**If you happen to be an intrepid outdoor type who enjoys winter sports like ski-ing, then you may have been one of tens of thousands of holiday makers that found themselves with a little less snow to slide around on in the alps this season as a result of an extremely unusual winter heatwave that scientists are suggesting is “the most extreme event in European history”** [**https://www.euronews.com/green/2023/01/03/climate-change-why-is-europe-experiencing-a-january-heat-wave**](https://www.euronews.com/green/2023/01/03/climate-change-why-is-europe-experiencing-a-january-heat-wave)

**Some mountain regions reached temperatures of twenty degrees Celsius in December, which is very pleasant if you’re sun bathing but absolutely useless if you want to practice your parallel turns! I imagine it must have been extremely frustrating for those involved, because let’s face it, ski-ing holidays aren’t cheap are they?**

**If you’re not an outdoor type and you think that ski-ing is just an extravagant luxury enjoyed by affluent westerners, then I imagine you may be supressing an ironic smirk at the news of all those poor lambs who’ve not been able to enjoy their expensive Christmas get away this year.**

**This seasons high alpine temperatures were a bit of a freak to be fair, driven largely by currents of very warm air drifting northwards from the West coast of Africa . But conditions like these are made much more likely by a globally warming atmosphere, so they may well become more commonplace in the future. And that won’t just mean a bit of inconvenience for winter sport enthusiasts. It’ll start to affect many hundreds of millions of people all over the world because as mountain snowfall diminishes in the colder months and temperatures continue to soar in the Summer, glaciers all over the world are shrinking at an alarming rate. And those glaciers are in many cases a vital source of fresh water for human communities further down the valley, not to mention innumerable species of flora and fauna that also rely on it for life.**

**So how bad is it, and how much worse could it get?**

**Well, that’s a very good question, and in January twenty-twenty-three and new research paper was published that provides us with the answer. So, lets dive in and see what it says.**

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

**Most of us probably don’t spend a great deal of our precious time thinking about glaciers, do we? They’re just something hidden away high up in remote mountain ranges, with little or no relevance to our daily lives. But according to a twenty-nineteen study published by the online journal Nature, almost two billion people all over the world rely directly on mountain glaciers and snowpack as their main source of fresh water supply. In many cases the seasonal melt also drives hydropower generation and irrigation for agriculture. So that’s no less than a quarter of the entire human population who are in deep do-do if glaciers disappear.**

**This latest publication is the result of research by teams at VARIOUS academic institutions, led by David Rounce, who is Assistant Professor of Environmental Engineering at Carnegie University in Pittsburgh, Pennsylvania.**

**The team looked at projected changes in all of the world’s glaciers, NOT INCLUDING the ice sheets in Greenland and Antarctica, based on data from the Shared Socioeconomic Pathways, or SSPs and Representative Concentration Pathways, or RCPs, published by the Intergovernmental Panel on Climate Change, or IPCC. Those are the projection charts you often see on the news or on channels like this one that estimate future levels of greenhouse gas emissions depending on how rapidly human societies achieve the transition to a more sustainable way of life and the impacts of those greenhouse gas emissions on average global surface temperatures over the course of the twenty-first century.**

**To keep things relatively simple, the team based their calculations on four separate temperature increases. Firstly, the one-point-five degree Celsius target set out in the Paris agreement, and then two degrees, three degrees and four degrees of warming by twenty-one hundred. Depending on which pathway our civilisation chooses over the next few decades, the world’s glaciers are projected to lose anywhere between twenty-six and forty one percent of their total combined mass by the end of the century compared to twenty fifteen measurements.**

**As a reference, the net outcome of all existing national climate policies from countries attending the COP 26 climate conference in Glasgow in twenty-twenty-one is a projected average global temperature rise of two-point-seven degrees Celsius compared to pre industrial levels by the end of this century. That’s assuming we actually meet all those policies of course, which is not something the world is currently on course to achieve.**

**There are more than two hundred thousand glaciers stretching right around the planet. Some of them are only about a kilometre across, but they nevertheless provide an essential seasonal service to their local habitat.**

**The team found that, even in the now vanishingly unlikely event that we manage to keep global temperature rises to only one-point five degrees Celsius, about a hundred and four thousand of those small glaciers would disappear completely. That’s pretty much half of all the glaciers on the planet, effectively gone forever. And about fifty thousand of THEM would actually be lost by twenty fifty, less than thirty years from now.**

**If, on the other hand, we manage to stray all the way up to four degrees of warming, which is the trajectory our global society is currently following, then we’d be looking at the permanent loss of as much as ninety percent of all glaciers. That’d cause more than fifteen centimetres or six inches of sea level rise, which would represent about eight percent of the total rise under a four-degree scenario.**

**That’s obviously very bad news for the lives and livelihoods of people living in coastal regions around the world, but it’s the areas directly dependent upon the glaciers that’ll suffer the most devastating consequences.**

**We’re already seeing some of those consequences happening in real time right before our eyes. A study published in twenty-twenty-one by the public University ETH Zurich and the University of Toulouse in France found that the world’s glaciers lost nearly three hundred billion tonnes of ice every year between twenty -fifteen and twenty-nineteen. That was found to be a thirty percent increase in the rate of retreat compared to the previous five years. Alaska, Iceland and the European Alps are among those already disappearing at an alarming rate. Switzerland’s fourteen hundred glaciers, for example, which represent about fifty percent of all the ice sheets in the Alps, lost half of their volume between nineteen-thirty-one and twenty sixteen. They lost another twelve percent by twenty-twenty-one, and according to the Swiss Academy of Sciences, during the extreme summer temperatures of twenty-twenty-two they lost another six-point-two percent or three cubic kilometres of ice– just in a single season. Now Switzerland’s got quite a bit of cash in the coffers of course, so while the loss of their glaciers is nothing short of an environmental tragedy, the country will no doubt find a way to adapt and survive. It’s not quite such a rosy outlook over in the Himalayas though. This vast mountain range is home to something like fifteen thousand glaciers that provide a crucial lifeline to about five hundred million people every Summer by releasing their melt waters into the Indus, Ganges and Brahmaputra Rivers that flow through Pakistan, India and Bangladesh. When those glaciers go, all three of those countries will experience catastrophic droughts and food shortages, and in the meantime the vastly increased level of meltwater cascading down the mountains during the hotter months will regularly overwhelm those river systems, causing disastrous levels of flooding like those we witnessed in twenty-twenty-two, when one third of the entire country of Pakistan was under water as a result of glacial melt from a summer heatwave combining with a monster monsoon season. The countries below the Himalayas don’t possess the economic resources of Switzerland, nor do they have well established and well organised infrastructure and services that can deal with these kinds of events. The result in Pakistan was that thirty-three million people were displaced and more than a thousand people died. And to coin a very hackneyed phrase… you ain’t seen nothing yet.**

**The main cause of all this warming and melting is essentially the profligate use of fossil fuels since the start of the industrial revolution, releasing massive quantities of carbon dioxide into our atmosphere, which of course is something that Pakistan and the other countries of the global south played very little part in. So, I guess it’s understandable that there was such fierce debate at COP 27 in Sharm El Sheikh on the subject of loss and damage funding for vulnerable countries who will be hardest hit by climate disasters. That debate did result in an historic agreement by the majority of rich western nations, eventually even including the United States of America, to create a specific fund to assist developing nations in responding to their loss and damage challenges. Governments also agreed to establish a ‘transitional committee’ to make recommendations on how to operationalize both the new funding arrangements and the fund itself at COP28 later in twenty-twenty-three, with the first meeting of the transitional committee expected to take place before the end of March.**

**But, we do also still need to do everything in our power to slow down the warming in an effort to prevent these existential crises happening in the first place. The authors of the Carnegie University paper sum it up quite well**

**“our projections” they say “reveal a strong linear relationship**

**between global mean temperature increase and glacier mass loss”**

**“This strong relationship at global and regional scales highlights**

**that every increase in temperature has significant consequences”**

**“The rapidly increasing glacier mass losses as global temperature increases beyond one point five degrees Celsius stresses the urgency of establishing more ambitious climate pledges to preserve the glaciers in these mountainous regions.”**

**No doubt you’ve got views and information that you’d like to add to the debate, so if you do then why not jump down to the comments section below and leave your thoughts there.**

**That’s it for this week. Before I go though, I just want to let you know about a new exclusive feature now being enjoyed by the channel’s Patreon supporters. For about the price of a coffee each month, you now get exclusive early access to every new video I produce, so you can point out any mistakes I may have made before I publish the final video on YouTube every Sunday. And believe me, there’s no shortage of those! You’ll also have access to regular additional content available only to Patreon members, and you’ll be able to directly influence the topics we talk about, via monthly content polls. And while we’re about it, I must just give a quick shout out to some folks who joined recently with pledges of ten dollars or more a month. They are**

**Alex Van Pelt**

**Dan Nilsson**

**David Burman**

**Peter Erlich**

**Andrew Shannon**

**Jeremy Smithson**

**Mattias Wahlberg**

**Daniel Katz**

**Alison LeDuc**

**Ultraczar**

**and**

**James Hatcher**

**If you’ve found this video useful and informative, then make sure you subscribe by clicking down there or on that icon there, and don’t forget to hit the notification bell too, so you can keep up with future content.**

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

**See you next week**