**A few months ago, I brought you news of a research paper published by a team of scientists at the Potsdam Institute for Climate Impact Research, in Germany. The paper outlined NINE so-called ‘earth system boundaries’ that the researchers regarded as critical indicators of the health of our planet’s balancing systems and how the status of each of them was impacting all the species that live here, including us.**

**Then, in September, another team of researchers published THIS paper showing that no fewer than SIX of those nine boundaries have already been breached, I’ll be taking a closer look at the details contained in that publication in a future video.**

**There is a school of thought though, outlined very eloquently by some folks in the comments sections of many of my videos, that says research papers like these are far too sensationalist and pessimistic. Some even go as far as suggesting that they’re being influenced by radical extremists and deliberately written in a way that’s designed to whip up fear and hysteria among unsuspecting members of the public like you and me. What we need, say those commentators, is some rational, sober analysis from sensible people who do proper work in sectors that actually make the world go round, like industry and commerce and finance.**

**So, a couple of weeks ago I had a chat with one of the authors of THIS paper, written by a group of people who are not normally known for their radical views. They’re called ‘actuaries’ and they’re lurking in the back offices of every financial and insurance institution on the planet. These folks are rarely seen, but their decisions influence almost every major human activity in our modern world, governing the ability of big companies to invest in new infrastructure projects, and even dictating whether or not you and I can afford to run a car, or go on holiday, or even buy a home. It turns out they’ve been taking a close look at the climate models and crunching the numbers to do what they do best, which is to provide dispassionate, hard-nosed, real-world risk management projections for some of the largest financial institutions on the planet. And there’s some stuff in here that I reckon you might want to know about!**

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

**Before I dive into the contents of this publication, I thought it was worth just setting the scene by shamelessly plagiarising part of this excellent book called ‘5 Times Faster’, written by Simon Sharpe, who spent several years advising the British government on climate policy in the run up to the Paris Agreement in twenty-fifteen.**

**Among the many fascinating insights that Simon shares in the book are two concepts that he refers to as ‘conservatism’ with a small ‘c’, and ‘averaging’, both of which are used by the Intergovernmental Panel on Climate Change, or IPCC, in order to achieve consensus for their publications among the hundreds of international lawyers and government officials who get to approve the content of the executive summary documents used by our policymakers to guide their decisions on climate action. In one section of the book, Simon interviewed a risk modelling expert at Lloyds of London by the name of Trevor Maynard, who explained the ‘conservative’ concept like this:**

**“scientists are ‘conservative’” he said “if they constrain their worst fears, and wait for more evidence before communicating them; therefore ‘conservative’ predictions tend to understate risk – they are LESS than best estimates. In the insurance world, ‘conservative’ reserves are HIGHER than would be required by best estimates. In matters of risk management,” Trevor says, “I feel the insurance point of view is more appropriate.”**

**And then there’s ‘averaging’, which, as the word suggests, is the scientific convention of drawing a sort of ‘best fit’ line through a bunch of data points on a graph. That is essentially how climate projections from multiple different modelling programs are presented in the so-called ‘Summary for Policymaker’ documents provided by the IPCC. But offering an average outlook on which to base national and international policies that could determine the health and wellbeing of entire populations is, in Simon Sharpe’s opinion, a very unwise strategy.**

**Imagine for example, you’re a contestant on one of those survival shows where you can win a million pounds if you complete a challenge. You’re stood in front of a stretch of quick sand and at the other end is a briefcase containing the prize money. The host of the show explains that the average depth of the quicksand is only fifty centimetres and all you have to do is wade through it to the other side and the fortune is yours. Many people would be very tempted to accept that challenge. But if the average depth is made up of some sections that are less than two centimetres deep and other sections that are more than two metres deep, then accepting the challenge won’t result in a life-changing bonanza, it’ll mean certain death.**

**What we’ve got here, according to Sharpe, is**

**“a difference in professional ethics between the culture of science and the culture of risk management.” Which brings us neatly to the publication I mentioned at the start of the video. This paper draws on the same peer reviewed climate science that informs all other mainstream publications, but the data has been analysed and assessed by three experienced actuaries, Sandy Trust, Sanjay Joshi and Jack Oliver, in conjunction with Professor Tim Lenton, who is Chair of Climate Change and Earth System Science at Exeter University here in the UK. Their conclusion is that the financial services industry has not yet woken up to the underestimation of risk in most climate modelling, and that a big adjustment is well overdue.**

**The authors point out that modern human civilisation has never had to go through an energy transition at this pace and scale while also trying to deal with a rapidly warming climate, so there’s no historical precedent that professional risk assessors can turn to for guidance, which is what those folks would normally do in situations like the one we face today. That means modelling how your bank or pension scheme, or an insurance company or investment firm might be impacted by physical and transition risks in a range of climate scenarios has become an extremely complex challenge for the worlds risk assessors.**

**Those actuaries don’t need to know about average levels of risk. They need to provide their paymasters with ‘worst-case’ scenarios based on some very specific parameters, including :**

**The level of future emissions in each scenario.**

**How quickly the climate will warm for a given level of emissions.**

**Whether we cross climate or ecosystem tipping points.**

**The level of damages we will experience as the climate warms, mitigated by adaptation.**

**How quickly we will transition as we react to the physical changes we experience.**

**The pace and scale of the transition in different geographies, economies and sectors.**

**And, how to incorporate factors such as land use, technological change and nature.**

**In that context, those Earth System Boundary papers that I mentioned right at the start of this video suddenly start to look much less like radical extremism and much more like precisely the kind of blunt reality check that our financial risk assessors require.**

**COP 26 saw the introduction of the Glasgow Financial Alliance for Net Zero, or GFANZ, which was designed to put financial systems in place that would move the world towards net zero.**

**Mark Carney – “The money is there is the world wants to use it”**

**But the climate emergency is a two-way street. It can certainly BE influenced in a positive way by smart strategic investment, but it also exerts its own influence ON exactly the finance systems that are meant to be fixing the problem. It’s a concept the money men call ‘double materiality’.**

**One of the most common phrases that I’m sure you good folks have seen in countless article headlines and YouTube video titles is ‘Faster than Expected’. In other words. ‘Oh dear, climate change is happening more quickly than anticipated’, with severe impacts already being felt by millions of people all over the world, even at the current level of warming of one-point-two degrees Celsius. But if you sit quietly with climate scientists, away from the TV cameras and microphones, the majority of them will tell you it’s not happening faster than they anticipated, it’s happening exactly as they have been fearing for decades, and about as fast as some of the more vocal experts like James Hansen have been warning us about since he first sat in front of The United States Congress back in the nineteen eighties. But ‘conservative’ scientific projections and ‘data averaging’ have meant our policymakers have been receiving a diluted version of reality that still persists today despite the best efforts of the IPCC to inject a bit of urgency into their most recent publication. They tell us that to give ourselves a sixty-seven percent chance of staying within one-point-five degrees Celsius of pre-industrial levels, we have a remaining carbon budget of less than three hundred and twenty billion tonnes. At our current emissions rate of roughly forty billion tonnes a year that means we don’t have until twenty fifty to reach net zero, we’ve actually only got until twenty thirty. So, the suggestion of some of our more delusional or perhaps disingenuous leaders that**

**“we can adopt a more pragmatic, proportionate and realistic approach to meeting net zero”**

**is just absolute garbage!**

**The people who control the worlds money are rapidly waking up to this reality and realising that the projection lines on climate graphs are not linear, they’re exponential. The authors of this paper offer the same warnings as the Planetary Boundary paper’s authors. Namely that tipping points like the collapse of the Greenland Ice Sheet, die back of the Amazon rainforest and methane bursts from the Arctic are not sufficiently well factored into IPCC projections, and those tipping points may interact and trigger each other like falling dominoes. And once those dominoes fall, the effects will be irreversible, at least on any timescale relevant to human civilisation anyway.**

**If you’re an actuary, or any kind of risk manager in the financial services industry, you are strongly urged by the authors of this paper to start factoring these likely events into your calculations. Take Himalayan glacier melt and sea level rise for example. About two billion people rely on meltwater from the Himalayan icecap for irrigation and drinking water, and hundreds of millions of them live in low-lying coastal regions in countries like Vietnam and Bangladesh, which are already feeling the effects of saltwater storm surges poisoning their agricultural soils, and where there is a real risk of becoming completely inundated during high tides within just a couple of decades.**

**Who is going to insure those folks against water shortages, flooding and heat spikes?**

**Well, “no-one!”, is the likely answer. And that means those people will either have to move, or perish.**

**So, who is going to insure governments and commerce against the risk of involuntary mass migration? It all gets a bit tricky don’t you think?**

**The papers authors tell us that applying the actuarial principles we looked at earlier to currently available climate modelling reveals that many of those models are severely under-estimating the economic impact of climate change, for several reasons.**

**Firstly, they’re not yet adequately factoring in recent real-world experience of climate change consequences, and they have limited consideration of higher warming scenarios.**

**Secondly, there is a lot of uncertainty in key climate-system modelling assumptions. From a financial risk managers point of view, the very real possibility that the one-point-five degrees Celsius carbon budget that I mentioned a moment ago may have already been used up should be factored into financial risk calculations. But this is not currently represented by any of the modelling.**

**Thirdly, the so-called ‘damage functions’ that the number crunchers use to estimate economic outcomes don’t currently include the very likely impacts of climate tipping points, or the catastrophic societal consequences of all that involuntary mass migration we just looked at.**

**And finally, the ‘general equilibrium models’, that are widely used today, contain a number of simplifying assumptions that just don’t match what’s happening in the real world.**

**Some organisations are now developing baseline or best estimate scenarios that take these factors into account, but this papers authors strongly suggest that that needs to become common practice. When it comes to protecting your client’s financial security, they say “it is better to be roughly right, than precisely wrong.”**

**So, what do the learned gentlemen responsible for this publication suggest for their industry colleagues then?**

**Well to start with, a much better appreciation of the interconnected risk drivers associated with Global Warming, and how they will impact financial markets and financial institution solvency. Firms need robust qualitative scenarios that show how these risks might cascade, and what actions need to be taken.**

**Risk managers are no different to the rest of us in the way they can be helped to understand the size of the challenge. Strong visual references are an indispensable tool for this job, like for example these flood maps showing the difference in impact between one-point five degrees Celius and four degrees Celsius of warming. They’re striking enough for ordinary folks like you and me, but if your company is responsible for stumping up the cash to fix one or the other of these scenarios, you’re likely to feel a strong sense of urgency to achieve the first one, and not allow the second one to ever happen!**

**And how about this for a bit of lateral thinking… why not start with what we want to avoid, then work backwards from there, instead of dreaming up model scenarios based on an entirely fictional world where climate change and the energy transition are not really happening?**

**In other words, take the net-zero transition as an immoveable imperative and retrospectively calculate all your numbers based on that.**

**There is obviously still a lot of uncertainty around how much warming our planet will experience, but atmospheric greenhouse gases are now double their pre-industrial concentrations, and using the actuarial definition of the word ‘conservative’, there is an argument for at least a twenty percent chance that we may be on a trajectory towards five degrees Celsius or more of warming at current consumption and emission levels.**

**The pace of warming is also uncertain. Some scientists estimate warming of around one degree Celsius every thirty years, which means we’ll be three degrees Celsius warmer than pre-industrial levels by twenty-eighty.**

**As a final rather sobering thought, the paper concludes that there is a genuine risk of a fifty percent destruction of global GDP somewhere between twenty-seventy and twenty-ninety, depending on the parameters used. Now you’re all smart people, so I’m sure you don’t need me to point out the impact that would have on the civilisation we humans have painstakingly built up over the last ten thousand years or so. But in the truly measured and guarded language of the actuarial profession, the paper’s authors leave us with this exemplar of understatement…**

 **“This analysis provides a compelling logic for net zero becoming part of fiduciary duty, as if we do not mitigate climate change, it will be exceptionally challenging to provide financial returns.”**

**You don’t say!!**

**No doubt you’re champing at the bit to offer your opinion on this one, so as always, feel free to jump down to the comments section below and leave your thoughts there.**

**That’s it for this week though. Thanks as always to our amazing Patreon supporters who help me keep all these videos free of ads and sponsorship messages and keep the content completely independent. If you feel a burning urge to support the stuff I’m doing on the channel, then why not pop over to patreon.dot.com forward slash just have a think to find out how to get involved.**

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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.**