"I have always felt that four degrees equals civil war."

An interview with David Bresch

David, you have been professor for weather and climate risk at ETH Zurich since 2016. Before that, you worked at Swiss Re, the large reinsurer, for 16 years. Can you tell us a bit about this previous work outside academia?

I joined Swiss Re from MIT, partly because at the time Swiss Re was interested in hiring scientists with expertise in climate science and policy. The first seven or eight years I held positions in natural catastrophe risk management. The goal was to devise models for the company to price risks or single deals. But a reinsurer can also use the same models to allocate capital, and over time more and more of my interest shifted to that. In essence, I was the chief modeler and established a globally consistent modeling framework for all hazards. Reinsurance in fact has played a special role in recognizing how climate change increases those risks. That's because Swiss Re and others, such as Munich Re, normally insure large portfolios of very complex risks across the globe, including for example millions of housing units of real estate in the United States, and all kinds of infrastructure such as rail networks, etc. Risk models underpin also more strategic conversations with clients, which are themselves insurance companies.

Later I became head of sustainability at Swiss Re, where I advanced and promoted these models to pursue a better understanding of climate risks and to advance policy conversations. This led for instance to collaborative work resulting in initiatives such as the Economics of Climate Adaptation (ECA) working group and the Task Force for Climate Related Financial Disclosure (TCFD). The main goal has always been to better internalize known externalities in decision making, such as climate change since the mid-nineties and more recently biodiversity loss. Again, reinsurance has a special role to play here because, even though reinsurance deals usually cover only a year, the sector has long been aware of the tragedy of the horizon. Mark Carney[1] used this term in his seminal speech which led to the formation of TCFD to describe the disconnect between long-term changes of the risk landscape and the rapid pace of the business cycle and changes in political mandates.

Already in 1995, Swiss Re issued a statement saying that climate change is a fact and essentially manmade. Since then, reinsurers have been active in advocacy. For instance, they have promoted the introduction of carbon pricing to remedy market failures to internalize known externalities. And that's why also internally, at some stage, the company had an internal carbon price and said it should guide decisions even though there currently is no policy requirement or a liability in that sense. It's no coincidence that a former Swiss Re employee, Reto Ringger, invented the Dow Jones Sustainability Index and now runs a bank guided by the global footprint approach.

From your experience at Swiss Re and based on your research, how do you assess the role of insurance as an instrument for dealing with climate change?

The first step is to remind ourselves about what's insurable. There must be a way to analyze risk. We cannot insure unknown unknowns. Usually, though, we confront familiar uncertainties. We understand the physics of storms, but each storm plays out somewhat differently. Usually, we can use actuarial analysis and turn this into insurable risk. For that, of course, we also need to rely on the law of large numbers: The more people similarly affected and exposed, the easier it is to set a price. And then obviously insurance must be economically viable and you must find capital willing to go for that.

When it comes to climate change, when you understand the changes in frequency and intensity, then this is amenable to standard risk management approaches. And so the catastrophic events would in theory remain insurable.

But things are changing. You have more and more wildfires and it's often because of compound

causation. So it's hot for longer, it has been drier for a longer period, and there are probably more ignition sources. And then you have cascading consequences. That can be because infrastructures and houses have been built closer to the burnable mass. You have construction in the area, probably also because these locations are attractive for the real estate market. And then it's cascading consequences again. When you have compound physical risks and more interrelated consequences, you might even reach the limits of insurability.

That's still all in the category of shock events, which are standard business for insurance. Where it gets even more tricky is with slow onset. Slow onset means you basically know it's going to play out badly, like sea level rise for coastal communities in many places around the globe. And insurance is not the right mechanism for these effects. If you know for sure it's going to play out, then you have to use planning and anticipatory action. But the interplay is interesting. Storm floods obviously occur more often if you have a higher tide as a result of climate change. Storm surge is in theory insurable, but then storm surge combined with sea level rise might be a challenge.

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In your academic work, you have looked at these compound hazard risks. Can you illustrate what they look like with other examples?

For example, you have a long-term drought, and then at the end of it you have an excessive amount of precipitation. It often then washes away a lot of topsoil. It will take decades for that ecosystem to recover. It could be that the topsoil is really gone. Traditionally a source of resilience might have been a type of agriculture with hedges and smaller plot sizes. The topsoil would be flushed away only over hectares and not square kilometers. However, in order to make these agricultural systems more productive, people have taken out the hedges or created larger plots. And then all of a sudden, wind erosion is stronger. Probably even the drying out is more vigorous. And then even occasional downpours affect much larger landscapes.

There is likely compound causation because of climate change, due to changes in weather patterns. This often interacts with changes in land use practices, and often it has a lot to do also with wealth distribution. In the past, many things were more redundant, sometimes by design and sometimes just because of people's sheer inability to optimize to the extreme. You normally had supply chains in which people had things in stock, so they could continue to produce despite supply chain disruptions. But now in a more just-in-time global economy, we have taken all of that slack out of the system. The attitude has been "Why do I have that in stock? I can order it immediately if I need it." Likewise playing to the theme of efficiency, agricultural companies moved to larger plots so that they can use larger machinery, but the larger machinery might compact the soil so that it can no longer absorb as much downpour. You might have to irrigate and then the water doesn't percolate away so quickly. Besides the increase in compound risks in the physical system, we have thus also reduced the resilience of our socioeconomic systems. And now we're reminded the hard way.

This relates to your work on adaptation. Could you discuss this a bit?

Already at Swiss Re, we were very much looking into and starting to promote the integration of natural hazards modeling with the economics of climate adaptation. Based on hazard modeling, you can develop a business case for adaptation, which means that if you invest in risk reduction measures, it is cheaper than sitting and waiting for the damage to occur. Not everything can be taken out or avoided through preventive action. There are things that will still happen. But the remaining risk – we could say the residual risk – through adaptation action is easier to insure because it will occur less often. And if it happens still, the severity will likely be diminished.

By doing so, we brought risk management technology familiar in the insurance market to the climate

adaptation conversations. In many places, we have run such Economics of Climate Adaptation (ECA) case studies in close collaboration with stakeholders. It's important to note that as a representative of an insurance or reinsurance company and equally now as an academic, I have always stayed away from proposing adaptation plans or strategies. My role rather is to offer a fact base to support the development of an adaptation strategy. Especially in adaptation, it is extremely important to consider the political, economic, and cultural context. For instance, in a democratic setting, policymakers need to check back with their constituencies to see whether a set of measures is legitimate and meets broader support. There is enormous variation. In the Netherlands, there are things people are used to. But if you implement the same measures in another part of the world, people might not only not be familiar with them, but for cultural reasons they might not want them. So especially in adaptation, there's really no one size fits all. It's utterly local. But what's global are the tools and the analysis frameworks – they can be applied everywhere, but they're only as good as the participation of all stakeholders. That's why we provide both the analysis methodology as well as the underpinning models open source and free access.

In these settings in which communities decide on risk management and adaption measures, you join them mainly as a modeler. Can you describe how this works?

For me, a model always starts with a mental model. So in essence, I first have an essayistic approach and try to tell a story. Together with stakeholders, we try to figure out what has happened in the past and what could happen in the future. Can we learn from it? Can we imagine something unfolding? Such conversations are then well rooted in climate science, through downscaling to bring global models to the regional and local scale. This leads for example to a spatially explicit understanding of what an extreme drought could look like in a given place. And then you can overlay this drought with your knowledge of what normally happens at this place – are oranges being produced that need a lot of water? What does the built environment look like? And so on. I very much like the triangulation approach in social sciences, i.e., combining different perspectives to obtain a rich picture of the problem at hand. I think it makes little sense to align all the evidence to incorporate it into a single model. There are orthogonal perspectives. And a complex system normally requires more than one angle of observation to understand it.

In that context, could you comment on the recent discussion among economists and the climate science community about integrated assessment models?

I have always been extremely critical of global integrated assessment models following the normal general equilibrium approach. They're not amenable to real shocks. You have to introduce shocks into them in such a tame fashion that they are not shocks anymore. The damage functions in these models normally arise from the relationship between global temperature and some aggregate number, like GDP loss. At least you should do it on a GINI basis because you might have only a 2% GDP loss, but a third of the population might be starving. Economists also bake a lot of normative concepts into these models and hide them a bit. It's interesting that the community started years ago to say, oh, three to four degrees, perfect temperature. But for a lot of people, three, four degrees represents the end of their way of life. And it's not a bright future ahead of them anymore. Indeed, it might already be hard today. Why did we set the 1.5 degrees threshold in the first place? Because we do not know whether coral reefs will survive even this temperature increase and whether the food chains in the oceans might start to be disrupted. Now we're learning the hard way. The ocean has never been so warm. And even physical climate science does not fully understand why.

I think we should really make a step change and reconsider: Are integrated assessment models up to the task? Because they look at it in a tame, spread out, aggregated way, which pays no attention to the diversity of economic systems. And for sure, they neglect the social strata that will be most affected. As a solution, some proposed making the damage function in these models steeper. But that's not good enough because the way they look at the economy is still so aggregated that what really happens to people is just not visible to these models. I said more than a decade ago that global warming by four degrees equals civil war. The French Revolution didn't happen because people did not want to eat cake. That was Marie Antoinette's perspective. You could say that the integrated assessment model is fairly close to Marie Antoinette's perspective on the world (even though the saying is not clearly attributable to her).

If you think about adaptation as a task for our societies today, do you have a suggestion about how to tackle this?

I will answer this as a citizen rather than as a scientist. I think that one interesting way of looking at the issue

is through spatial planning. Such planning should be holistic and consider the precarious existence of humans in concrete places. We should use spatial planning to ask foundational questions, about who has what rights of use, how we balance different interests, and how to deal with risks. When we adopt a holistic framework, we may also be able to address the issue of social justice. We need to turn away from the currently dominant approach, which implies a privatization of gains and a socialization of risks.

Thanks, David, that was very inspiring.

Notes

The interview was conducted by Leon Wansleben on May 12, 2025, and transcribed by Tobias Burgwinkel and Leon Wansleben.

1 https://www.bankofengland.co.uk/-/media/boe/files/speech/2015/breaking-the-tragedy-of-the-horizon-climate-change-and-financial-stability.pdf