Catastrophe and Climate

SOA Research INSTITUTE

Research Program Newsletter

Sponsored by the SOA Catastrophe and Climate Strategic Research Program Steering Committee

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Focus on Terminology: Risk

By Max J. Rudolph, Steve Bowen

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 considers inconsistent terms, evolving terms and terms that may 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) if you have a term that you think actuaries, climatologists and sustainability experts use in different ways from each other or from common use. Vocabulary awareness will lead to improved communications between these professionals.

Risk

Risk, based on uncertainty, can vary in meaning based on perspective and experience. The economist Peter Bernstein was quoted in CFA Magazine (March/April 2004) as saying "Risk is … about the unknown, the inescapable darkness of the future." The variance metric uses this definition, but a stock price that regularly increases is not so worrisome as one that does nothing but decline. Others look only at downside risk, either in absolute terms or relative to goals. A pension plan may require returns of 7% so would look at risk as anything less than that.

Financial experts require a risk event to have uncertain financial outcomes. They sell insurance so companies can hedge certain downside risks, manage their own strategic and operational risks, and buy risky investments. An entity must have exposure to an uncertain event for it to be considered a risk. Insurers take into account hazard changes along with how and where buildings are constructed.

Behavioral responses are considered, and cost benefit analysis is completed to determine if the strategy used to modify the gross risk to a net result is cost effective. This analysis could include long-term repercussions of actions like greenhouse gas emissions but usually is limited to standard accounting practices that do not consider that resources are limited or that side effects could leave the ecosystem in a changed state.

In the context of climate for financial firms like insurers, one area where "risk" is truly growing exists on the ESG (environmental, social, governance) side as companies decarbonize portfolios to meet net-zero commitments. Risk can come through the lens of greenwashing, activist investors, transitioning the portfolio too quickly or without proper financial backdrops to limit loss, or the reputational risk of doing nothing / not enough to make meaningful steps in greening up your business strategy. Institutional investors, long participating in energy and utility finance, are key players in the transition away from greenhouse gases.

IPCC definition – Risk.[1]

The IPCC defines risk as purely downside, applies only to climate change, and does not focus on economic results. This makes sense for the stated purpose as noted in the definition.

The potential for adverse consequences for human or ecological systems, recognizing the diversity of values and objectives associated with such systems. In the context of climate change, risks can arise from potential impacts of climate change as well as human responses to climate change. Relevant adverse consequences include those on lives,

[1] IPCC, 2022: IPCC glossary associated with AR6 https://apps.ipcc.ch/glossary/

livelihoods, health and well-being, economic, social and cultural assets and investments, infrastructure, services (including ecosystem services), ecosystems and species.

In the context of climate change impacts, risks result from dynamic interactions between climate-related hazards with the exposure and vulnerability of the affected human or ecological system to the hazards. Hazards, exposure and vulnerability may each be subject to uncertainty in terms of magnitude and likelihood of occurrence, and each may change over time and space due to socio-economic changes and human decision-making (see also risk management, adaptation and mitigation).

In the context of climate change responses, risks result from the potential for such responses not achieving the intended objective(s), or from potential trade-offs with, or negative side-effects on, other societal objectives, such as the Sustainable Development Goals (SDGs) (see also risk trade-off). Risks can arise, for example, from uncertainty in implementation, effectiveness or outcomes of climate policy, climate-related investments, technology development or adoption, and system transitions.

The IPCC defines compound risks as the interactions of hazards that affect exposed and systems or sectors[2]. Several IPCC definitions are included in the footnote.

Summary

The IPCC defines risk by focusing on bad things happening to human or ecological systems as a result of climate change, while financial experts bring this definition under an expanded umbrella that includes financial exposures. This is not surprising but, when climate scientists are having a discussion with financial experts, they should remind each other of these differences so comments are communicated clearly. By putting a price on risk, financial experts in the insurance community can nudge those with economic interests to accept only sustainable risks.

The groups each need to be aware that these terms have 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.

As climate change evolves, historical data becomes less predictive around risks driven by drought, excessive rainfall and sea level rise. Modeling expertise by experts like actuaries can enable better decisions through transparent and consistent analysis of risk.

Max Rudolph is a principal at Rudolph Financial Consulting, LLC.

Steve Bowen is a Meteorologist and the Chief Science Officer at Gallagher Re.

[2] IPCC considers risk to be a result of a combination of hazard (physical climate impact), exposure (being in a location of setting potentially affected by a hazard), vulnerability (sensitivity to the hazard and lack of adaptation)

SOA Research Reports - Recent Releases!

SOA Research Institute recently published the last paper in the series, Expert panel discussion on Catastrophe Cyber risk. This report focuses on presenting strategies and solutions for enhancing cyber resilience against catastrophic cyber events. For a brief overview of the key learnings from all the papers in the series checkout the summary provided.

Catastrophe & Climate Steering Committee had recently sponsored two Call for Essays, read below the selected submissions. In addition, also provided below is the link for the SOA Research Institute Virtual Open House featuring the Catastrophe & Climate Steering committee held on June 21, 2023.

Catastrophic Cyber Risk: An Expert Panel Discussion Series

By Unal Tatar, PhD, Brian Nussbaum, PhD, Omer F. Keskin, PhD, Elisabeth Dubois, MBA, PMP, Dominick Foti, MBA, Doug Clifford, Brianna Bace, Rian Davis

Integration of technology and digital transformation within organizations has created technological interdependencies within and across organizations, such that the impact of cybersecurity incidents can cascade very quickly from organization to organization and across borders. Thereby creating potentially, a systemic risk, often contagious and frequently beyond the understanding or control of any single entity. This has implications for insurance companies, reinsurers, regulators, consumers, and society.

The goal of the Expert panel study is to take a multi-disciplinary, holistic approach to catastrophic cyber risk in this four-part series of discussions and subsequent reports.

https://www.soa.org/resources/research-reports/2023/cat-cyber-risk

Strategies and Solutions Against Catastrophic Cyber Incidents- Part 4, June 2023

The fourth and final installment of this series of expert panel discussions was recently published.

The purpose of this report is to present strategies and solutions for enhancing cyber resilience against catastrophic cyber events. These strategies and solutions are based on the findings of the first three meetings and subsequent reports, which were held to examine catastrophic cyber risks and conduct red teaming scenario analyses.

This report aims to provide a comprehensive and actionable plan that can be used by the cyber insurance sector and its stakeholders to strengthen their cyber risk management practices and increase their ability to respond effectively to catastrophic cyber events. It draws on the insights and recommendations generated during the expert panel meetings and distills them into a set of concrete and practical strategies that can be implemented at different levels of the cyber insurance sector and its stakeholders.

The report is intended for a wide audience, including cyber insurance companies, policymakers, regulators, industry associations, and other stakeholders who have a role to play in enhancing cyber resilience against catastrophic cyber events. Its ultimate goal is to promote a more proactive and collaborative approach to cyber risk management, one that recognizes the shared interests and responsibilities of all stakeholders and fosters greater trust and confidence in the cyber insurance sector as a key contributor to cyber resilience.

Red Teaming Analysis of a Widespread Catastrophic Cyber Incident - Part 3, May 2023

Red Teaming Analysis of a Catastrophic Cyber Attack on Critical Infrastructure - Part 2, March 2023

Setting the Scene: Framing Catastrophic Cyber Risk - Part 1, January 2023

Climate change infographics

The wildfires of Canada and the intense precipitation leading to massive flooding, considered in Vermont as one in thousand-year event forced many of us to refer to some of the recent research done on the topic. A couple of research papers that we recommend for reference are listed below and do review the infographics presenting the key learnings from these studies, published recently.

Potential Impacts of Climate Change on U.S. Inland Flood Risk by Mid Century *by Peter Sousounis, PhD, Alastair Clarke, PhD, Doug Fullam*

Infographic: https://www.soa.org/2023/2021-climate-change-impact-us-flooding-fastfacts.pdf

Research Report: https://www.soa.org/resources/research-reports/2021-climate-change-impact-us-flooding

Potential Impacts of Climate Change on U.S. Wildfire Risk by Mid Century *by Peter Sousounis, PhD, Alastair Clarke, PhD, Doug Fullam*

Infographic: https://www.soa.org/2023/us-wildfire-infographic.pdf

Research Report: https://www.soa.org/resources/research-report/climate-change-impacts-to-us-wildfire-risk

Virtual Open House, June 2023

SOA Research Institute Virtual Open House: Catastrophe & Climate Strategic Research Program - The panel of speakers included Joan Barrett, FSA, MAAA, C. Ian Genno, FSA, FCIA, CERA and Rob Montgomery, ASA, MAAA, FLMI

Access the webinar recording and the slides:

https://www.soa.org/resources/research-reports/2023/cc-openhouse-06212023/

The Actuary magazine, July 2023

Checkout the recent articles in *The Actuary* magazine:

Actuaries and Climate Change - Two strengths and a potential Achilles' heel *by Bob Collie, FIA*
Given the scale of interest in the topic and the massive potential impact on insurance, pensions and investment, this should surprise nobody. Actuaries, of course, are just some of the people interested in climate change. The core of our expertise is financial risk, not climate science. Climate science is a specialist area and a complex one at that. However, we bring something unique to the table in applying our particular skill set to the emerging questions around the implications for the financial sector. And I believe that we, as a profession, have two great strengths—and one characteristic that could hinder us if we are not self-aware. So, let's start with the strengths.
https://www.theactuarymagazine.org/actuaries-and-climate-change/

Impact of Climate Change on Insurance – An AI perspective *by Amarnath Suggu*
AI, it appears, is a good option for assessing climate change-induced weather risks. It can help insurers better understand and predict the risk of weather events and the accompanying losses, thus improving risk modeling. AI models are computationally less intensive and generate forecasts faster than traditional models. Many technology startups, research organizations and government agencies have successfully adopted AI to forecast and monitor natural calamities. I believe it is just a matter of time before AI replaces the traditional models as the de facto means in the fight against climate change. https://www.theactuarymagazine.org/impact-of-climate-change-on-insurance

SOA Call for Essays, June 2023

Catastrophe & Climate Steering Committee had recently sponsored two Call for Essays, read below the selected submissions.

Sustainability and Sustainable Development Goals

The SOA Research Institute Catastrophe & Climate Strategic Research Program would like to better understand how concepts of sustainable development and sustainability can drive changes to actuarial practice or be addressed by actuarial practice areas.

Sustainable Development Goals as Reverse Threat Multipliers *by Max J. Rudolph, FSA, CERA, MAAA, CFA*

https://www.soa.org/2023/sustainable-development-goals.pdf

Sustainability and the United Nations Sustainable Development Goals (SDGs) *by Sam Gutterman, FSA, CERA, FCAS, MAAA, FCA, HonFIA*

https://www.soa.org/2023/sustainable-development-goals-sdgs.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. Mixed signals adding to uncertainty…

   https://www.insurancejournal.com/news/national

   Forecasters from Colorado State University (CSU) stressed uncertainty in their latest outlook on Thursday for the current Atlantic hurricane season, even as they held steady the number of storms expected.

   > Forecasters Stress Uncertainty in Latest Hurricane Forecast Aug 04, 2023
   > Given the conflicting signals between a likely moderate/strong El Nino and a much warmer than-normal tropical and subtropical Atlantic, the team stresses that there is more uncertainty than normal with this outlook," the CSU researchers said.
   > The meteorologists continued to forecast 18 named tropical storms for the hurricane season, which ends on Nov. 30. Nine named storms are expected to become hurricanes, four of which will be major, with sustained winds of at least 111 miles per hour (179 kph).
   > The CSU researchers increased the number of storms expected this year in their forecast issued in early July.
   > www.insurancejournal.com

2. Air pollution sources have shifted …How?

   https://www.noaa.gov/noaa-nasa-spearheading-massive-air-quality-research-campaign-summer

   Scientists from NOAA, NASA and 21 universities from three countries are deploying state-of-the-art instruments in multiple, coordinated research campaigns this month to investigate how air pollution sources have shifted over recent decades.

   > NOAA, NASA spearheading massive air quality research campaign this summer, Aug 03, 2023
   > Since the 1970s, U.S. scientists and environmental regulators made significant strides in reducing air pollution by cleaning up tailpipe and smokestack emissions. Yet levels of two of the most harmful types of pollution, ground-level ozone and fine particulates, have decreased only modestly in recent years. Both still contribute to the premature deaths of more than 100,000 Americans every year.
   >
   > "This is an unprecedented scientific investigation — in scope, scale and sophistication — of an ongoing public health threat that kills people every year," said NOAA Administrator Rick Spinrad, PhD. "No one agency or university could do anything like this alone."
   > www.noaa.gov

3. How can we handle the heat better?

https://www.technologyreview.com/extreme-heat-health

How much can we expect to adapt to climbing temperatures?

> Here's how much heat your body can take, Aug 03, 2023
>
> Heat loss, and therefore the whole balancing act, can get derailed when we're exposed to extreme heat. If your body isn't able to cool itself down fast enough, a whole cascade of problems can start, from stressing out your heart to throwing your kidneys and liver into chaos.
>
> A whole host of factors can alter exactly how our bodies will keep the teeter-totter of our internal temperatures balanced. Age, health status, medications, and how acclimatized we are to heat (more on this later) help determine how much heat your body is able to lose. People who are very old or very young have more trouble regulating their body temperature. And activity level will determine just how much heat your body is making that it needs to get rid of.
>
> www.technologyreview.com

4. Too Little Too Slow

https://www.bloomberg.com/news/features/our-planet-is-warming-fast-and-needs-extreme-climate-solutions

Every region of the world needs to prepare for unprecedented heatwaves, warns research published in the journal.

> An overheating planet requires extreme climate solutions, July 28, 2023
>
> "The key thing that we find is that anywhere in the world could experience one of these heat waves beyond what is currently seen as possible from the observational record ... everywhere needs to be prepared for them."
>
> Crucially, they find that communities facing the most risk have never dealt with such extreme heat in the past. That means they might not be prepared to handle the consequences since emergency response plans tend to take shape after a similar disaster has already taken place.
>
> "Anywhere in the world could experience one of these heat waves beyond what is currently seen as possible." They've had no reason to adapt, to learn how to live with it yet," says Vikki Thompson, lead author of the paper.
>
> www.bloomberg.com

5. Weather Forecasting - Private companies and AI are filling the Gap.

https://www.economist.com/science-and-technology/the-high-tech-race-to-improve-weather-forecasting

Private companies—and AI—are transforming the weather business.

> The high-tech race to improve weather forecasting, July 26, 2023
> Climate scientists reckon the heatwaves were made far more likely by climate change. Weather forecasts gave countries advance warning, a job that will become even more important as the planet warms further. Governments are investing in bigger and better forecasting models. They are being joined by private firms producing smaller-scale, specialized forecasts for businesses—and by tech firms betting that AI can revolutionize the field.
> https://www.economist.com

6. Adapt: Economies Need to Reorient

https://www.ft.com/How an era of extreme heat is reshaping economies

As record-breaking heatwaves become the new normal, a range of industries brace themselves for changes to the way they do business.

> How an era of extreme heat is reshaping economies, July 21, 2023
> The economic impact of what experts warn could be a new era of record-breaking heat goes far beyond tourism. Industries ranging from construction, to manufacturing, agriculture, transport and insurance are all bracing for changes to the way they do business as high-temperature days become more routine because of climate change.
> Business leaders and policymakers are now counting the cost of shuttered companies and decreased productivity. A study published by academics at Dartmouth last year found that heatwaves, brought on by human-caused climate change, cost the global economy an estimated $16tn over a 21-year period from the 1990s.
> https://www.ft.com

7. High Temperatures may Continue through at least 2025

https://theconversation.com/4-factors-driving-2023s-extreme-heat-and-climate-disasters

Between the record-breaking global heat and extreme downpours, it's hard to ignore that something unusual is going on with the weather in 2023.

> 4 factors driving 2023's extreme heat and climate disasters July 27, 2023
>
> People have been quick to blame climate change – and they're right, to a point: Human-caused global warming does play the biggest role. A recent study determined that the weekslong heat wave in Texas and Mexico that started in June 2023 would have been virtually impossible without it.
>
> Three additional natural factors are also helping drive up global temperatures and fuel disasters this year: El Niño, solar fluctuations and a massive underwater volcanic eruption.
>
> Unfortunately, these factors are combining in a way that is exacerbating global warming. Still worse, we can expect unusually high temperatures to continue through at least 2025, which means even more extreme weather in the near future.
>
> www.theconversation.com

8. Reputational Risk

https://www.scientificamerican.com/airlines-grapple-with-flights-delayed-by-climate-fueled-heat

Longer, more intense heat waves fueled by climate change could make it harder for planes to get off the ground.

> Airlines Grapple with Flights Delayed by Climate-Fueled Heat, July 25, 2023
>
> Meanwhile, more frequent heat waves could force some airlines to cut their passenger loads, since it's harder for airplanes to lift off in hotter, thinner air, according to a 2017 paper by researchers at Columbia University and other institutions. In some places, airplanes will have to reduce their weight by 10 to 30 percent during the most extreme heat.
>
> Those effects will be felt most intensely at airports with relatively short runways, such as New York's LaGuardia and Washington's Reagan National, the paper said.
>
> The reaction to the Delta flight delay shows how extreme weather is creating a reputational risk for the airline industry, said Steven Clarke, a senior director at the climate-focused investment group Ceres.
>
> The delays and flight cancellations don't just come with a financial cost — they threaten the perception that the airlines are fast and reliable, he said.
>
> www.scientificamerican.com

9. Mandatory Disclosures of Flood History is the way to go…

https://www.bloomberg.com/coastal-real-estate-in-places-like-florida-can-t-seem-to-price-climate-risk

Too few homebuyers have the right information to make decisions amid rising sea levels. Some states are moving in the right direction, but not enough.

> Coastal Real Estate Can't Seem to Price Climate Risk, July 21, 2023
> Asset prices are supposed to reflect risk, but the coastal real estate market has been challenging that notion for years. Not only is the threat of rising seas not "priced in," but many of the most vulnerable markets in the country — think Florida — are also among the frothiest, with Miami area home prices up around 64% since 2019. Logically, buyers must either lack information about the climate threat or they're intentionally choosing to disregard it, perhaps under the influence of climate-skeptical politicians.
>
> In June, the New York Legislature voted in favor of extending mandatory disclosure of flood history to homebuyers, closing a loophole in the process and adding to similar action for renters the year before. In March, a related effort cleared the New Jersey Legislature (and has since been signed by Governor Phil Murphy) to extend disclosure to both buyers and renters. And last year, Hawaii became the first state to specifically require disclosures related to sea-level rise. More states still need to follow including — maybe most urgently — Florida. "It's absurd that states want to hide information about flood risk from their own citizens," Rob Moore, a senior policy analyst with the Natural Resources Defense Council, told me by phone.
>
> Can read this article at https://www.washingtonpost.com/coastal-real-estate-in-places-like-florida-can-t-seem-to-price-climate-risk
>
> www.bloomberg.com

10. Managing Flood Control System – A Careful Balancing Act

https://theconversation.com/how-well-managed-dams-and-smart-forecasting-can-limit-flooding-as-extreme-storms-become-more-common-in-a-warming-world

As climate change makes extreme rainfall more common, it will further test the nation's flood-fighting capabilities and reservoir networks' finite storage.

> How well-managed dams and smart forecasting can limit flooding as extreme storms become more common in a warming world , July 25, 2023
>
> As rising global temperatures make extreme storms more common, the nation's dams and reservoirs – crucial to keeping communities dry – are being tested. California and states along the Mississippi River have faced similar flood control challenges in 2023.
>
> Expanding the number and size of reservoirs could help, but the social and ecological impacts make reservoir construction a tough political sell. Optimizing existing storage is the next-best strategy. Regardless, reservoir managers and forecasters are positioned at the front line of a battle that will become more challenging in a warming future.
>
> www.theconversation.com

11. Greenhushing – Good or Bad?

https://grist.org/language/greenhushing-climate-pledges-greenwashing-lawsuits/

It's hard to criticize what you can't hear.

> Greenhushing, explained: Why companies have stopped talking about their climate pledges, July 24, 23
>
> The word is a play on "greenwashing," a well-established marketing tactic in which companies overstate their environmental credentials. In a way, one has led to the other. Governments are cracking down on greenwashing, and the list of lawsuits over deceptive environmental marketing is growing. It's not surprising that some companies are reacting to this new landscape with silence, rather than risking a costly court case. But keeping quiet makes it hard to scrutinize what companies are doing, and also makes it more difficult for them to learn from one another's mistakes.
>
> Whatever the reasons for greenhushing, it's not all bad news. The companies that were blasting everyone with misleading information about their climate progress finally have a reason to stop, Whitman said. "They should be worried about litigation, regulation, and consumer pressure, and they should shut up about it."
>
> www.grist.org

12. Spread of Infectious Diseases

https://grist.org/climate-connections-diseases-pathogens/

People around the world are living longer, healthier lives than they were just half a century ago. Climate change threatens to undo that progress.

> Climate Connections - A Warming Planet, Pathogens and Diseases July 18, 2023
> Across the planet, animals — and the diseases they carry — are shifting to accommodate a globe on the fritz. And they're not alone: Ticks, mosquitos, bacteria, algae, even fungi are on the move, shifting or expanding their historical ranges to adapt for climatic conditions that are changing at an extraordinary pace.
>
> The World Health Organization estimates that between 2030 and 2050, just a handful of climate-related threats, such as malaria and water insecurity, will claim a quarter of a million additional lives each year.
>
> Other papers in the series: Mosquitos are moving to higher elevations — and so is malaria
>
> A brain-swelling illness spread by ticks is on the rise in Europe
>
> In the US, a fungal disease is spreading fast. A hotter climate could be to blame
>
> www.grist.org

13. Underground climate change

https://www.nytimes.com/chicago-underground-heat.html

Basements and train tunnels constantly leak heat, causing the land to sink and straining building foundations. Scientists call it "underground climate change.

> Underground Heat Is Shifting Chicago's Foundations July 14, 2023
>
> Rising underground temperatures lead to warmer subway tunnels, which can cause overheated tracks and steam-bath conditions for commuters. And, over time, they cause tiny shifts in the ground beneath buildings, which can induce structural strain, whose effects aren't noticeable for a long time until suddenly they are.
>
> www.nytimes.com

14. Are we clear on the assumptions - Garbage in garbage out?

https://www.ft.com/content/financial models on climate risk 'implausible', say actuaries

Lack of understanding of full economic damage caused by 'hothouse' conditions.

> Financial models on climate risk 'implausible', say actuaries July 04, 2023
>
> Financial institutions often did not understand the models they were using to predict the economic cost of climate change and were underestimating the risks of temperature rises, research led by a professional body of actuaries shows.
>
> Many of the results emerging from the models were "implausible," with a serious "disconnect" between climate scientists, economists, the people building the models and the financial institutions using them, a report by the Institute and Faculty of Actuaries and the University of Exeter finds.
> www.ft.com

15. Bad Ozone

https://www.wired.com/story/ozone-pollution-india-heat-waves

Indian cities, afflicted by rising temperatures and poor air quality, are becoming hot spots of ozone pollution, which has proven a difficult problem to fix.

Heat Waves Are Unleashing a Deadly but Overlooked Pollutant, June 19, 2023

Scientists are increasingly raising the alarm about **surface ozone**. It's a secondary pollutant that isn't released from any source, forming naturally when oxides of nitrogen and volatile organic compounds—such as benzene, which is found in gasoline, or methane—react under high heat and sunlight. This makes ozone a particularly ugly modern threat—a problem that arises where pollution and climate change coincide.

"Even an hour of exposure can give you very poor health outcomes," says Avikal Somvanshi, a researcher at the Center for Science and Environment in New Delhi. While ozone is beneficial in the high atmosphere, where it absorbs ultraviolet radiation, down on Earth's surface, concentrations of it can be deadly. Data on its impacts is patchy, but a 2022 study estimates that ozone killed more than 400,000 people worldwide in 2019, up 46 percent since 2000. And according to the State of Global Air Report 2020, it is in India where the number of ozone deaths has increased the most over the past decade..

https://www.wired.com

16. Been ignored far too long

https://www.scientificamerican.com/whats-happening-in-the-ocean-and-why-it-matters-to-you-and-me

With unprecedented marine heat waves sweeping the globe, we need better solutions for ocean sustainability.

What's Happening in the Ocean, and Why It Matters to You and Me, July 14, 2023

With such massive changes already underway, however, it's also essential to do everything we can to foster the ability of the ocean's ecosystems to cope. This includes protecting unique marine habitats, reducing the other ways we're putting stress on the ocean and its inhabitants, and helping fish, plants and coral adapt to the rapidly changing conditions. The good news is that people are coming up with many creative ways to do this.

As we begin to understand the vast impact our choices have on the ocean and, consequently, on us, the need for urgent action becomes even more apparent. We can't afford to ignore the irreplaceable role and indispensable services it provides. It's still possible to shape a future where people and the ocean can thrive together; but to do so, we must act now.

www.scientificamerican.com

17. Uncertainty makes it harder to price the risk.

https://www.economist.com/finance-and-economics/why-people-struggle-to-understand-climate-risk

We have two different landscapes with two very different fire regimes that require two very different management practices. That's really what we're trying to focus on, a researcher says.

> Why people struggle to understand climate risk, July 13, 2023
>
> The task of setting the appropriate price is made even more difficult by the fact that, in the language of economists, a warming world faces "uncertainty" as well as "risk". John Maynard Keynes described uncertainty as a situation where there is "no scientific basis to form any calculable probability whatever". He gave the example of predicting the likelihood of a war in Europe or whether a new invention would become obsolete. Risk, by contrast, means situations where the relative probabilities are well known: picking a red ball from the first urn, for instance.
>
> Yet even a perfect scientific model could not banish all uncertainty. Climate change involves the messy world of policy as well as the clarity of physics.
>
> www.economist.com

18. The Sky is Falling?

https://www.wired.com/story/the-upper-atmosphere-is-cooling-prompting-new-climate-concerns

Scientists are worried about the effect this change could have on orbiting satellites, the ozone layer, and Earth's weather.

> The Upper Atmosphere Is Cooling, Prompting New Climate Concerns, June 03, 2023
>
> There is a paradox at the heart of our changing climate. While the blanket of air close to the Earth's surface is warming, most of the atmosphere above is becoming dramatically colder. The same gases that are warming the bottom few miles of air are cooling the much greater expanses above that stretch to the edge of space.
>
> This paradox has long been predicted by climate modelers, but it has only recently been quantified in detail by satellite sensors. The new findings are providing a definitive confirmation on one important issue, but at the same time they are raising other questions.
>
> https://www.wired.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 US 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.

Podcast: Crossing Thin Ice

An ongoing educational series of podcasts by Actuarial Risk Management, where *Dave Ingram* and *Max Rudolph*, fellow actuaries discuss topics related to emerging risks and different aspects of risk management practices. The recent podcast, 14th in the series, focuses on **Cascadia Earthquake.**
https://crossingthinice.podbean.com/

Interview - 'Crossing the river by feeling the stones', August 2023

McKinsey Quarterly, in this edition of *The Quarterly Interview: Provocations to Ponder*, eminent economist and tech historian W. Brian Arthur looks at how businesses can adapt to a world of continued uncertainty.

https://www.mckinsey.com/capabilities/risk-and-resilience/crossing-the-river-by-feeling-the-stones

Emperor's New Climate Scenarios – a warning for financial services, July 2023

Limitations and assumptions of commonly used climate-change scenarios in financial services

By Sandy Trust, Sanjay Joshi, Tim Lenton, Jack Oliver

Scenario modelling is an important component of the actuarial risk-management toolkit. In the context of climate change, scenario modelling enables financial institutions and regulators to investigate the impact of different climate futures, which is important given the challenges we face.

The IFoA has partnered with the University of Exeter to produce this paper demonstrating how a deeper understanding of climate change, including tipping points can improve financial services climate- scenario modelling.

In the paper we use actuarial principles to examine the limitations and assumptions in relation to climate-change scenario modelling practices in financial services, focusing on hot-house world scenarios of 3˚C or more of warming. It demonstrates how current techniques exclude many of the most severe impacts we can expect from climate change, such as tipping points and second order impacts – they simply do not exist in the models meaning the models understate the level of risk.

Our objective in writing this paper is to help accelerate the progress of more realistic scenario modelling, which we in turn hope will help to further accelerate the progress on decarbonisation we need.

https://actuaries.org.uk/media/qeydewmk/the-emperor-s-new-climate-scenarios_ifoa_23.pdf

Climate Risk Pose Broad Impacts on Financial Security System – A public Policy Issue Paper, June 2023

This report was drafted by the Climate Change Joint Committee of the American Academy of Actuaries.

The primary contributors were *Lisa Slotznick, MAAA, FCAS, Kenneth Kent, MAAA, EA, FCA, FSA, Stuart Mathewson, MAAA, FCAS, Charles Merz, MAAA, FSA*

The actuarial profession is considering climate risks and their effect across all practice areas. Assumptions and models will need more explicit considerations of how data reflects experience, assumptions, and methods to incorporate climate change. Both frequency and severity of climate-related events are accelerating, which affects both short-term and long-term financial modeling.

As a result, awareness that climate change and climate risks will impact actuarial work across practice areas is important because these physical risks and the potential subsequent impacts of the transition risks will result in historical data having decreasing credibility to inform actuarial assumptions in the short, medium, and long term.

In addition, investment strategies will need to reflect considerations of how companies are adjusting to climate change impacts. This paper provides actuaries with a practical guide for considering a broad range of impacts that climate change may have on their work.

https://www.actuary.org/sites/default/files/2023-06/CRIFS.pdf

The Climate Change Adaptation Gap: An Actuarial Perspective, May 2023

Aisling Kennedy (Lead), FSAI (Ireland), Sam Gutterman, FSA, FCAS, MAAA, CERA, FCA, HonFIA (United States), Bertha Pilgrim, FIA (Barbados), Ashish Ranjan, FIA, FIAI, CERA (India), Didier Serre, FIA (UK), Stuart Wason, FSA, FCIA, CERA, Hon FIA (Canada),

Adaptation, when used in relation to climate, is the process of adjustment to actual or expected climate and its effects. Progress on climate adaptation has been slow, siloed and incremental, with little evidence of the transformative adaptation that is needed to address significant climate hazards and exposures. There is a substantial gap relative to the level of adaptation likely to be needed given predicted levels of global warning. Investment in adaptation now can reduce the ultimate costs of climate change significantly.

Actuaries can contribute to adaptation planning and the assessment of potential adaptation actions, not only in the usual areas of actuarial practice but through broader application of their experience and skills in risk management and cost-benefit and scenario analysis.

This paper aims to provide an overview of the issues involved in adapting to climate change, both in general terms and with a focus on considerations relevant for current areas of actuarial practice. It also aims to identify areas in which actuaries can participate more broadly in adaptation action. Actuarial training in risk assessment and measurement means that actuaries will take account of the uncertainties inherent in designing adaptation solutions and anticipate and quantify the costs and benefits of such solutions over time, having regard to a range of potential climate scenarios.
https://www.actuaries.org/IAA/Documents/Publications/Papers/IAA_CRTF_Paper6_AdaptationGap.pdf

To get a quick overview use the links provided - YouTube recording and the slide deck of the Webinar conducted by IAA on June 23, 2023 are available here and on the IAA website.

Future Actuary Risk and Opportunity Radar, April 2023

This report has been developed by the Future Actuary Task Force of the IAA Executive Committee and approved by the Executive Committee.

Who is the future actuary? What will be the domain knowledge and the skillset required by actuaries in the future? Rapidly evolving technologies like artificial intelligence (AI), machine learning, and automation create a new future of work. New threats, and in parallel opportunities will continue to arise with emerging risks such as demographic and economic changes, climate-related risk, and pandemics. In addition, global and local regulatory requirements such as Environmental, Social & Governance (ESG) are continuously evolving. The actuarial profession must ensure that it takes on dynamic business and advisory roles, while maintaining the professional approach to all actuarial services.

https://www.actuaries.org/IAA_FutureActuaryReport_13April2023_Final.pdf

Book Recommendations

The Ministry of the Future, *by Kim Stanley Robinson*[3]

Reviewed by Sam Gutterman

Although "The Ministry for the Future" is certainly a work of science fiction, it is far more than that. It is also part horror story, part science fact, part activist strategy, and part sort-of-romance. It combines education and entertainment.

The part that has stayed with me since I first read it about two years ago is contained in its first twelve pages. It is a horror story of a small town in Uttar Pradesh in India during a more-than-sweltering regional heat and humidity wave. It is seen through one man's eyewitness account that describes what happens to the inhabitants of a village experiencing uninhabitable extreme heat. If you read it, it may haunt you for quite a while – it did me. It made me think of what might happen if I ever got stuck in extreme weather conditions – is it possible for the climate to get this bad?

The remainder of this 563-page book is not as depressing. Nevertheless, it left me with the strong impression that, unless strong action is taken, some dire circumstances will inevitably ensue in many locations. It is peppered with short sections on science facts, especially but not exclusively related to climate change. For those deeply aware of what is happening around the world in climate, those sections could be skipped. But for most readers who aren't climate experts, it can serve as a well-written set of useful climate change facts.

Its major thrust though, involves how the public and private sectors could address this issue in the future. This includes how environmental activists might try to implement policy changes, although often illustrated by actions that are too extreme for most to accept. The use of organized political, scientific, and economic actions, at a global or organized-local level, can force some changes to happen.

A fictional UN Ministry for the Future is created under the auspices of the Paris Agreement (adopted at COP21 in 2015 in Paris), Article 18, to help implement the Agreement, working together with the IPCC. The Ministry strategizes and helps execute high-level approaches to reduce climate risks. Many of the solutions presented are not realistic (a couple are primarily wishful thinking). That said, there are seeds of possible actions, primarily focused on the decarbonization process and financial incentives for businesses and governments, to mitigate their greenhouse gas emissions.

The Ministry, as well as other organizations, attempt numerous approaches – some of the more successful ones described in the novel involve cooperation with monetary authorities and technological approaches – a few of which are not realistic. But this is a novel and not non-fiction.

One message is that to achieve a specific objective, a broad net may have to be cast to identify one or more that might work at scale. But that doesn't mean that a given strategy will work. One that was tried was geoengineering – although in real life several geoengineering approaches are being assessed, I feel they should be implemented only after serious study, as there may be consequential risks associated with their use.

Fossil fuel companies are, as might be expected, looked upon as enemies of the future and future generations. It may be that eventually some of these companies will experience some stranded assets.

The book raises the question of whether governments or the private sector will play a more significant role in addressing climate change risks – the Ministry seems to think that anyone that can help in implementing partial solutions to the problem is welcome. My conclusion is that it will take a team effort of many stakeholders to effectively deal with this issue with huge potential consequences – the global community, national and local

[3] Kim Stanley Robinson, "The Ministry for the Future". New York, NY. Orbit. 2020.

governments, businesses, and individuals. Public-private coordination and partnerships may reap the greatest rewards.

It strongly suggests that the approaches that should be considered need to be global in scope, although a super-body, such as the UN's Ministry for the Future, may not be in the cards in today's world of divided politics and nationalism. Maybe not until several horror scenarios such as the one given in the first chapter force the hand of government and businesses. The biggest issue is where the finances will come from to effectively 'fix' or at least address the problem.

And finally, it has a bit of romantic background, although it is a somewhat quirky one. The entire novel is primarily seen through the eyes of Mary Murphy, the Irish head of the Ministry, and Frank May, the person whose eyes the reader experiences in the opening chapter. They have a sort-of-romantic relationship, although, at one point, Frank briefly kidnaps Mary, which isn't a typical start of a relationship. It never comes close to love or sex – it is more a relation of care and respect from a distance, one who has had a PTSD experience, and someone who recognizes the possible spread of this type of experience.

I hope that the extreme scenes described will not occur often, although several almost-as-bad ones have occurred recently. I know that scientific arguments may not be sufficient in and of themselves to result in immediate change. It may take serious early warning events and conditions to energize key stakeholders to create sufficient change to control the climate trajectory.

It provides an ultimate message of hope – extreme outcomes, while possible, can be avoided by effectively working together and wise policy. Maybe some of the solutions given will encourage more creative and technological answers, although I am not as optimistic that it will lead to a happily-ever- after-tale in real life.

The Ministry is partly a dystopian novel. But it also addresses possible approaches to achieve favorable outcomes on a global basis. It does not have an exciting plot – it isn't that type of novel. Rather, its intent is, not only to entertain, but to be a combination of an education/consciousness-raising novel, in an attempt to impart a message through storytelling by following the lives of two very different people and how they one might be able to make a difference. It will take a team effort, the team consisting of all types of people and sectors. Being optimistic, I am hopeful that we as a society will muddle through, whatever trajectory our future actions and climate scenario will lead.

If you haven't already, I recommend reading this book.

Lessons from the COVID War by The COVID Crisis Group

Reviewed by Max Rudolph, FSA, CFA, CERA, MAAA

Overview

While the pandemic is not over, this is the right time to start thinking about preparing for the inevitable "next time." Unfortunately, geopolitics and internal US politics are not in a cooperating mood. The Covid Crisis Group (CCG), brings a variety of skill sets from epidemiologists, academics, researchers and politicians. They put together a first pass that was expected to help a federal commission debrief the issues and plan for improvements. Congress did not form such a commission, so they publicly released their thoughts in this important book. Following the review, the author will share some personal thoughts about the topic.

The CCG likes to use war analogies about the "battle." They focus on prevent and warn, contain the attack, defend and fight back. The model of a standing army with funded research should be built for public health. Where they use statistics, the message is clear. Both the US and the world can do better. The age-adjusted mortality rate in the US was 40% higher than Europe. Some states, especially Florida, were worse with twice the mortality rate of Spain. Recognizing these metrics and looking for locations where results were better can be studied for local adjustments

that align with the culture. Benefits like paid sick leave and extended healthcare were not available in the U.S. but are in other parts of the world. Good ideas don't depend on the source.

The US started off the pandemic with a challenged health infrastructure. Nursing homes, along with public and rural health systems, were already at a breaking point. The national stockpile had deteriorated, and the national pandemic preparedness office had been closed. Technology was not coordinated, even when it has been developed. Private industry was not engaged. Some urban health systems and the biopharma industries were successful.

Local health departments in the US have a big presence but are often underfunded and understaffed. Medical staff became overworked and stressed, and many left the field. Updating the national health ecosystem would have many benefits beyond a pandemic but there is little interest. Those who prepare scenarios in advance are better able to adjust later. You can't monitor and react if data is collected on paper. An integrated data system is the place to start.

The CDC can perform better and needs its role better defined. It currently is a bureaucracy that is very good at academic style research. During a crisis this is not helpful. The US needs a nimble response team, either within the CDC or elsewhere, that is prepared to work in a fast-changing environment. A structure using knowledgeable public health experts where key issues are escalated is needed.

The next pandemic could occur naturally, result from a lab leak or bio-warfare. Symptoms could vary or be unseen, ages impacted could vary, and the virus could spread via aerosol or droplets. Influenza varies from coronavirus and other viruses. Surveillance, sharing of data and testing protocols should be ready to move quickly. This requires a continual investment in technology, international coordination and communication through the WHO. Prior preparation prevents poor performance. Preparation varies to some degree, but too much focus on the cause did us no favors in 2020. Including experts in the planning process helps decision makers understand the issues. It's too late to learn about a complex topic once the crisis has started. Politicians need to rely on experts and informal networks at that point to translate situational awareness into actionable intelligence.

Highlights

Practices during the pandemic were not all bad. Some things went well and groups, including BARDA (Biomedical Advanced Research and Development), stepped up. Unfortunately, this was not the case consistently, and leadership was lacking. During a crisis you need an adult in the room and a coordinated federal response.

Going forward the United States should build up public health departments at the local and federal level. Preparations should be undertaken that don't just focus on solving the COVID-19 crisis. Data and knowledge should be shared. What could be different? How can lower socioeconomic groups be supported? Don't forget that perfect is the enemy of the good, so be practical. Taking action can't wait until there is 100% knowledge.

Thoughts from the author

This book is very interesting, but it mostly limits itself to the health part of the discussion. I think that financial experts, including actuaries, could be very useful in planning for the next pandemic both for the impacts on health and mortality but also on the economy. Communications experts should also be involved, as few scientists and subject matter experts are strong speakers and influencers.

Whether to consider lockdowns, and how broadly, should look at social costs, mental health impacts, food insecurity and economic impact. A regional lockdown like 1918 would probably have worked better. I remain amazed at how quickly the supply chain adjusted to the new reality, although just-in-time supply chains need to be revisited to improve resiliency. In March 2020, I expected food security to define the event and, while important, most people were able to access food even after Russia's invasion of Ukraine, a country that is a primary exporter of food.

In the US we were lucky that technology had progressed to work as well as it did for school and work, but it was not perfect and likely encouraged us to prescribe broad lockdowns. A pandemic differs from a physical disaster, where

natural investment occurs to replace infrastructure that has been damaged or destroyed. As public health programs are strengthened, data collection should be reviewed and improved. The highest age groups measured remain the same as a century ago.

Risk management utilizes a Control cycle. Study, implement, monitor, adjust – repeat. A pandemic requires the same style – continuous learning and adjustments to improve. You can't have a trader's mentality that results can be optimized. A virus continually works to evade our defenses, so what works tomorrow will differ from successful mitigation strategies of yesterday and today.

Governments at all levels let public health capabilities go stagnant, much like risk management teams are often viewed as a cost until a crisis happens. Then it's too late. Let's do better this time.

Max J. Rudolph is a principal with Rudolph Financial Consulting, LLC in Omaha, Nebraska and is associated with Actuarial Risk Management and the Crossing Thin Ice podcast

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.

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