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## Focus on Terminology: Loss and Damage

*By Max J. Rudolph, Steve Bowen and Matti Goldberg*

For those actuaries who desire to become more active in climate awareness activities, there are times when language becomes an issue. Terms used for decades in each specialty may mean something different to the other group or may be confusing to the layman.

Terms and definitions may mature over time. This column will alternate between inconsistent terms, evolving terms and terms that need a few extra words or examples to become understood by all. It is a recurring feature of this newsletter, so please let us know ([max.rudolph@rudolph-financial.com](mailto:max.rudolph@rudolph-financial.com)) if you have a term that you think actuaries, climatologists or sustainability experts use in different ways from each other or from common use. Vocabulary awareness will lead to improved communications between these professionals.

### Insurer use of loss and damage

Insurers have used the term loss and damage for many years. Loss refers to a physical loss, due to events like a car accident, fire, or a natural catastrophe. However, it can also refer to a non-physical loss. One example in the property and casualty sector would be a commercial (business)-related financial hindrance (loss) due to business interruption from a natural or man-made hazard. Damages can compensate someone for the loss incurred, be non-economic or general (usually for pain and suffering), or punitive designed to incent the accused (and others) to change their practices.

### Loss and damage in international climate debates

The general usage in climate debates resembles that of insurers: climate impacts cause suffering, and arrangements are needed to support the victims. However, the concept is not legally consolidated, and “loss” and “damage” are not differentiated but rather used as interchangeable articulations of the problem.

The concept is both a rallying cry to characterize the severity of climate impacts on small islands and poor countries, and a signifier for UNFCCC work since 2007 on measures to address loss and damage from sudden and low-onset climate impacts through, for example, early warning, emergency preparedness, risk management, and insurance. This work happens mainly under the Warsaw International Mechanism. Following COP27 in November 2022, governments agreed to a new fund for responding to loss and damage, which aims to assist vulnerable countries. The design, contributors and other rules of the fund will be worked out in 2023.

## IPCC definition - Loss and Damage, and losses and damages.<sup>1</sup>

The IPCC considers that Loss and Damage (capitalized letters) refers to political debate and work under the UNFCCC following the establishment of the Warsaw International Mechanism in 2013, which is to “address loss and damage associated with impacts of climate change, including extreme events and slow onset events, in developing countries that are particularly vulnerable to the adverse effects of climate change.” Lowercase letters (losses and damages) have been taken to refer broadly to harm from (observed) impacts and (projected) risks. The IPCC’s efforts focus on documenting the latter, with the assumption that the information will help the former.

### Summary

Insurers use these terms in very legally specific ways to define their risk exposures in ways that clarify what is covered and, importantly for them, what is not. Many years of litigation have defined these legal interpretations.

In contrast, climate scientists and global politicians think of loss and damage, permanent or resolvable, both as the suffering caused by climate events, and as the area of international policymaking concerned with solutions to that suffering. The term is evolving with the policy debate, and possibly moving towards being the fourth pillar of climate action alongside mitigation, adaptation and climate finance as defined in Article 2.1 of the Paris Agreement.

The groups each need to be aware that this term has nuances that vary by user so making sure the meaning is clear at the beginning of a project or article is important. By seeking out terms that need clarification, actuaries can help to improve the overall process as well as improve their own work product.

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<sup>1</sup> Definition is slightly modified from IPCC glossary. IPCC, 2021: Annex VII: Glossary [Matthews, J.B.R., V.Möller, R. van Diemen, J.S. Fuglestvedt, V. Masson-Delmotte, C. Méndez, S. Semenov, A. Reisinger (eds.)]. In Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press. In Press. <https://www.ipcc.ch/report/sr15/glossary/>

## What now? – An Actuarial Perspective

No doubt that a lot of work is ahead of us but what we saw both at COP 27 and COP 15 was promising. Indeed, the scale of commitments were nowhere close to the targets defined to achieve Paris Agreement but were significant steps in the right direction. A lot of research and updates on various regulatory frameworks and standards that were underway came forth around the time and in the months thereafter. Here we share some thoughts from our committee members on the related topics and on the outcomes of the COPs.

### **Biodiversity is becoming an investment issue.**

*By Bob collie*

Below is a quick summary of the article published by *Bob collie*, in Summer 2022 on his [blog](#). The article is a great read, it discusses how and why the investment community should start considering the impact on Biodiversity while evaluating investment decisions and portfolios. The article references research papers and discusses regulatory frameworks under development which facilitate the integration of these risks in financial decisions. You can find the article at <https://collieesg.com/biodiversity/>.

*“No sooner are institutional investors getting accustomed to the idea of building climate-related analysis into their processes than broader questions of environmental impact have started to force their way into the conversation. Biodiversity is about the health of the planet on which we depend. As Professor Sir Partha Dasgupta put it: “our economies are embedded within nature, not external to it”. Investment is beginning to recognize that. It’s not that we have to stop doing our jobs, or to stop trying to make money, it’s that we have to see and accept the bigger picture within which finance is operating.*

*Biodiversity investment frameworks are likely to draw on the work already under way around climate considerations, borrowing some of the structures for data, transparency, reporting standards and risk factor assessment. TNFD, for example, is consciously adopting much of the structure of TCFD. There are differences, though. Without better measurement of the impact of activities on nature, materiality will be difficult to judge. Even knowing what to measure is not necessarily straightforward. But complex and multi-dimensional as the question is, it’s a question that the investment world can no longer afford to ignore.*

## After TCFD ... Get Ready for Disclosing Nature-related Risks and Opportunities – TNFD

By Timothy M.H. Cheng, ASA

After the closing of COP 15 UN Biodiversity Conference in Montreal, the topic of nature has been brought up again before end of the eventful 2022. 195 nations have agreed to protect and restore at least 30% of Earth's water and land by 2030, with a newly created biodiversity fund of \$30 billion a year.

Many actuaries have been exploring climate risks and impact of natural catastrophes. To get the whole picture, we cannot turn a blind eye to nature conservation. A healthy ecosystem is essential to keep greenhouse gases at a low level and build resilience to extreme weather events. In the insurance world, lack of proper nature-based solutions leads to more unpredictable losses due to climate change. The upcoming TNFD (Taskforce on Nature-related Financial Disclosures) framework guides companies to disclose their nature-related risks and opportunities, with the aim of supporting a shift in global financial flows away from nature-negative outcomes.

The TNFD framework was announced in 2020 and they have now published the third version of beta framework (v0.3) with continuous public consultation and pilot testing. Ultimately, TNFD will deliver its complete recommendations in September this year, enabling organizations (including insurers) to report and act on evolving nature-related risks. Given TCFD (Taskforce on Climate-related Financial Disclosures) has gained wide industry adoption among leading insurers globally<sup>2</sup>, actuaries and risk managers should start to get more familiarized with the topic of nature-related risk.

For those who are familiar with TCFD, you may realize that the current [recommendations](#) for TNFD are structured around similar pillars and disclosure areas as it is looking for IFRS reporting integration as well. The location aspect is new and unique for TNFD as they stressed that nature-related dependencies and impacts are location specific. They have identified more than 30 biomes to be assessed, including grasslands, wetlands, lakes, deep sea floors etc. Under an insurer setting, this requirement means a thorough review of underwriting portfolios – identifying the localized nature dependencies and potential impacts.

TNFD also emphasizes the alignment of nature targets and climate targets. Currently, there are near 30 leading insurers around the world (accounting for 15% of world premium volume) committed to transition their insurance underwriting portfolios to net-zero by 2050<sup>3</sup>. Actuaries should take into account of such targets in their work as it will impact the business mix and even lead to exit of certain biodiversity-rich and carbon-intensive markets.

Among all the recommendation pillars, scenario analysis could be again one of the pain points to complete the disclosure. Recently, Principles for Responsible Investment (PRI) has added biodiversity into its global climate policy forecast to create what it claims is the world's first scenario analysis to combine the two themes for investors<sup>4</sup>. The FPS+N scenario incorporates additional policy levers that support the nature transition, land protection/restoration, and nature markets. This could be an illustration on how to consider nature-related elements in the scenario planning process.

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<sup>2</sup> More than 40% of surveyed insurance companies reported climate-related financial information, extracted from page 9, TCFD Status Report 2022 <https://assets.bbhub.io/company/sites/60/2022/10/2022-TCFD-Status-Report.pdf>

<sup>3</sup> (Re)insurers transitioning their underwriting portfolio to net-zero GHG emissions by 2050, UN-Convened Net-zero Insurance Alliance, <https://www.unepfi.org/net-zero-insurance/>

<sup>4</sup> Robinson-Tillett, Sophie PRI adds biodiversity to global climate policy forecast, IPE magazine Jan 2023 <https://www.ipe.com/news/pri-adds-biodiversity-to-global-climate-policy-forecast/10064355.article>

As part of the SOA Catastrophe & Climate Steering Committee, we aim to bring thought leadership and best practices to the global actuarial community. We have recently published reports on [TCFD best practices](#) and [Climate data sources for actuaries](#). If you are also interested in the climate and sustainability space, we welcome you to follow our newsletter and check out [SOA Engage](#) for volunteer opportunities!

## COP 27 a Retrospective

*By Aadit Sheth, ASA, ACIA, CERA*

As global leaders met in Sharm el-Sheikh, Egypt for the 27th Conference of Parties (COP27), this felt like the world's last opportunity to limit global temperatures to the 1.5°C Paris target. At COP26, the 1.5°C goal was formalized and there had been renewed hope from the Glasgow Climate Pact; the pact provided hope that nations would align their national determined contributions (NDCs) with the 1.5°C pathway. At COP27, the renewed hope from COP26 had been just another "failed promise" and as the United Nations Secretary General, Antonio Guterres, said "the 1.5-degree goal is on life support, and the machines are rattling". COP27 may have not relieved us from "life support" with the 1.5°C goal, but it did bring with it one of the brightest spots in recent climate conferences and that was the agreement to establish and operationalize a loss and damage fund.

The loss and damage fund aims to provide financial assistance to the most vulnerable nations, impacted by the unavoidable risks of climate change. This is a massive step to climate justice and is very symbolic that the resolution to establish such a fund was agreed at the COP, nicknamed as "Africa's COP". Over several decades, there has been a lot of talk, but very little climate-related financial aid from developed nations.

Extreme weather events caused devastating impacts in several developing nations across 2022 and the theme of establishing such a fund was impossible to ignore at COP27. From an African perspective, the continent accounted for only 2-3% of the world's carbon emissions over the last few decades and yet it is disproportionately vulnerable to the impacts of climate change<sup>5</sup>. From the deadly floods in West Africa to the excruciating droughts around the Horn of Africa, extreme weather events have killed at least 4,000 people and affected 19 million in 2022 alone<sup>6</sup>. Apart from the fatalities and displacements, the implications of climate change could have huge financial consequences to the continents; studies have shown that at the current global warming rate, the average hit to GDP per capita across African countries would be a 20% reduction by 2050 and an enormous 64% by 2100<sup>7</sup>. The unprecedented and often unreported climate damage accentuated the case for the loss and damage fund. It is worth remembering this is not climate charity, but climate justice for the nations which are suffering the grave consequences created by others' actions.

The decision to establish such a fund is a historic breakthrough in climate negotiations; however, operationalizing such a fund is difficult and fraught with several challenges. The number one challenge is holding the developed nations accountable for their commitment.

In 2009, at COP15 in Copenhagen, developed countries committed to a collective goal of mobilizing \$100 billion per year by 2020 to help poorer nations adapt to climate-related risks; according to the United Nations, the countries are still failing to meet this minimum requirement.

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<sup>5</sup> Africa is particularly vulnerable to the expected impacts of global warming, UN Climate Change Conference, Nairobi 2006 [https://unfccc.int/files/press/backgrounders/application/pdf/factsheet\\_africa.pdf](https://unfccc.int/files/press/backgrounders/application/pdf/factsheet_africa.pdf)

<sup>6</sup> Emergency Events Database, The International Disaster Database, <https://www.emdat.be/>

<sup>7</sup>The cost to Africa, drastic economic damage from climate change, Christian Aid, Nov 2022 <https://www.christianaid.org.uk/sites/default/files/2022-11/the-cost-to-africa.pdf>

As with any fund, the loss and damage fund has critical questions that need to be addressed: how much funding is needed, who receives the funding and how much do they receive, what will trigger a loss and damage compensation, how will the funds be delivered, who will pay into the fund and how much will they pay? China and India are in an interesting situation- the UN currently classify the two countries as developing nations, and this would technically make them eligible for climate finance; however, they are two of the top three largest emitters of greenhouse gases. So, from a climate justice perspective, China and India should be key contributors to the fund, but this remains an unknown.

On the subject of climate finance, this was a conversation that also played a crucial part of COP27. Mia Motley- the Prime Minister of Barbados- alongside other key delegates pushed for reforms at the two largest financial institutions, the IMF and the World Bank. Her plan, known as the “Bridgetown Initiative”, calls for reshaping the global economic system. One key aspect of Motley’s initiative includes changes to funding and loan repayments for developing nations especially after climate disasters.

Loan repayments after extreme weather-related events can be significantly challenging and often results in nations spiraling into a debt crisis. Natural disaster clauses within debt instruments can help cease debt payments after such events and help recovery from natural disasters. Similarly, her plan proposes creation of a \$500 billion Global Climate Mitigation Trust seeded with IMF special drawing rights to fund climate projects. The key advantage is that member nations could borrow at the 2.4% overnight interest rate. Currently, poorer nations are seen as high-risk investments and they often borrow capital for climate relief and mitigation at rates north of 10%, while more developed nations can borrow between 1-4%.

From a global economic and actuarial standpoint, climate finance is critical in adapting and mitigating climate risk and novel ideas could help tackle the perennial problem. Reforms such as the “Bridgetown Initiative” affect the financial sector and as actuaries, it is crucial we understand and adapt to the economic and financial consequences. But honestly, our work does not stop there- as leaders in risk management and finance, we could also have an impact and influence private sector financial contributions to funding and seek other innovative sources of climate finance.

Overall, COP27 could have achieved more than it did- many believe not enough was done to limit warming to the 1.5°C and there is no evidence to suggest we are any closer to limit warming to under 2°C either. Major emitting nations still do not seem to be held accountable for their actions and neither are the oil and gas companies, who are expected to report record-breaking profits in 2022. The COVID-19 pandemic, war in Ukraine and cost of living crisis stole majority of the limelight in 2022, but with every fractional increase in global temperatures, millions more people will be exposed to extreme climate-related events.

In conclusion, whether COP27 was a success or failure is hard to justify; if COP27 is another climate conference with over-promising and under-delivering, then the future looks bleak and climate chaos will soon be irreversible. It is vital to remember that the clock is ticking on this global issue and, we as global citizens need to play our parts in rallying action to prevent “climate hell”.

## SOA Featured Research Projects

By Priya Rohatgi, ASA

Following are the three most recent papers published by SOA Research Institute.

### A Practical Guide for Working with Weather Datasets - Topic #2: Strategies for Processing Large Weather Datasets, Dec 2022

By Patrick Wiese, ASA

**Analyzing weather datasets?** If this is anywhere on your to-do list, this is a [series](#) for you to follow. It's being developed to serve as a practical guide for actuaries and researchers. The first paper released in Oct 2022 provided an overview of the main types of weather datasets. This recent release by *Patrick Wiese*, the second in the series, discusses some of the computer programming strategies needed for processing large weather datasets using a standard personal computer.

As actuaries, risk analysts and amateurs working with weather data, we often lack the adequate infrastructure needed for weather analyses. While working on our personal machines we often run into either storage or memory limitations. *To overcome a PC's memory constraints, this paper presents illustrative computer programs that iteratively loop through a large data file, processing the data in small chunks. This technique is programmed in many different languages, and this paper presents examples written in R, VBA, C++, and Python. Because the illustrative programs are short and simple, no prior programming experience is necessary to grasp the key ideas. This paper is accompanied by 6 small computer programs written in VBA, Python, R, and C++, zipped together into a single file to simplify the download process.*

[Strategies for Processing Large Weather Datasets](#)

### Flood Risk Management and Adaptation Under Sea-Level Rise Uncertainty

By Chi Truong, PhD, AIAA, Matteo Malavasi, PhD, Stefan Trueck, PhD and Han Li, PhD

**Well timed!** The SOA Research Institute recently published a report engaging the researchers from the *Department of Actuarial studies and Business Analytics at Macquarie University* and *Center of Actuarial studies at the University of Melbourne*. Over last few years and as recently as January 2023, the world has experienced an increasing number of extreme weather events that inflicted significant unexpected losses making adaption and preparedness critical for survival.

*In urban settings, and particularly in coastal regions, factoring in climate uncertainty when identifying and assessing optimal adaptation policies has become essential to increased resilience to storm surge risk.*

This report starts with a literature survey, identifies how their research can improve upon the existing body of knowledge and addresses some of the issues that can further facilitate the analysis and evaluation of adaptation strategies for flood risk.

*In this report, the researchers examine optimal adaptation pathways to increase the resilience of coastal regions to flood and storm surge risk. The proposed modeling framework allows to examine the timing of investment, when both hard protection measures<sup>8</sup> and soft measures<sup>9</sup> are available. It also takes into account the economic growth in loss exposure and the uncertain impacts of climate change. The project:*

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<sup>8</sup> Hard protection measures – dikes or sea walls

<sup>9</sup> Soft protection measures - building codes that require buildings to be elevated to a certain height, dry flood-proofing measures that seal the buildings to prevent water from entering the buildings, and wet flood-proofing measures that move valuable assets to a higher level. Soft measures also include land use policy that converts the most vulnerable housing areas to parkland



- Develops a new modeling framework for pricing catastrophic risk in coastal regions, taking into account the impact of economic growth, the seasonal impact of tides, uncertainty about the mean sea-level rise, and the stochastic volatility of storm surges.
- Develops a real options framework that can determine flexible adaptation pathways, i.e., the optimal time to invest into single investment projects, and optimal pathways for adaptation, when multiple adaptation measures are available.
- Calculates appropriate insurance premiums for flood risk without adaptation, as well as when the optimal adaptation pathway is followed.
- Applies the proposed models to three coastal regions, namely New York, Copenhagen, and South East Queensland (Australia)

For more, the research is available at: <https://www.soa.org/research-report/2022/flood-rm-adapt-sea-level.pdf>

## Actuarial Weather Extreme series

In January, the SOA Research Institute published two new reports in the series examining the impact of some of the Atmospheric Rivers that kept battering California in succession.

### **The Actuarial Weather Extremes Series California Precipitation December 30-31, 2022**, by *Matthew Self*

This report focuses primarily on 3 stations in California, selected based on their total precipitation on 12/31/2022. The report reviews the historical trend w.r.t to the maximum daily and hourly precipitation in month of December. The paper also attempts to fit a distribution with little success, which is a good reminder of an important lesson “*as actuaries it’s our responsibility to focus on the model’s purpose at all phases of analysis*”. Data was sourced from Automated Surface Observing System (ASOS) and Global Historical Climatology Network (GHCN).

### **Actuarial Weather Extremes Series Salinas River California Streamflow: January 2023**, by *Matthew Self*

Based exclusively on the U.S. Geological Survey (USGS) data, this subsequent report *examines the impact of the record rainfall on river and stream discharge levels through California, with a detailed focus on historical observations of the Salinas River in two locations.*

<https://www.soa.org/globalassets/cc192-actuarial-weather-extremes-january-2023-salinas-river-ca-streamflow.pdf>

<https://www.soa.org/globalassets/research-report/2023/act-weather-extremes-ca-2022-12-report.pdf>

## In the News

By Priya Rohatgi, ASA

Here are some recent events that are at the intersection of Climate change, the evolving environmental risks and policy initiatives and regulatory framework to mitigate its impact. As you click through the articles below, we invite you to consider how these events may impact actuarial applications, and to note any associations to economic and insured losses.

### 1. Future of insurance industry – Retreat or Reinvent?

<https://www.bloomberg.com/climate-is-forcing-the-most-risk-aware-industry-to-reinvent-itself, Jan 24, 2023>

The insurance industry provides many homeowners and businesses with a financial safety net. Climate impacts are creating holes in it.

[Climate is forcing the most risk-aware industry to reinvent itself](#), Jan 24, 2023

When it comes to climate impacts, the frontline of the finance industry is insurance. Last year's payout from damages caused by extreme-weather events totaled \$120 billion—about the same as the economic output of Kenya. And that's a 50% increase over the previous decade's average.

Reinsurers have had it worse, according to a Moody's report published earlier this month, with their profits trailing those of insurers. That's causing reinsurers to increase their premiums, limiting the types of coverage they provide, and even exiting some markets. Now even the investors in re-insurers are unhappy about their investments as they get lower returns than expected.

The difficulties are forcing the insurance industry to get creative. There are three levers it can use to reduce climate risks: reduce its own emissions, force the companies it invests in to reduce their greenhouse gases, and create products that would help its customers shrink their environmental footprint.

[www.bloomberg.com](http://www.bloomberg.com)

### 2. Role of climate change in outbreaks of Cholera

<https://www.bloomberg.com/disease-a-little-known-but-deadly-effect-of-climate-change>

The largest cholera outbreak in Malawi shows how increasingly extreme weather is having negative impacts on health.

[A Deadly, Overlooked Consequence of Climate Change: Disease](#), Jan 31, 2023

Then there's cholera, a disease of poverty and poor infrastructure. The strains of bacteria that cause cholera spread through the fecal-oral route, which tends to happen in places where there is a lack of access to clean water and poor hygiene.

Treating cholera requires oral rehydration solution (ORS), a mix of salts and sugar delivered in clean water. However, when a flood or drought displaces large populations, delivering either clean water or ORS becomes harder and makes outbreaks worse. And cholera outbreaks have happened not just in Malawi, but also in flood-hit Pakistan, Nigeria, and Mozambique in just the last few months.

[www.bloomberg.com](http://www.bloomberg.com)

3. What can we learn from the pilot?

<https://www.vox.com/federal-reserve-jerome-powell-climate-change-citigroup-jpmorgan>

The central bank is studying climate risks at major banks, but Fed chair Jerome Powell doesn't want to get involved in policy.

[The Federal Reserve is starting a climate experiment](#), Jan 23, 2023

The central bank this month announced details about how it will conduct a “**pilot climate scenario analysis exercise**” involving the six largest U.S. banks: Bank of America, Citigroup, Goldman Sachs, JPMorgan Chase, Morgan Stanley, and Wells Fargo.

The Fed is careful to note that its climate scenario analysis is different from a stress test. In Fed-speak, a stress test measures whether a bank has enough money to meet its obligations during difficult economic times. The Fed can then use the results to set new rules or adjust its policies.

The climate scenario analysis, by contrast, is more of a storytelling exercise. One pathway imagines a world in which there are basically no new climate policies between now and 2050, allowing current economic trends to continue. The other chalks out a pathway to net-zero greenhouse gas emissions by the middle of the century. The Fed is building on climate models developed by the Intergovernmental Panel on Climate Change (IPCC) and financial models from the Network of Central Banks and Supervisors for Greening the Financial System (NGFS).

In both of these worlds, banks will then have to figure out how their loan portfolios would respond to the aforementioned physical and transitional risks. The Fed has set a deadline to receive these reports from banks by the beginning of August.

Fed did acknowledge that the experiment isn't comprehensive. But the fact that the Fed is looking at this tells all financial institutions, not just the six studied in this analysis, that they can't ignore the effects of climate change on their operations.

[www.vox.com](http://www.vox.com)

4. Canaries in the coal mine

<https://www.nytimes.com/2023/01/09/science/parasites-global-warming.html>

Warming temperatures in one part of the world seem to have driven down the parasite population, suggesting another unexpected way that climate change harms ecosystems.

[You May Miss These Parasites When They're Gone](#), Jan 09, 2023

According to a groundbreaking study published in the Proceedings of the National Academy of Sciences. Controlling for other factors like pollution and fluctuating fish populations, the team found that across all species, parasites declined by 38 percent for every degree Celsius of temperature increase. Some species were harmed more than others.

As scientists learn more about the hundreds of thousands of other parasitic species that do not harm humans, a picture of animal groups that play key roles in maintaining healthy ecosystems is emerging. For instance, parasites keep species populations in check just like predators do.

What the findings do say for sure, Dr. Wood added, is that parasites are in need of conservation, just like any other species. “Parasites are playing these vital roles in ecosystems that will disappear when they do, and that’s when we’ll notice how important they are”.

[www.nytimes.com](http://www.nytimes.com)

**5. Record water levels due to Compound events - High tide flooding and winter storms**

<https://oceanservice.noaa.gov/news/jan23/december-2022-record-water-levels.html>

From Alaska to Washington, several of NOAA’s water level stations observed their highest recorded water levels.

[December 2022 water levels break eight historical records](#), Jan 19, 2023

December was an active month for NOAA’s [National Water Level Observation Network \(NWLON\)](#). A staggering eight stations observed all-time high-water levels — some of which broke records in place for 40 years. The Pacific Northwest was the most affected region, with four locations in the state of Washington observing their highest-ever water levels on record. Weather conditions often compound high tide flooding, which can cause even more damage. This happened on December 27, 2022, when a strong winter storm hit the Pacific Northwest while tides were still above normal following the perigean spring tide.

NOAA predicts many coastal regions of the U.S. will experience higher than normal high tides between January and February 2023. The U.S. West Coast, in particular, may experience some of the highest tides between January 18-26 and February 18-21. These dates coincide with a perigean spring tide.

[www.oceanservice.noaa.gov](http://www.oceanservice.noaa.gov)

**6. FEMA – the backstop has hit its limit**

<https://www.globalreinsurance.com/fema-cuts-nfip-reinsurance-programme-for-2023>

Its reinsurance placement has halved to \$500m, amid hardening rates and diminishing capacity

[FEMA cuts NFIP reinsurance programme for 2023](#), Jan 11, 2023

Its reinsurance placement has halved to \$500m, amid hardening rates and diminishing capacity

[www.globalreinsurance.com](http://www.globalreinsurance.com)

**7. Inflation double whammy – rising costs and claims**

<https://www.globaldata.com/inflation-stands-insurance-industrys-biggest-challenge-2023>

According to a GlobalData poll over a third of insurance industry insiders cited inflation as the standout challenge for 2023. It was significantly ahead of other key themes such as digitalization, climate change, regulation, COVID-19, cybercrime, and geopolitics.

[Inflation stands out as the insurance industry’s biggest challenge in 2023](#), Dec 20, 2022

Ben Carey-Evans, Senior Insurance Analyst at GlobalData, comments: “Inflation poses such a significant threat to insurers as they face a double-edged sword. Insurers will face inflationary pressure themselves in terms of the cost of running their business and claims costs will rise as a result of supplies and work becoming more expensive. However, while insurers would usually pass on higher claims costs to consumers in the form of higher premiums, individuals in the UK have less disposable income than ever, with the cost of living soaring and wages remaining stagnant. This will make it hard for insurers to push through premium rate increases while not losing customers and seeing penetration rates fall.”

[www.globaldata.com](http://www.globaldata.com)

#### 8. Tornado alley shift – spatial and temporal

<https://www.nbcnews.com/science/torando-alley-creeping-new-territory>

In recent years, researchers have noticed that fewer tornadoes were touching down in the Great Plains and that more were hitting the Southeast.

[Tornado Alley is creeping into new territory](#), Jan 26, 2023

A tornado that tore through the Houston area on Tuesday (Jan 24) was the kind of early-season storm that scientists say has been occurring with increasing regularity — a sign that patterns of severe weather are shifting. “It’s pretty rare to see an active January and February that all of a sudden goes dull in April and May,” Gensini said. “When you look at tornado statistics, if it starts early in January and February, it’ll typically just keep going.”

Victor Gensini, is an associate professor in the department of earth, atmosphere and environment at Northern Illinois University.

[www.nbcnews.com](http://www.nbcnews.com)

#### 9. 2023 – is going to be HOT, HOTTER or HOTTEST?

<https://www.bbc.com/news/science-environment-64192508>

New data shows that 2022 was the fifth hottest year for Europe since records began. But scientists are warning that 2023 could be even warmer, as a climate phenomenon called La Niña - which has been suppressing global temperatures - comes to an end.

[What are El Niño and La Niña, and how do they change the weather?](#), Jan 11, 2023

Despite the La Niña triple, the EU's climate monitoring service says that 2022 was the fifth warmest year on record.

Prof Adam Scaife from the Met Office said: "Global average temperature over the last three years has been at near record levels, but it would have been even higher without the cooling effects of a prolonged La Niña."

A 0.2C temperature rise would add about 20% to the existing global temperature rise from climate change.

The Met Office expects La Niña to end later this year, "raising the prospect of even higher global temperatures".

[www.bbc.com](http://www.bbc.com)

**10. Words matter – extreme weather is fueling the media hype-machine**

<https://www.nytimes.com/2023/01/18/science/weather-forecasts-language.html>

When the barometer drops, the volume of ‘hyped words’ rises, and many meteorologists aren’t happy about it.

[Bomb Cyclone? Or Just Windy with a Chance of Hyperbole?](#), Jan 18, 2023

“The language evolved to get people’s attention,” said Cindy Bruyere, director of the Capacity Center for Climate and Weather Extremes at the National Center for Atmospheric Research. She sat with two fellow scientists at a coffee bar between sessions and became increasingly animated as she discussed what she called “buzz words” that lack meaning.

“I have zero pictures in my head when I hear the term ‘bomb cyclone,’” she said. “We need significantly clearer language, not hyped words.”

[www.nytimes.com](http://www.nytimes.com)

**11. Atmospheric rivers overwhelm California**

<https://www.asce.org/civil-engineering/successive-atmospheric-rivers-test-californias-infrastructure>

California has been hit by repeated storms fueled by torrents of moisture called atmospheric rivers that will only intensify in a warming climate.

[Successive atmospheric rivers test California’s infrastructure](#), Jan 23, 2023

Heavy rains from the recurring storms have caused flooding and landslides across the state, severely testing — and, in some cases, overwhelming — the infrastructure designed to accommodate such events.

[www.asce.org](http://www.asce.org)

**12. A 43-day atmospheric river storm... in 1861**

[https://cw3e.ucsd.edu/wp-content/uploads/2013/10/Dettinger\\_Ingram\\_siam13.pdf](https://cw3e.ucsd.edu/wp-content/uploads/2013/10/Dettinger_Ingram_siam13.pdf)

Geologic evidence shows that truly massive floods, caused by rainfall alone, have occurred in California about every 200 years. The most recent was in 1861, and it bankrupted the state.

[The Coming Megafloods](#), Jan 2013

**The intense rainstorms sweeping** in from the Pacific Ocean began to pound central California on Christmas Eve in 1861 and continued virtually unabated for 43 days. The deluges quickly transformed rivers running down from the Sierra Nevada mountains along the state’s eastern border into raging torrents that swept away entire communities and mining settlements. The rivers and rains poured into the state’s vast Central Valley, turning it into an inland sea 300 miles long and 20 miles wide. Thousands of people died, and one quarter of the state’s estimated 800,000 cattle drowned. Downtown Sacramento was submerged under 10 feet of brown water filled with debris from countless mudslides on the region’s steep slopes. California’s legislature, unable to function, moved to San Francisco until Sacramento dried out—six months later. By then, the state was bankrupt.

[www.cw3e.ucsd.edu](http://www.cw3e.ucsd.edu)

### 13. Greenwashing - consumers beware!

<https://www.bloomberg.com/four-examples-of-greenwashing-according-to-the-eu>

European Union regulators identified words and marketing slogans often used to convince consumers a product is environmentally friendly.

[How Eco-Friendly Is That Product? Here Are Four Ways to Spot Greenwashing](#), Jan 18, 2023

In anticipation of combating misleading climate claims on packaging and in advertisements, the European Union has identified a handful of common words and phrases used by companies to pitch their products as environmentally friendly — even when they aren't.

“Climate neutral,” “carbon neutral,” “100% CO2 compensated.”

“The greenest you can buy!”

“50% reduction by 2030”

“Biodegradable,” “compostable,” “bio-based” plastic

[www.bloomberg.com](http://www.bloomberg.com)

### 14. Hazards of rising sea level amplified by natural variabilities on Earth

<https://phys.org/news/2022-11-sea-exceed-coasts-nasa.amp>

New results show average sea level rise approaching the 1-foot mark for most coastlines of the contiguous U.S. by 2050. The Gulf Coast and Southeast will see the most change.

[Rising sea level could exceed estimates for US coasts, NASA study finds](#), Nov 16, 2022

By 2050, sea level along contiguous U.S. coastlines could rise as much as 12 inches (30 centimeters) above today's waterline, according to researchers who analyzed nearly three decades of satellite observations. The results from the NASA Sea Level Change Team could help refine near-term projections for coastal communities that are bracing for increases in both catastrophic and nuisance flooding in coming years.

For instance, by the mid-2030s, every U.S. coast will experience more intense high-tide floods due to a wobble in the Moon's orbit that occurs every 18.6 years. This lunar cycle, in combination with rising sea level, is projected to worsen the impacts of high-tide flooding during the 2030s and 2040s.

[www.phys.org](http://www.phys.org)

### 15. Climate change saga: A to Z

<https://www.newyorker.com/magazine/2022/11/28/climate-change-from-a-to-z>

The stories we tell ourselves about the future. By Elizabeth Kolbert

[Annals of a Warming Planet - Climate Change from A to Z | The New Yorker](#), Nov 21, 2022

Climate change resists narrative — and yet some account of what's happening is needed.

Millions of lives are at stake, and upward of a million species.

And there are decisions to be made even though it's unclear who exactly will make them.

[www.newyorker.com](http://www.newyorker.com)

## Studies/Research Published Outside the SOA

By Priya Rohatgi, ASA

In this section we try to direct our readers to some of the work done by fellow actuarial societies and other professional associations/institutions in the U.S. and around the world. The risks related to climate instability and loss of biodiversity are not only global in scale but are long term, uncertain and highly complex. Therefore, we feel the need to collaborate, share knowledge and tap into the research and developments that are happening around the world and across disciplines.

### Reinsurers defend against rising tide of natural catastrophe losses, for now.

*Special Report by Moody's Investors Service, published Jan 2023*

*Climate change, which is driving more frequent and increasingly severe natural catastrophes, is a growing threat to reinsurers because they accumulate losses from primary companies.*

Moody's recently published an interactive report discussing the challenges the reinsurers are facing due to increased frequency of extreme events and how they are mitigating these current risks and looking for new opportunities to resolve them in future. The report also points out the current Moody's ESG Profile Scores by financial institutions including re/insurers.

*Rising physical climate risk as a result of chronic, slow-moving trends such as rising sea levels (coastal flooding), as well as increasing intensity of rainfall and extreme temperatures creates additional underwriting and risk management complexity. Reinsurers continue to study and evaluate the consequences of climate change. Given the volatility of catastrophes, reinsurers are responding through rate increases, catastrophe modeling enhancements, greater stress testing and varying degrees of exposure reduction.*

*Nevertheless, the effects of climate change amplify earnings volatility risk for reinsurers. They will need to continue to manage their portfolios effectively, look for new opportunities and price risk appropriately in order to be able to continue to assume these increasing physical climate risks.*

<https://www.moodys.com/web/en/us/about/insights/data-stories/reinsurers-mitigate-lower-profits.html>

### Nature and the Insurance Industry: Taking action towards a nature-positive economy.

By The Geneva Association

*Author: Maryam Golnaraghi, Director Climate Change & Environment & Contributing author: Adrien Mellot*

The Summary for the report is a great place to start. *The report provides the latest scientific evidence on the impacts of human activity on nature and their socio-economic implications, laying out the challenges and opportunities facing re/insurers and how they, as risk managers and investors, can support the development of a nature-positive economy and incentivise sustainable business models. It also explores the profound inter-connectivity between nature loss and climate change in terms of both risks and solutions and highlights seven factors that are driving nature-positive considerations into core business decision-making in insurance.*

[https://www.genevaassociation.org/sites/default/files/2022-11/nature\\_and\\_insurance\\_summary.pdf](https://www.genevaassociation.org/sites/default/files/2022-11/nature_and_insurance_summary.pdf)

[https://www.genevaassociation.org/sites/default/files/2022-11/nature\\_and\\_insurance\\_report.pdf](https://www.genevaassociation.org/sites/default/files/2022-11/nature_and_insurance_report.pdf)



## Federal Reserve Board's Pilot Climate Scenario Analysis (CSA) Exercise

As we all know that Federal Reserve Board is starting a pilot Climate Scenario Analysis (CSA) exercise with a goal to gather qualitative and quantitative information about the climate risk-management practices of large banking organizations.

*The pilot CSA exercise comprises two separate and independent modules: [a physical risk module](#) and a transition risk module ([Excel](#) available). By separating these two types of climate-related financial risks, large banking organizations and supervisors will be able to better identify critical data, modeling, and risk-management components for each type of risk, although this approach does not capture potential interactions between physical and transition risks.*

*For each module, the Board will describe forward-looking physical or transition risk scenarios, including core climate, economic, and financial variables, where appropriate. In selecting scenarios for this exercise, the Board leveraged existing work conducted by the Intergovernmental Panel on Climate Change (IPCC) and the Network of Central Banks and Supervisors for Greening the Financial System (NGFS). The pilot CSA exercise includes a range of plausible future outcomes that can help build understanding of how certain climate-related financial risks could manifest for large banking organizations and how these risks may differ from the past.*

*Each participant will estimate the effect of these scenarios on a relevant subset of credit exposures. The physical risk module will focus on estimating the effect of specific scenarios on residential real estate and commercial real estate (CRE) loan portfolios over a one-year horizon in 2023. The transition risk module will focus on estimating the effect of specific scenarios on corporate loan and CRE loan portfolios over a 10-year horizon from 2023–32. The pilot CSA exercise will not include a review of the trading book.*

*For each loan, participants will calculate and report to the Board traditional credit risk parameters, such as probability of default (PD), internal risk rating grade (RRG), and loss given default (LGD), under a range of scenarios.*

*For the purposes of this pilot exercise, participants will assume that balance sheets remain static over the relevant projection horizon. This approach allows participants to focus on risk measurement, rather than on forecasting how business strategies and balance sheets could evolve over time.*

*Over the course of the exercise, the Board will engage with participants to understand their approaches and challenges with respect to the financial risks of climate change. Information collected and discussed with participants will include detailed documentation of governance and risk-management practices, measurement methodologies, data challenges and limitations, estimates of the potential impact on specific portfolios, and lessons learned from this exercise that could inform any future CSA exercises.*

<https://www.federalreserve.gov/publications/climate-scenario-analysis-exercise-instructions.htm>

## About the Society of Actuaries Research Institute

Serving as the research arm of the Society of Actuaries (SOA), the SOA Research Institute provides objective, data-driven research bringing together tried and true practices and future-focused approaches to address societal challenges and your business needs. The Institute provides trusted knowledge, extensive experience and new technologies to help effectively identify, predict and manage risks.

Representing the thousands of actuaries who help conduct critical research, the SOA Research Institute provides clarity and solutions on risks and societal challenges. The Institute actuaries, academics, employers, the insurance industry, regulators, research partners, foundations and research institutions, sponsors and non-governmental organizations, building an effective network which provides support, knowledge and expertise regarding the management of risk to benefit the industry and the public.

Managed by experienced actuaries and research experts from a broad range of industries, the SOA Research Institute creates, funds, develops and distributes research to elevate actuaries as leaders in measuring and managing risk. These efforts include studies, essay collections, webcasts, research papers, survey reports, and original research on topics impacting society.

Harnessing its peer-reviewed research, leading-edge technologies, new data tools and innovative practices, the Institute seeks to understand the underlying causes of risk and the possible outcomes. The Institute develops objective research spanning a variety of topics with its [strategic research programs](#): aging and retirement; actuarial innovation and technology; mortality and longevity; diversity, equity and inclusion; health care cost trends; and catastrophe and climate risk. The Institute has a large volume of [topical research available](#), including an expanding collection of international and market-specific research, experience studies, models and timely research.

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