**See you next week.**