Catastrophe and Climate

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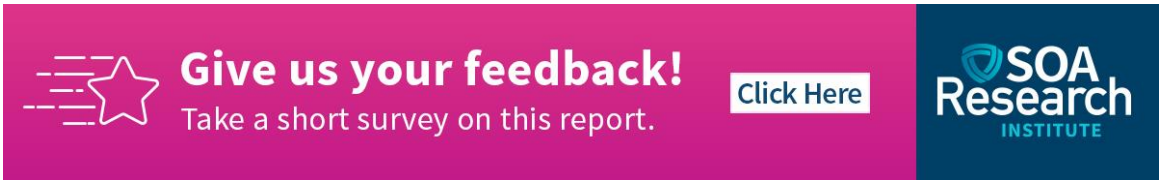


Focus on Terminology: Let's plant some trees – What could go wrong?

By Max J. Rudolph, Dr. Jesse Bell and Steve Bowen

For those actuaries who desire to become more active in climate awareness activities, there are times when language becomes an issue. Terms that have been used for decades in each specialty are used in ways that mean something different to the other group. Terms and definitions may mature over time. This column will rotate between inconsistent terms, evolving terms and terms that need a few extra words or examples to become commonplace in the actuarial space. 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 or people working in sustainability areas use in different ways. The format will be to introduce and define commonly used terminology used in multiple fields that need to work together. The hope is that having vocabulary awareness will improve communications between these professionals.

INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC) DEFINITION - AFFORESTATION

Planting of new forests on lands that historically have not contained forests. [Footnote: For a discussion of the term forest and related terms such as afforestation, reforestation and deforestation, see the IPCC Special Report on Land Use, Land-Use Change, and Forestry (IPCC, 2000), information provided by the United Nations Framework Convention on Climate Change (UNFCCC, 2013) and the report on Definitions and Methodological Options to Inventory Emissions from Direct Human-induced Degradation of Forests and Devegetation of Other Vegetation Types (IPCC, 2003).] See also Reforestation, Deforestation, and Reducing Emissions from Deforestation and Forest Degradation (REDD+). (Ed. Note: redundant footnotes are listed once)

IPCC DEFINITION – DEFORESTATION

Conversion of forest to non-forest.

IPCC DEFINITION - REFORESTATION

Planting of forests on lands that have previously contained forests but that have been converted to some other use.

CLARIFICATION – AFFORESTATION, DEFORESTATION AND REFORESTATION

Planting trees is generally a good thing, but there are many nuances. As settlers converted forests to cropland and instituted European methods of farming, sequestered carbon was released, and temperatures rose slightly. When Europeans "discovered" North America, releasing zoonotic diseases like smallpox that Native Americans had not previously been exposed to, killing a large percentage of the population, previously cleared forests were naturally reclaimed, and carbon sequestered.

In a recent SOA report[1], the challenges surrounding planting trees was shown to have increased fire risk in some instances. Prior to the Industrial Revolution the earth's ecosystem had been stable for 10,000 years (since the last Ice Age). Deforestation and poorly planned fire suppression techniques are among the

[1] Jevtic, P. et al. New Fire Hazard Risk from Policy Responses to Climate Change. Society of Actuaries. February 2021. https://www.soa.org/globalassets/assets/files/resources/research-report/2021/fire-hazard-risk.pdf

processes that have released sequestered carbon, but the geographic location and watershed also matters. The report notes that fast-growing monocultures (e.g., eucalyptus, pine), especially those that are not native to the area, can actually increase fire and pathogen risks. A bit of research and planning is worthwhile, whether to learn about local species that are likely to survive common localized weather events or large-scale planting that considers the pros and cons of straight-line planting of similarly aged trees versus clumps of multiple varieties left to disperse naturally.

A specific example is the 2016 Fort McMurray Fire in Alberta, Canada[2]. Prior to the fire, well-intentioned humans had converted peatlands to forests of tall black spruce trees. This lowered the water table and dried out the peat, making a high intensity fire more likely.

SUMMARY

As actuaries become more aware of recent events and natural experiments, this can be incorporated into modeling techniques. While actuaries are unlikely to enter the climate system modeling space due to hardware requirements (supercomputers), physical risk models that develop loss estimates can build off these learnings.

By seeking out terms that need clarification, actuaries can help to improve the overall process as well as improve their own work product.

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

Dr. Jesse Bell is the Claire E. Hubbard Professor of Health and Environment at the University of Nebraska Medical Center.

Steve Bowen is a Meteorologist and the Head of Catastrophe Insight at Aon.

[2] Elbein, Saul. Tree-planting programs can do more harm than good. National Geographic. April 26, 2019. https://www.nationalgeographic.com/environment/article/how-to-regrow-forest-right-way-minimize-fire-water-use#:~:text=Tree%2Dplanting%20programs%20can%20do,techniques%20can%20be%20a%20problem.&text=Throughout%20the%2020th%20Century,by%2C%20well%2C%20planting%20them.

Looking beyond the obvious…

CITIES AND THE BROWN OCEAN EFFECT

By Frank Grossman, FSA, FCIA, MAAA

You may have heard the old saying, "It never rains but it pours," suggesting that one's ills tend to compound themselves. This can literally occur when hot summer weather interacts with the infrastructure of our largest cities. Urban rain storms have the potential to be transformed into even stronger storms, reflecting past decisions about the design and construction of our cities.

During the evening of August 7, 2018, after several days of humidity and temperatures in the low nineties, a summer storm dropped 2.8 inches of rain over Toronto, with two inches falling in just a single hour. This sudden rainfall caused flooding in the western and central parts of the city, resulting in insured losses of more than CN$80 million. Filthy, bacteria-laden sewage—toxic waste by another name—flowed in the streets and down into the subway system. Total uninsured damages due to overland flooding can only be surmised. As the city's wastewater treatment plants were overwhelmed, stormwater flows scoured the rivers that transect Toronto, and eventually delivered their fetid brew to Lake Ontario.

Admittedly, this extreme weather event was dwarfed by torrential downpours that struck Zhengzhou and New York City during the summer of 2021. Both had hourly downpour rates several times greater than the Toronto storm. The prospect of a warmer climate augurs as much. We may expect more localized and intense rainfalls, with significant consequences for urban communities and their infrastructure.

Yet the Toronto storm was unique in several respects. There was no observed lightning, so Environment Canada didn't issue a thunderstorm warning. Similarly, as the progress of the slow-moving disturbance seemed to stall, a Toronto-wide storm alert was not released. The Toronto Star called it a "ninja storm," noting that: "It hovers, then strikes. A relentless rain that floods one part of the city but spares another, then disappears as suddenly as it arrives." Though the city has dozens of official water gauges, when storms slip past the gauges their precipitation is not measured and consequently not recorded. A local meteorologist speculated that some locations in the urban core received as much as eight inches of rain during the storm.

Tropical cyclones are basically heat engines that routinely weaken after making landfall. This is fundamentally due to the loss of the ocean heat as their energy source. In recent years, however, a new category of inland tropical cyclones has been identified. Tropical cyclone maintenance and intensification events (TCMI) take their energy from warm wet soils—rather than warm seas. It's been suggested that the heat exchange from land surfaces may even rival that from the ocean, albeit for short periods of time. This means that under certain conditions, storms can intensify after making landfall.

According to Dr. Marshall Shepherd, the "brown ocean" environments associated with TCMI have three defining features. First, the atmosphere's lower level is tropically warm and humid, with minimal temperature variation. Second, there must be sufficient soil moisture in the vicinity of the storm. Lastly, the evaporation of soil moisture must release enough latent heat over a wide area to mimic the energy

released by the ocean. Hence, the brown ocean effect refers to the ability of saturated soils and wetlands to deliver enough moist heat energy to maintain, and potentially intensify, a warm-core tropical cyclone[3].

Cities invariably have "heat islands" that amplify the risks of climate change. For example, hot summer weather is more dangerous for city dwellers prone to heat-related illness, than their similarly afflicted country cousins, due to the urban heat island effect. Heat is typically generated by motor vehicles, the heating and cooling of buildings, and also absorbed from the sun by built infrastructure.

Consider for a moment the ecology of parking lots. Though widely thought to be necessary for human life, they plainly exacerbate the problem of stormwater runoff by adding to the impervious surface area of a city. But a matter of no lesser environmental consequence is that their countless acres of concrete and asphalt are an anvil for the sun to beat down on—a massive urban heat sink. And when the rains come during a summer heat wave, the threat is not only flooding, but also the widespread evaporation of moisture and an attendant heat exchange akin to the brown ocean effect.

There are several adaptive measures that could help to reduce the damage caused by heavy urban rainfalls. Nearly a quarter of Toronto has combined sewers, a single conduit to carry both human waste and stormwater. Instituting a stormwater charge based on rooftop size would offer property owners a financial incentive to keep the water on their property—rooftop gardens and buffering rainfall storage tanks are possible solutions. The fee revenues could be dedicated toward improving water treatment facilities and eliminating combined sewers.

Less reliance on concrete, asphalt and masonry, and less urban sprawl, can help keep cities cooler. Making room for more porous surfaces, such as parkland swales, can help mitigate run-off. Another key adaptation is increasing the urban tree canopy to provide more shade, cool the air through evapotranspiration, and help regulate water flow.

One of the basic challenges of adapting to climate change is the uncertainty of regional rainfall patterns in the years to come. As Lord Stern noted in his landmark review, "Changes in rainfall patterns and extreme weather events will lead to more severe impacts on people than that caused by warming alone." Our present risk is that governments will choose to sink billions of dollars into disaster relief and recovery rather than greener infrastructure. It's much better—and invariably cheaper in the long run—to prepare than repair.

Another challenge is the rear-view mirror outlook of many actuaries. Is it only the rare actuarial scientist who—faintly echoing Archimedes—has implored others, "Give me data and I'll build a model with it"? In the context of climate change, the value of historical data will doubtless be less than it was in days past. New approaches to achieve data quality will be needed, as illustrated by the failure of Toronto's rain gauges to accurately record basic information.

The inter-related and combined influences of climate and cities—temperature, moisture, infrastructure, and ultimately people—on urban extreme weather events needs to be better understood. This is especially

[3] Editor's Note: See the Glossary of the bonus September 2021 CCRP newsletter for more about the Brown Ocean effect. https://www.soa.org/globalassets/assets/files/resources/research-report/2021/2021-06-catastrophe-and-climate-newsletter.pdf

so as many cities adapt too slowly to keep pace with our changing climate. The August 2018 storm and its disastrous result prompted a veteran Toronto city councilor to remark, "We are sitting in a city that was built for a climate that no longer exists."

SOA Featured Research Project

POTENTIAL IMPACTS OF CLIMATE CHANGE ON U.S. WILDFIRE RISK BY MID CENTURY

Peter Sousounis, PhD, Alastair Clarke, PhD and Doug Fullam, ASA, (AIR Worldwide)

This report provides results from a recently conducted study using the AIR Wildfire Model for the United States and available climate information to estimate how climate change may influence wildfire losses to U.S. property by mid-century. The climate change conditioned catalogs were used to evaluate climate change impacts (relative change in losses) to the AIR Worldwide US Industry Exposure Database, with all factors other than area burned held constant.

Potential Impacts of Climate Change on U.S. Wildfire Risk by Mid Century | SOA

Environmental Risk Paper Series

Following is a recent addition to our ongoing Environmental risk series: Environmental Risk Series | SOA

IMPACT OF CLIMATE CHANGE ON INVESTORS (OCTOBER 2021)

Max J. Rudolph, FSA, CFA, CERA, MAAA

The report discusses how to make the leap to investing in a long-term future which includes climate change, along with what investors should think about. It illustrates the pluses and minuses of disclosure methods and illustrates the gives and takes generated by actions. For example, "A potential side effect of avoiding carbon investments would be that no stakeholders would retain share ownership to encourage better ESG practices".

In the News

By Priya Rohatgi, ASA

A lot happened since our last quarterly Newsletter in July. This quarter saw the loss and wins of the field of climate science. Release of IPCC's first report AR6 WG1 – the physical science basis, confirms that our world has already warmed up more than 1.1.

Distressingly, many of the extreme weather events that we faced over the summer globally were not projected by any current climate models and arrived well ahead of schedule. Hurricane Ida, which impacted many states, left New York stunned by record setting precipitation and flooding, highlighting the failures and unpreparedness of the current infrastructure and the system throughout.

With the COP 26 in motion, all nations are gearing up making new pledges (NDC's), map out their transition plans and financial commitments. This will require more scrutiny, transparency and accountability to make meaningful progress. The selected articles below touch upon on many of these topics. As you click through

the articles below, we invite you to consider how these events may impact actuarial applications and our work.

Featured Tool

KNMI Climate Explorer is a scientific tool, a free web application for the analysis of climate data statistically. It contains more than 10 TB of climate data and dozens of analysis tools. It is part of the World Meteorological Organization (WMO) Regional Climate Centre at The Royal Netherlands Meteorological Institute (KNMI), the Dutch national weather service. With the vision to make the science and the climate data accessible to everyone, Geert Jan Van Oldenborgh created this computer program and managed this tool up until now.

1. **Saddened by the loss of Climate Science Pioneer Geert Jan van Oldenborgh…**

   https://www.bloomberg.com/news/articles/2021-10-14/climate-science-pioneer-geert-jan-van-oldenborgh-dies

   Van Oldenborgh was the driving force, who helped made the extreme weather event analysis also called attribution science a global phenomenon.

   > Pioneer of attribution science Geert Jan van Oldenborgh dies, aged 59
   >
   > Dutch climate scientist Geert Jan van Oldenborgh has died from cancer at the age of 59. He is regarded as one of the pioneers of attribution science, which has hugely boosted public awareness of how climate change is linked to extreme weather.
   >
   > www.climatechangenews.com

2. **This is the first!**

   https://www.theatlantic.com/first-climatologist-win-nobel-prize-physics

   Manabe's win is a reminder that climate science was not always the politically fraught undertaking it is today—and that it is, in itself, a major scientific achievement of the past half century.

   > The Key Insight That Defined 50 Years of Climate Science
   >
   > Manabe is one of the first climate scientists to win the physics Nobel. (When he received the call that he had won, he reportedly exclaimed, "But I'm just a climatologist!") He shared this year's prize with Klaus Hasselmann, a climate scientist at the Max Planck Institute for Meteorology in Germany, and Giorgio Parisi, a theoretical physicist at Sapienza University of Rome.

In a series of crucial papers in the late 1960s, Manabe made several observations that set the stage for the next half century of climate science. He said, for instance, that doubling the amount of carbon dioxide in the atmosphere would raise Earth's average temperature by 2.3 degrees Celsius—a reasonable lower bound for that number, scientists now believe.

www.washingtonpost.com

3. Race against time… Need a forward-looking resilience plan and fast.
https://www.technologyreview.com/ida-dodged-nyc-flood-defenses-climate-change-storm/

Despite spending billions on adaptation, cities aren't keeping up with climate change.

How Ida dodged NYC's flood defenses

The problem is, we're seeing these impacts and these changing storms faster, and adaptations are just not keeping pace," says Lauren McPhillips, a hydrologist at Penn State University who studies urban flooding.
While New York City and other coastal areas are more vulnerable to sea-level rise, any urban area can experience what's called pluvial flooding, the kind caused by rainfall.

www.technologyreview.com

4. How does the United States generate electricity currently?
https://www.visualcapitalist.com/road-to-decarbonization-united-states-electricity-mix/
The US has made some bold decarbonization pledges including carbon pollution-free utilities sector by 2035.

Road to Decarbonization: The United States Electricity Mix

How does each state's electricity mix compare? This infographic from the National Public Utilities Council highlights the energy sources used for electricity in U.S. states during 2020, using data from the U.S. Energy Information Administration.

With 50 states and even more territories—each with different energy sources readily available and utilized—some parts of the U.S. are a lot closer to carbon-free electricity than others.

National Public Utilities Council is the go-to resource for all things decarbonization in the utilities industry.

www.visualcapitalist.com

5. Time to get real!
https://www.theguardian.com/environment/world-wasted-chance-build-back-better-covid-un The world is squandering the opportunity to "build back better" from the Covid-19 pandemic, and faces disastrous temperature rises of at least 2.7C if countries fail to strengthen their climate pledges, according to the Emission Gap Report 2021 from the UN.

> World faces disastrous 2.7C temperature rise on current climate plans, UN warns
>
> Report from UN published on Oct 26th, warns that countries' current pledges would reduce carbon by only about 7.5% by 2030, far less than the 45% cut scientists say is needed to limit global temperature rises to 1.5C, the aim of the Cop26 summit that opens in Glasgow on Oct 31st.
>
> António Guterres, the UN secretary-general, described the findings as a "thundering wakeup call" to world leaders, while experts called for drastic action against fossil fuel companies.
>
> www.theguardian.com

6. 'Forever Chemicals' contamination much more widespread in the US than assumed
https://www.theguardian.com/environment/us-epa-pfas-forever-chemicals-sites-data
No part of the US appears free from the potential risk of air and water contamination with the chemicals

> Revealed: more than 120,000 US sites feared to handle harmful PFAS 'forever' chemicals
>
> The US Environmental Protection Agency (EPA) has identified more than 120,000 locations around the US where people may be exposed to a class of toxic "forever chemicals" associated with various cancers and other health problems that is a frightening tally four times larger than previously reported, according to data obtained by the Guardian.
> The list of facilities makes it clear that virtually no part of America appears free from the potential risk of air and water contamination with the chemicals known as per- and polyfluoroalkyl substances (PFAS).
>
> www.theguardian.com

7. Who pays the bill? The case for climate equity.
https://e360.yale.edu/features/for-climate-equity-developing-nations-must-be-paid-for-damages
"To demonstrate who owes the money, just look back at where carbon emissions have come from historically".

> Why the World's Rich Nations Must Pay for Climate Damage
>
> Damage from increasingly extreme weather events is falling especially hard on developing countries, even though they have done the least to contribute to climate change. At the upcoming UN climate talks, rich nations must begin to compensate them for their mounting losses.
>
> No one expects this quandary to be solved in Glasgow — in fact, it will be a victory just to get the issue of loss and damage on the official agenda going forward. But it's not like there are going to be fewer floods or typhoons or fires in the years ahead. As droughts deepen, so will the thirst for justice.
>
> www.e360.yale.edu

8. Insurers as agents of change, take on new role of climate activism
https://www.washingtonpost.com/climate-environment/climate-change-insurance-coal/
How insurance giants might accomplish what generations of climate activists have not.

> What could finally stop new coal plants? Pulling the plug on their insurance
>
> More than 30 insurance companies have announced restrictions on underwriting coal projects, making it difficult for major coal operators to line up bank financing and investment for mines, transportation and power plants. Without insurance, those investments could seem too risky.
>
> Thomas Buberl, chief executive of Axa, the giant French underwriting firm, is leading a coalition of eight major insurers called the Net Zero Insurance Alliance. The goal, he said in an interview, is to have "all the insurers applying a methodology to only underwrite companies directed toward climate transition and not to the dark ages of burning coal."
>
> www.washingtonpost.com

9. Cat bonds – more popular than ever
https://www.ft.com/content/6becd6bb-8c25-4d62-8648-c3fae904f18e

> Catastrophe bonds storm into mainstream as climate threat grows
>
> Catastrophe bonds were first created in the 1990s as a niche form of risk transfer from insurers to investors. They have expanded steadily to a market of more than $30bn in terms of debt outstanding.
>
> www.ft.com

10. The perverse incentives of fossil fuel subsidies – Recent study by IMF
https://www.economist.com/as-energy-prices-spike-governments-reach-for-the-dirtiest-tool-in-the-box
A new IMF study shows that fossil-fuel subsidies are a climate nightmare.

> As energy prices spike, governments reach for the dirtiest tool in the box
>
> If governments were to eliminate both explicit and implicit subsidies by 2025—admittedly, a huge if—then global emissions of carbon dioxide would fall by 36%, and global tax revenues would be higher by 3.8% of world GDP, compared with a scenario with no subsidy reform.
>
> www.economist.com

11. A cruel irony of climate change – many forests are now net emitters of carbon?!
https://www.bbc.com/news/science-environment
Ten of the world's most protected forests have become net emitters of carbon, as they are degraded by human activity and climate change.

> Climate change: Human activity makes forests emit carbon
>
> Even the best and most protected forest areas in the world are threatened by the global climate crisis. "It's a vicious cycle," Dr Carvalho Resende said.
>
> "More carbon emissions means more wildfires, which means more carbon emissions."
>
> And wildfires are not the only climate-related threat.
>
> www.bbc.com

12. Accountability begets responsibility
https://www.globalwitness.org/en/campaigns/forests/deforestation-dividends/#introduction
Investigation shows extensive financing activity has continued since Paris accord on global warming

> Deforestation Dividends
>
> Financial institutions made an estimated $1.74 billion in deforestation-adjusted proceeds from deals with some of the world's most harmful deforesters in the five years following the Paris Climate Agreement's adoption in December 2015, our analysis suggests. We estimate the total value of the deals with these deforesters at $157 billion.
>
> At the heart of the problem is a failure of voluntary commitments and a lack of accountability, which means banks can make problematic deals over and over again. Communities and NGOs are testing new legal boundaries to try to hold financiers to account. However, governments in major financial centres, including the EU, UK, US and China, need to effectively regulate financial institutions and companies to end their complicity in deforestation and their ability to profit from it.
>
> FT wrote: Global finance industry sinks $119bn into companies linked to deforestation
>
> www.globalwitness.org

13. Future shock – Covid disruptions to food chain a mere preview of what lies ahead
https://www.bloomberg.com/covid-rattled-our-food-chain-climate-change-is-a-seismic-shock
Record heat and drought is forcing producers to adopt new business models to survive changing weather patterns.

> Climate Change Is Already Shocking Our Food Chain
>
> Farming has always been a perilous industry, but now it's facing levels of risk never seen before.
>
> Producers must devise new strategies for their land: what to grow and where to grow it. Consumers will have to adjust to price increases even steeper than during the pandemic — and perhaps a less consistent supply of their favorite foods. Lawmakers will need to provide subsidies to support the transition, especially for small and midsize farms.
>
> www.bloomberg.com

14. Carbon offsets – more transparency and standardization needed
https://www.afr.com/taking-carbon-offsets-out-of-the-shadows-and-on-to-the-trading-floor
A task force launched by Mark Carney is seeking to bring order to a market criticized for its quality and lack of regulation. Done right, it could inject huge sums into underfunded climate solutions.
Taskforce for Scaling Voluntary Carbon Markets

> Taking carbon offsets out of the shadows and on to the trading floor
>
> Can planting trees in China's Guizhou province cancel out emissions from natural gas burned for energy in offices and homes across China?
>
> A nascent but growing trend in which fossil fuel shipments are paired with carbon offsets – units that organizations can buy to compensate for their emissions and help their carbon-intensive cargoes appear greener.
>
> Concerns over the quality and integrity of offsetting schemes have plagued them since they were first introduced more than 20 years ago. Critics say they often do not capture as much carbon as they claim. Many view offsets as providing companies with a license to pollute and say they represent a bad use of money that would be better spent on efforts to cut emissions.
>
> FT article: Carbon offsets: a licence to pollute or a path to net zero emissions?
>
> www.afr.com

15. Is your decarbonization pathway aligned with science?
https://www.edie.net/SBTinitiative-launches-net-zero-standard-for-corporates
The Science Based Targets initiative (SBTi) has today (28 October) unveiled the world's first standard for corporate net-zero emissions aligned to climate science.

> Science Based Targets initiative launches net-zero standard for corporates
>
> The SBTi's new Net-Zero Standard is the world's first science-based certification of companies' net-zero targets. The certification is given to businesses if their decarbonization strategies are in alignment with the Paris Agreement's goal of keeping planetary warming to 1.5C.
>
> Companies will be required to set both near and long-term science-based targets across all scopes. These included near-term targets covering the next 5-10 years, with longer-form targets capped at 2050.
>
> www.edie.net

16. UK regulators aim to make Climate science accessible to Actuaries
https://www.reuters.com/uk-regulators-set-up-climate-taskforce-help-actuaries
"Most actuaries are well aware that something is happening to the climate but are less familiar with the specifics of the science," Joint Forum on Actuarial Regulation (JFAR) said in a statement.

> UK regulators set up climate taskforce to help actuaries
>
> UK regulators would form a taskforce to publish a report on the science of climate change to help actuaries do a better job of assessing the risks posed by global warming.
>
> "Bringing to life the specifics of the science of climate change in a format suitable for actuaries should lead to greater actuarial engagement on climate change."
>
> www.reuters.com

17. Does 'Build Back Better' spending package match the U.S. pledge for NDC?
https://www.voanews.com/Biden-bid-for-billions-in-green-investment
It has an NDC of 50% to 52%, and it has the means to achieve that," Michael Mehling, deputy director of the Center for Energy and Environmental Policy Research at the Massachusetts Institute of Technology told VOA.

> Climate Activists Praise Biden's Bid for $555 Billion in Green Investment
>
> The package contains $555 billion in spending directed at reducing the country's greenhouse gas emissions to between 50% and 52% of 2005 levels by 2030.
>
> As per the bill: $320 billion in tax credits, spread over 10 years, aimed at making a wide array of green technologies cheaper and easier to implement.
>
> $110 billion to incentivize the creation of a domestic supply chain for the delivery of products, key to broad electrification of the U.S., including batteries, solar cells and other technologies.
>
> $105 billion would go toward building resiliency in communities that are already feeling the drastic effects of climate change through extreme weather events.
>
> Approx. $20 billion that would go toward government procurement of next-generation green technologies – essentially helping to create a market for the products and services that the other elements of the proposal will be subsidizing.
>
> www.voanews.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.

The **Task Force on Climate-related Financial Disclosures** (TCFD), established by the Financial Stability Board (FSB), recently published its 2021 TCFD Status Report. The latest report describes progress on climate-related disclosure and TCFD implementation efforts, insights, and challenges.

The report indicates significant progress in the TCFD aligned climate-related financial disclosures globally. Europe remains the leading region, while US is still lagging relative to rest of the world. This progress is largely due to the growing support of the private sector, governments and organizations around the world requiring climate disclosures through legislation and regulation. International standard setters and regulators such as Finance Ministers and Central Bank Governors of the G7 and G20, the IFRS Foundation, the European Commission and many others are also looking to incorporate climate issues in their disclosure standards that are built upon the TCFD recommendations

The companies remain most likely to disclose information on their climate-related risks and opportunities (Strategy a), while the disclosure of the resilience of companies' strategies under different climate-related scenarios (Strategy c) noted a slight uptick. The governance recommendations were the least disclosed.

Within industry, 'Materials and Buildings' companies are ahead on disclosures. The insurance industry saw a significant increase in the average level of disclosures between 2019 and 2020 and now leads in the disclosure of risk management processes (Risk Management b).

The TCFD also published two additional documents to support decision-useful disclosure. Guidance on Metrics, Targets, and Transition Plans to support preparers in disclosing decision-useful information and linking those disclosures with estimates of financial impacts; and updates to the implementation guidance on its Recommendations initially published in 2017.

Book reviews

Continuing our theme of 'Plague', Max J. Rudolph reviews the literary work by *Katherine Anne Porter* Pale Horse, Pale Rider to provide our readers with more opportunity to compare and contrast different perspectives. In addition, he suggests a few more titles by other authors on the 1918 influenza pandemic, providing a richer insight into our current condition.

PALE HORSE, PALE RIDER

By Max J. Rudolph, FSA, MAAA

When events happened long ago, historical reports make circumstances seem more straightforward than it really was. As I reviewed the 1918 influenza pandemic over much of the past 20 years this became clear to me, just as looking back at coronavirus from the future will need to be put in the context of recent political and economic challenges. With this in mind I decided to read one of the best-known stories of historical fiction from the era, written by Pulitzer Prize winner Katherine Anne Porter. Titled *Pale Horse, Pale Rider*[4], it is one of three shorts included from a century ago and the book bears its name (you can also find it in *The Collected Stories of Katherine Anne Porter*)[5]. The author is recounting a version of her personal story from the period, where she nearly died, and tells it in a form that makes it a page turner for roughly 70 pages.

The story follows a female reporter on the east coast, 24 years old, who has just met a soldier at her boarding house who is waiting to ship out for World War 1. Their time together crosses paths with funeral processions, war bond drives and many declarations that encourage social distance (no kissing!). It is clear that the disease, whatever type of plague it is, is primarily impacting young adults. When she herself becomes sick her beau does what he can to help and makes sure she gets one of the limited ambulances and hospital rooms available, visiting her whenever allowed. She spends a month in various states of fever induced delirium, waking to the news that the war has ended. Unfortunately, her soldier has died in the meantime, likely exposed to influenza by her.

Like any good storyteller, the author makes you feel like you are there with them as they see a show or take walks. While *Pale Horse, Pale Rider* was originally written while memories were fairly recent, there are several other historical novels I have read that would also gain the reader knowledge of the time and place specific to the 1918 pandemic. There are others.

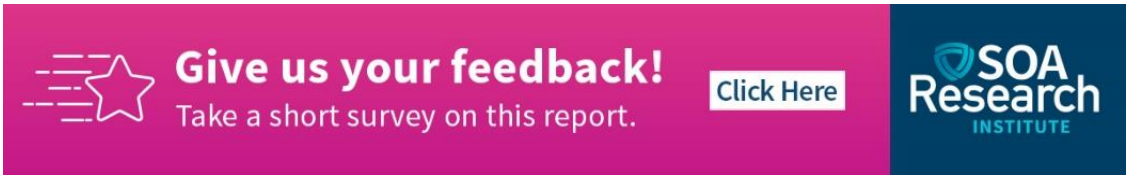
The first is *Wickett's Remedy*, by Myla Goldberg and published in 2010. It follows a young woman as her life is upended by normal events and then must traverse the travails associated with influenza. Through it all she acts honorably, more than can be said for some of the elders she crosses paths with. Some of the events she encounters near Boston are based on facts, making the book an interesting read.

The second is *The Last Town on Earth*, written by Thomas Mullen in 2006. While the other two books focused on the east coast of the US, this one looks at the west coast and draws contrasts

[4] Porter, Katherine Anne. Pale Horse, Pale Rider. Houghton Mifflin Harcourt Publishing Company. 1936.
[5] Porter, Katherine Anne. The Collected Stories of Katherine Anne Porter. Harcourt Brace & Company. 1965.

between them as the pandemic was anticipated before it arrived. A small logging town in the northwest decides to quarantine itself as some towns did during the Black Death plague of the Middle Ages. Good families are torn as strangers arrive and are met by roadblocks and guns. Mullen puts you in the era, with union organizers and potential spies everywhere as the paranoia and fear that accompanied a plague arriving during a time of war and censored reporting. It is easy to find similarities to today's situation as groups live off the grid and prefer isolation. Either of these books could be made into a movie, and the Porter story has been adapted for radio and television.

If you have seen a good book about catastrophic events, whether related to climate, pandemics, earthquakes or anything else you found interesting please share it with others by offering a book review in this newsletter. You can follow my reading history on the Goodreads app and I can be reached at max.rudolph@rudolph-financial.com.



Glossary

By Priya Rohatgi, ASA

In this section we explain terms that appear across climate research and related news articles. You might be familiar with some of them as they are probably common to your practice area or have seen it a number of times recently but would be good to add to our repository. In addition, we'll also direct you to the resources that we feel can be helpful in enhancing our understanding of Climate modeling , science and other related phenomena.

New Edition of the Oxford English Dictionary is dedicated to exploring the language of climate change. https://www.belfasttelegraph.co.uk/news/uk/new-terms-in-oxford-english-dictionary-as-language-of-climate-crisis-takes-hold-40970661.html

Eco-anxiety refers to persistent worries about the future of Earth and the life it shelters. Eco-anxiety': fear of environmental doom weighs on young people

Forever Chemicals, scientifically known as perfluoroalkyl and polyfluoroalkyl substances (PFASs) are a large chemical family of over 9,000 highly persistent chemicals that don't occur in nature. These compounds may take hundreds, or even thousands, of years to break down in the environment. They can also persist in the human body, potentially causing health problems.

Of the more than 9,000 known PFAS compounds, 600 are currently used in the U.S. in countless products, including firefighting foam, cookware, cosmetics, carpet treatments and even dental floss. Because of their widespread use, release and disposal over the decades, PFASs show up virtually everywhere: in soil, surface water, the atmosphere, the deep ocean—and even the human body. https://www.scientificamerican.com/forever-chemicals-are-widespread-in-u-s-drinking-water

Nationally Determined Contributions (NDCs) submitted by countries under the Paris Agreement of the United Nations Framework Convention on Climate Change (UNFCCC) represent pledges on climate action that seek to limit global warming to well below 2°C, preferably to 1.5 °C, over pre-industrial levels.

NDCs are where countries set targets for mitigating the greenhouse gas emissions that cause climate change and for adapting to climate impacts. The plans define how to reach the targets, and elaborate systems to monitor and verify progress so it stays on track. Since climate finance is key to implementing the plans, NDCs ideally also detail a financing strategy.

Every five years, countries update their NDCs. Each new round is expected to ratchet up ambition through steeper emissions cuts and more expansive adaptation measures. Building on each other over time, the NDCs are essential to ensuring a livable future for everyone on the planet. https://www.un.org/en/climatechange/all-about-ndcs

Carbon offset schemes allow individuals and companies to invest in environmental projects around the world in order to balance out their own carbon footprints. The projects are usually based in developing countries and most commonly are designed to reduce future emissions. This might involve rolling out clean energy technologies or purchasing and ripping up carbon credits from an emissions trading scheme. Other schemes work by soaking up CO2 directly from the air through the planting of trees.
https://www.theguardian.com/environment/2011/sep/16/carbon-offset-projects-carbon-emissions

Carbon Neutral means that any CO2 released into the atmosphere from a company's activities is balanced by an equivalent amount being removed.

Net zero emissions simply put, net zero means we are not adding new emissions to the atmosphere. This will be achieved when all GHG emissions released by humans are counterbalanced by removing GHGs from the atmosphere in a process known as carbon removal.

First and foremost, human-caused emissions (such as those from fossil-fueled vehicles and factories) should be reduced as close to zero as possible. Any remaining GHGs should then be balanced with an equivalent amount of carbon removal, which can happen through things like restoring forests or using direct air capture and storage (DACS) technology. Reaching net-zero emissions is akin to achieving "climate neutrality." https://www.wri.org/insights/net-zero-ghg-emissions-questions-answered

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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Society of Actuaries Research Institute
475 N. Martingale Road, Suite 600
Schaumburg, Illinois 60173
www.SOA.org