

Extreme Weather Unlikely to Revert to the Mean

This is MSCI Perspectives, your source for insights for global investors and access to research and expertise from across the investment industry. I'm your host, Adam Bass, and today is July 20th, 2023. If you've been paying attention at all, it's tough to argue against the fact that the impacts of climate change are here. We're feeling the effects with higher temperatures, wildfire risks, a summer's worth of rainfall over a weekend and on and on and on. But what does this mean for insurance companies and consumers ability to purchase affordable insurance? What does it mean for other types of companies and perhaps most relevant to this program, what does it mean for investors?

Companies really need to understand how their physical assets are exposed to different physical hazards. It's going to vary geographically, how a business in the United States is impacted versus a business in Europe versus Asia and it also will depend on the industry that company is in as well. Whether they're a utility company, a construction, consumer, discretionary, they all have different impacts.

That's guest number one for today.

My name's Katie Towey. I'm a researcher on the physical risk team of the Climate Risk Center at MSCI. And my work here at MSCI focuses on applied physical risk and hazard research.

Regional differences aside though.

And I think there's really no region or industry that will not be impacted by some type of extreme weather event, whether that be directly or indirectly. What just occurred in the northeast, just north of New York City, there was significant flooding that washed out parts of roads, disrupted train service to New York City, damaged homes and businesses, uprooted a lot of people's lives. And this one storm has a trickle-down effect of impacts. And I think that's really what companies and investors really need to take note of. And I think companies and investors are seeking to determine what the financial impact of these events will be on assets.

That's where MSCI's physical risk model really comes into play by considering acute and chronic hazards. And to just quickly define these terms, acute hazards are event driven, they typically have intense impacts over a short period of time. So these are more like flooding events, tropical cyclones, wildfires for example. And chronic hazards are these more slow to manifest events and they can persist for longer periods of time. So thinking of extreme heat and cold as an example. So given these definitions of chronic and acute hazards, we can assess the current and future costs associated with business interruption for chronic hazards, and then asset damage and business interruption for acute hazards.

And this information will be super valuable to companies and investors so they can understand not just which physical assets are most exposed to which physical hazards, but also what the financial impact of that will be. So you can consider the example of a fluvial flooding event to a manufacturing facility, and if the damage is significant enough that could force that facility to close for repairs. And if that happens, depending on the length of time, that can lead to business disruption, which will then impact businesses downstream that maybe purchase items from this manufacturing facility. So really

this focus on the supply chain and disruption to it because that can have an effect that impacts far greater area than just where the event occurred.

Our second guest today expanded on this idea.

My name is Gillian Mollod and I'm a physical risk researcher at MSCI. We can't always predict the future perfectly, but we really try in our climate models to anticipate what we'll see in the future years. But there are times when there's trickle-down effects that we don't necessarily expect to see.

What are some of the, let's call them the less obvious risks, that investors or even companies are not focused on, but probably should be?

So you would picture the risks of you have a flood, right? And the building's impacted by that flood and maybe the business is interrupted for a few days. So that's something you can picture. But what you can't picture so easily is how a heat wave or an extreme heat event will affect business. Research shows that productivity goes way down when we're experiencing days of extreme heat and also outdoor working conditions are often impossible to take the... They get disrupted as well. It's hard for people to work outside when there's extreme weather events. So I think the sort of more gradual, what we call the chronic risks, how they play out is a little less obvious than the acute event driven wildfires and tropical cyclones.

On a short term basis, people can live with it, power outages, not being able to go outside, but as those become more frequent, the quality of life might deteriorate to the point where a local area is no longer desirable. This could happen with respect to extreme heat as well.

And that would be.

My name's Nancy Watkins, and I'm an actuary and a principal with Milliman, an independent consulting firm. My work focuses on catastrophic risk for insurers, real estate industry groups, state and federal government agencies and local communities.

We've spoken before on the program about the unique position that insurance companies find themselves in when we're talking about the impact of physical risk on both their business and their operations. That's why we really were happy to have the opportunity to speak with Nancy for this episode and we will get to that part of her story. But for now, why don't we let her continue with this idea of the overall effect on communities.

I think that parts of the south have been almost unbearable when the nights just don't cool down. If those days become more and more frequent, it's not an insurance problem. It's not necessarily a physical risk problem, but it's a quality of life problem. So I think from a financial investment perspective, you have to think about a lot of different aspects of climate change and how it changes the physical environment beyond insurance, beyond property values.

Nancy also had a bit to say about those so-called trickle-down effects and the problems faced by insurance firms as well as investors, as they work to develop a clear picture of risk.

The effects of climate change on physical risk are not always clear. For example, for hurricanes, we do know that there's more moisture in the air, and so hurricanes are more likely to bring greater rainfall, but we don't know exactly how climate change will impact the frequency and severity of hurricane. We also don't know exactly how climate change will impact severe convective storms.

We do understand a lot about the increase in flood risk from climate change. Sea level rise, I think is one of the easiest things to understand. If the sea level goes up, flood risk goes up. But exactly how fast that will happen is a big question mark. I mean, the whole nature of the long-term risk is that there are many different things that could change it significantly. And so we have to be prepared for events that have never happened before in our lifetimes and that are very interdependent on actions that we cannot necessarily control or predict with accuracy.

To get their results, researchers and others turn to highly sophisticated models. And the two types of models that our guests talked to us about were catastrophe models and climate modeling. Let's start with catastrophe models, and those are the ones that insurance companies as well as local regulators have tended to look to.

Catastrophe models have been used for many, many years by insurance companies to manage and measure catastrophic risk. They measure not only what has happened, but a whole spectrum of events that could happen. So they help insurers understand how much reinsurance to buy and how much to charge for catastrophic risks like wildfire, earthquake, hurricane. A wildfire catastrophe model would be very useful to understand the risk when it's changed due to factors like expansion of building into the wild land urban interface. So a fire that might have happened 30 years ago in the same area might not have burned down any houses because there weren't any houses there, but it could cause hundreds of millions of dollars of damage if a major development was there.

So this is the way that insurance companies try to relate historical events to the risk that they're insuring in the future. They're also useful for understanding the effects of mitigation. We're working really hard with fire chiefs and catastrophe modelers and insurance companies to understand how community mitigation and home level mitigation can reduce the risk.

I think it's important to sort of highlight the difference between catastrophe modeling and climate modeling. Catastrophe model uses a lot of re-analysis data, which takes historic data and predicts how it'll play out similarly in the future. And they also use cost estimates from past events, whereas climate models use scenario analysis, so predicting kind of what trajectory the carbon emissions will take depending on policies that are put in place or not put in place. So we'll reach say three degrees by 2100 or we'll keep it at 1.5 degrees. So that's sort of what scenario analysis does.

And then there's different types of climate models. So there's earth system models or global circulation models, which are essentially using physics and chemistry and all sorts of science to predict how all our earth systems will change depending on how hot our atmosphere gets and how much carbon dioxide will be emitted. And there's of course a degree of uncertainty within that, which is why with climate models you often look at a distribution, but climate modeling is a little bit different than catastrophe modeling because instead of using historic data, it's more using what we predict to be future data.

Regardless of the type of model we're talking about however, they all need, say it with me now, reliable data. That brings challenges, right, Katie?

Yeah, so there are a lot of challenges. One, we can focus on the locations of the company's assets themselves. So we have at MSCI a proprietary asset location database. It's the core of our physical risk model, but we have to collect data for that asset location database. It's essential to understand the geographical and structural characteristics of an asset. So we really need to be able to collect as much information as we can, but it also relies on that information being made available. In our asset location database, we collect asset data from commercially available databases, different publicly

available data sets, whether that be from government or open source databases. So a lot of third party data sources. That's one big issue.

Another one is relying on the hazard data, so understanding how heat, how flooding, how wildfires, what the extent of the magnitude of those hazards are. We utilize global climate models and the output from those global climate models. With these different models that we utilize for different hazards, one challenge there is each hazard requires a different type of resolution. So for example, if we're assessing extreme heat, we generally can rely on coarse or spatial resolution to model extreme heat, but if we're looking at flooding, that tends to be a much more localized event and that requires a lot more detailed spatial information.

The biggest data challenges that we face with global climate models is that they tend to be coarser, they're not as high resolution. So you'll hear the term down scaling, which means taking a global data set and then making it more granular at a region more regional basis. So we try to do that, but that's not always possible. Sometimes there's just computational limitations or just limitations to the data. Sometimes you miss some of the nuances, the risk nuances, when you look at a global model. Beyond that, it's a lot of climate models come with a large degree of uncertainty, and that's just because we can't really predict the future.

As we get more observational data, we then have a larger set of data to base our analysis on and our projections into the future, and that helps us become more confident over time in understanding what the impacts could be. There's always some bit of uncertainty, but we do follow the latest science and that's what drives our models and we have fairly good accuracy surrounding the data that we have available.

That being said.

Clients are really asking for transparency, not just to understand the data that is being fed into our models, but also the models themselves, right? Understanding the methodology behind them, really getting a good handle on how certain calculations are done. There's a real need for attribution analysis. So really understanding there are so many different drivers that can impact the physical risk at a location. It's from the company's financial metrics. It's to where the locations of a company's assets are located. It's how a particular hazard is at that location. Is it more of a threat to heat than flooding or vice versa? There's so much data that goes into it, it's really understanding what these key drivers are and how they're going to change in the future as well. And analyzing that change over time, right? So it's not just what's occurring today, but 5, 10, 50 years from now as well. It's really getting the best understanding of how all these different drivers contribute to understanding their financial impact of the physical risk at a location.

Gillian and Katie are focused on investors and helping them make better decisions, but how are insurance firms using the data they're modeling and how are they assessing exactly how to move forward in different regions of the world?

As long as companies feel that they can manage and measure the risk and they believe that they can charge enough for it, they are likely to offer coverage. Now, whether that's affordable or not is a different question. So if you have these situations where the risk is rising, then there's often a period of resetting where the companies have to gather more data, they have to look at their experience versus what the catastrophe models they are using are telling them. They may decide that they need to do more close inspections or change the terms under which they'll offer coverage, but that I believe is doable in many cases for markets that are temporarily uninsurable. In case of California wildfire for example, it's possible that the admitted market where the state regulators are controlling the rates and

attempting, I guess, right now potentially to control underwriting, that market may not be attractive to an insurance companies. Insurance companies want to take on risk, they just want to be able to manage it, measure it, and charge enough for it.

You talked about California, some insurance companies no longer writing new policies, State Farm, Allstate. Are we reaching a point where some areas of the country are simply uninsurable?

I think it is possible that some areas are uninsurable. I'm not sure California is. California has a specific set of circumstances right now that have made certain areas, at least temporarily uninsurable, but I think that those issues could be worked out. I think that there's areas where if you have repeated flood losses, it's difficult to understand the economic rationale for rebuilding homes over and over again. I do think that there may be more areas of the country in future years where I think flood is going to be the first peril that becomes very obvious that you have sunny day flooding, there's days when you can't drive your car out of your driveway because your street is underwater. That might make an area uninsurable. I think right now what we're talking about is a breakdown of the kind of balance between insurance availability, affordability and reliability, which I think are the three pillars of a sustainable market.

I think investors should be paying attention to state regulation and whether it has allowed insurance companies to function in a reliable fashion. And so what I mean by that is if state regulators are focused only on affordability and they're denying insurance companies the ability to reflect the actual risk in their pricing and their underwriting, eventually that's going to have an impact on insurers' willingness to be there. If the residual market, which is usually most states have an insurance plan that's run for risks that can't get insurance from the private insurance market, if the residual market starts getting too big, that creates its own set of risks to sometimes state taxpayers, sometimes future policy holders, and sometimes the insurance market in the state itself.

So in Florida, Louisiana, Texas, California, the state insurance markets of last resorts are getting very, very big and they're growing fast. So if the risk isn't properly transferred into the private market, then it gets unsafely concentrated into one place and it has to be dealt with. The local economy depends on the ability to transfer risk reliably. So having a sustainable insurance market is important for basically any kind of economic projections, financial projections, understanding how risk gets transferred into the mortgage market and the banking system. You really have to think about what happens if the insurance market breaks down, where does that property risk go? Some of it goes back to the mortgage market and to the banks and to the GSEs that are ultimately responsible for the properties.

GSE stands for government sponsored enterprise.

Then it goes to the taxpayer in some cases for federal disaster aid. Local communities, if they can't transfer their risk away, there's a possibility that real estate values could be depressed, that people might stop wanting to move into the communities, that businesses may not feel like it's a safe place to relocate to.

After Hurricane Sandy, I know there were places in Suffolk County where the county actually purchased land because it was no longer viable to have property on there that because it was going to eventually just be flooded and protecting a piece of property that you'll have to keep paying for no longer becomes worth it.

So what do we know? Well, we know that once in a century events are happening every few years. We know that even in areas where perhaps the frequency of these events has not increased, the intensity has or may, be it storms in the northeastern United States or extreme heat in China. And we know that

insurance companies and investors are working to get a handle on the myriad of inputs and data so they can make decisions that will affect not only their bottom lines, but people's lives as they consider where homes and businesses can be built sustainably. What's next?

Impactful extreme weather events will continue to affect companies around the globe and homes and businesses will be damaged or even worse, destroyed. Business operations will be disrupted and there will be this trickle-down effect that impacts others far away geographically from where the event is occurring. And investors should really take note about which companies are setting themselves up to adapt to this reality, whether that be through companies investing in new technologies that are maybe more climate friendly or adapting their business strategies and practices to perhaps embrace new opportunities. Not everyone is expected to be a climate whiz, but you need to position yourself to understand what the risks of these physical risk hazards are going to be to the companies that you are investing in.

This is all about making a good business decision, but these companies need to also employ good practices that set themselves up. So just positioning yourself to take a really concerted effort to understand physical climate risk and how it can impact your investments going forward.

Some people in the physical risk research community believe that we've kind of already hit a point of where we no longer can mitigate against climate disasters and that we should focus on adaptation. And I will say that there's a number of really wonderful ways to adapt to climate change. I try to be optimistic and think that we will put some policies in place and we'll keep warming down below two degrees, but I wonder if the 1.5 degree goal is by this point out of reach. But I will say with adaptation measures like building natural systems to absorb the water that'll come with flooding or creating hurricane proof buildings or developing more green roofs or putting more solar panels. I mean, that's sort of more mitigation, but any sort of adaptation to climate change, incorporating that into city planning and architectural development, I think is going to be a really creative new field, and I think it's just going to grow over time. So there are some innovative ways to deal with climate change, and I think those are going to be interesting to follow in the years to come.

That's all for this week. A big thank you from Joe and me to Katie, Gillian, and Nancy, and to all of you for listening. You can find more details on the subject at [msci.com](https://www.msci.com). Next up on the program, emerging markets, we tend to paint these countries with a broad brush, is it time to expand the palette? Until then, I'm your host Adam Bass, and this is MSCI Perspectives. Stay safe, everyone.

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