**Back in April of this year I made a video examining major changes that were brewing in the ENSO weather and ocean current system down here in the South Pacific. Most of us will have heard of the two extremes of that system, the cooler than average La Nina phase and the warmer than average El Nino phase. There’s also a neutral phase, which is roughly where the ENSO system was when that April video was made, having been in the cooler La Nina phase for an unusually long period of about three years. Meteorologists classify the warmer El Nino event as occurring when sea surface temperature in the Niño three-four region of the Pacific Ocean reaches nought-point-five degrees Celsius above average. Temperatures above THAT indicate STRONGER El Niño conditions.**

**All the projections coming out of the major meteorological organisations at the time were for a moderate to strong El Nino event to develop during Summer twenty-twenty-three and continue into Spring twenty-twenty-four. There was nothing unusual in that prediction. It’s a perfectly normal consequence of the natural ebbs and flows in wind patterns and ocean currents in that part of the world. What was unusual though, was the record high sea surface temperatures that ALREADY existed in almost every other region of our global oceans as a direct consequence of climate change.**

**By July, the average peak sea surface temperature in the Niño three four region had moved up to about one degree Celsius above average, with a trajectory taking it towards one-point-nine-nine degrees Celsius by December, indicating that the coming El Nino was going to be significantly stronger than originally expected. By August that prediction had changed though. It now looks more like reaching two-point-three degrees Celsius above average by the end of the year, prompting the world’s inherently cautious and conservative weather agencies to predict a VERY strong El Nino event into twenty-twenty-four, triggering what they describe as ‘extreme and potentially destructive weather globally’.**

**So, a combination of record high sea surface temperatures and a very strong El Nino event may be about to give us humans a rather unpleasant sample of the ‘new normal’ as we hurtle towards mid-century. And one of the major threats that these extreme weather events are increasingly exposing, is the fragility and vulnerability of our global food supply network.**

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

**Now as I’m sure you know, the oceans cover more than seventy percent of Earth’s surface and they’re slower to absorb and release heat than our atmosphere is. That creates what the science bods call “thermal inertia" which mitigates the global average temperature increase across land and sea. In a recent interview with the Guardian, oceanographer and climate scientist at the University of New South Wales, Prof Matthew England explained that heating one cubic metre of air by one degree Celsius takes about two thousand joules of energy. But to heat the same volume of WATER by the SAME AMOUNT requires four million-two-hundred-thousand joules of energy.**

**“By absorbing all this heat,” England says, “the ocean lulls people into a false sense of security that climate change is progressing slowly.”**

**To understand and track the rising energy imbalance in the oceans, studies regularly measure ocean heat content or OHC. In this twenty-twenty-one study, scientists from around the world analysed thousands of global ocean temperature readings, each taken during that year from depths of at least two thousand metres. The paper’s authors found that, despite the cooler La Nina conditions that existed when the research was carried out, ocean temperatures had elevated by about fourteen zettajoules compared to the previous year. A Zettajoule is apparently ten to the power of twenty-one joules of energy which, to be honest, is a number that my limited brain finds extremely difficult to comprehend or imagine. Luckily though, our ever-helpful scientists have crunched the numbers into something a bit more tangible for folks like you and me. So, the twenty-twenty-one temperature increase of fourteen zettajoules turns out to be roughly the equivalent of detonating seven Hiroshima atomic bombs in the ocean every second of every minute of every day, for three hundred and sixty-five days. If that’s not mind blowing enough for you, how about this technical chart published in the last IPCC report showing that between nineteen-seventy-one and twenty-eighteen our oceans absorbed three hundred and ninety-six zettajoules of heat. And the increase in ocean temperature, according to the data, has been accelerating, with the result that, by Spring twenty-twenty-three, we had global sea-surface temperature anomalies that proper, rational, cautious science types were describing with phrases like ‘off the charts’ and “into uncharted territory’.**

**Overlay a strongly warming El Nino event onto that already overheating global system and you’ve got a situation that you need to pay attention to, to say the least.**

**You can get the full low down on how and why the ENSO system works the way it does by jumping back to my previous video, so I won’t repeat all of that here, suffice to say that when El Niño events arise, the interactions between the ocean and atmosphere create temporary changes that are, unsurprisingly, most strongly experienced in the regions closest to it, but that can also have significant and potentially catastrophic impacts on weather systems across most of the globe. The obvious manifestation of all this extra heat is the dramatic increase in extreme weather events that we all now see in our newsfeeds on an almost daily basis. According to the US National Oceanic and Atmospheric Administration or NOAA, the United States has already beaten its own record for the most natural disasters causing a billion dollars or more of damage in a single year. And there’s still four months of the year to go! The total cost to the nation so far is almost sixty billion dollars. Similar impacts have been felt in every inhabited continent on the planet, most recently demonstrated by the desperate scenes in Libya that we’re witnessing as I’m making this video in early September. What we humans are less good at focussing on though are the longer-term impacts of those events on our increasingly interconnected and interdependent global food supply network.**

**Even if you’re fortunate enough to avoid six feet of water flooding into your home or a wildfire destroying your entire town, and even if you live in a wealthy western nation with lots of infrastructure and resources for dealing with such events, if food becomes scarce then all sorts of really very unpleasant consequences start kicking in.**

**Much smarter analysts than me tend to use cereal crops like maize, rice and wheat as their barometer for global market stability. This study from July twenty-twenty-two provides us with a nice tangle of spaghetti lines showing how the supply of wheat criss-crosses the planet every day, stabilising each nation’s increasingly wobbly crop yields, providing basic nourishment for more than two-point-five billion human beings, and of course feeding the insatiable modern Mammon of GDP and global economic growth. The paper’s researchers offer us the rather stark conclusion that “Few will remain unaffected by the new global food shock given the highly interconnected nature of contemporary agri-food systems.”**

**Another study, published in December twenty-twenty-two explains that “countries' reliance on global food trade networks implies that regionally different climate change impacts on crop yields will be transmitted across borders.” This redistribution, say the papers authors, “constitutes a significant challenge for climate adaptation planning and may affect how countries engage in cooperative action.”**

**Aaah! ‘co-operative action’…yeah…**

**The paper investigates the long-term potential impacts of climate change on global food trade networks of ALL THREE key crops: wheat, rice AND maize, projecting that major threats to global food security can be brought about by quite modest production changes in just a few major global producers. The big challenge, say the papers authors, is whether the MAIN GLOBAL EXPORTERS WHOSE NAMES ARE SHOWN ON THESE so-called ‘trade communities’ charts can balance production and import losses in some of the world’s most vulnerable countries.**

**And it’s not just scientific researchers that are ringing alarm bells either. The data are being very seriously analysed and increasingly applied in the decisions taken by global financial institutions like insurance companies and banks. Here’s a report by none other than Barclays from January twenty-twenty-three.**

**Now, before you start throwing things at the screen and screaming that Barclays are one of the world’s worst offenders when it comes to continuing to invest hundreds of millions of dollars into fossil fuels… I know and I agree. But it would appear that while their investment arm is no paragon of virtue, their actuaries do appear to have cottoned onto the seriousness of the situation.**

 **“The current food price volatility” Barclays explains “exposes the fragility of our global food system. Rising food insecurity, social unrest, displacement and migration are all possible effects.”**

## The report explains that a phenomenon known as ‘Heatflation’ has already become part of the agricultural vernacular, describing how higher temperatures lead to smaller harvests and higher prices. 10:00 But, it’s not just extreme heat that hurts crop yields of course. It’s all the severe flooding, more frequent landslides and unexpected frosts that are also causing huge amounts of damage, even in mighty economies like the United States of America and Europe.

**The floods in Pakistan between July and October last year washed away nearly half that country’s crops, at an estimated cost of two-point-three billion dollars. Vegetable prices spiked by five hundred percent as a result. Drought in the Horn of Africa forced millions of people to migrate in search of food. And here in Europe, record-breaking heatwaves last year in the UK, France, Italy, Spain and Germany did severe damage to summer crops including maize, sunflower and soybeans, all of which has mostly been repeated during this year’s European heatwave as well. The world’s largest food PRODUCER AND largest food IMPORTER, China, experienced extreme heat and a month-long drought during the rainy season in the south, threatening domestic autumn crops, and extreme floods this year which have caused similar levels of damage.**

**According to the United Nations’ Food and Agriculture Organization, or FAO, sixty-three percent of the damage and loss to major economic sectors from disasters occurring between two-thousand and-eight and twenty-eighteen was shouldered by agriculture, with disaster-related losses recorded in crop and livestock production during that period estimated at two-hundred-and eighty-billion dollars. In the poorest countries, which accounted for almost half of all that impact, lost production translated to seven trillion kilocalories per year, which is the annual food consumption of seven million adults.**

**The Barclays report concludes that the current food crisis is probably the worst in a decade. The authors argue that the consequences of climate change combined with trade restrictions and regional conflict, are rapidly reversing years of progress in the global battle against hunger and poverty.**

**If you live in a net exporting country you may think well, we’ll just have to export less and use the yields to feed our own people - and indeed that is increasingly what’s being discussed. According to Barclays, many countries are responding with policies that amount to food protectionism, which on a global level, they say will only lead to further food insecurity as richer countries outcompete poorer ones in the race for scarce resources. And in any case, in the context of our modern global economic model, reduced exports lead to declining economies, even in rich countries, with all the socio-economic and political problems that I’m sure you don’t need me to bore you with here.**

**This year’s ‘very strong’ El Nino event is, according to the WMO, highly likely to result in twenty-twenty-four becoming the hottest year ever recorded, and the hottest year we modern humans have ever had to contend with. It may even temporarily push the average global surface temperature back up to more than one-point-five degrees Celsius above pre-industrial levels. And the undeniable consequences have now arrived at our doorstep, even at that relatively modest level of warming. So, the complacency displayed by some commentators who suggest that two or three degrees Celsius of extra warming might be no bad thing for our planet starts to look just a little bit short sighted, don’t you think?**

**Net importer, or net exporter, the message seems to be that we really are all in this together, whether we like it or not. Our economies are inextricably linked, funnily enough just like our oceans and our climate and all of nature’s other calibration systems that have allowed life on this little planet to thrive for millions of years. Knock all that out of kilter, which is what we’re doing at the moment, largely as a result of the greenhouse gas emissions from the production and combustion of fossil fuels, and the delicate balancing act we’ve benefitted so handsomely from is in real danger of collapsing around us.**

**So, plenty to have a think about folks, eh?**

**See you next week.**