Award Winner

Climate Risk: Catastrophe Planning and Financial Modeling for Retirement

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INTRODUCTION

The population that is now retired or reaching retirement age in the next 20 years must come to terms with a dramatically recast set of expectations because of climate change. Both recent events and long-term trends strongly suggest that the impacts of climate change are real, and part of our collective experience for the foreseeable future. Key among these considerations is the threat of climate catastrophes, with the retired population especially vulnerable to the effects of such disasters.

As an example, the 2025 LA wildfires caused extensive damage to the area, with particular ramifications for the retirement population who are physically disabled, living in nursing homes, or needing special assistance. There were over $22 billion in losses suffered to property and possessions, impacting the financial, physical, and mental security of some of the region's most vulnerable.[1] Retrospective analysis of the response efforts reveals that evacuation, relocation, financial, and mental health support efforts were inadequate for the population.[2]

Applying these risks and lessons learned to the current and future retirement population nationwide, there is a compelling argument that proper risk mitigation will require that insurance companies, government agencies, support organizations, and healthcare systems do better to collaborate on these issues.

To address a rapidly escalating climate-driven risk environment, these groups can work together to safeguard the future of our retirement population.

[1] Dennis P. Sugrue et al., *S&P Global Scenario Analysis,* "Global Reinsurers Grapple with Climate Change Risks." Referenced from https://www.spglobal.com/ratings/en/regulatory/article/210923-global-reinsurers-grapple-with-climate-change-risks-s12116706.

[2] Steve Lopez, *LA Times* column, "The Nightmare of Evacuations for the Elderly and Disabled in the Path of the Fires." Referenced from https://www.latimes.com/california/story/2025-01-18/column-for-the-aged-and-frail-both-danger-and-trauma-can-be-greater-when-disaster-strikes.

CLIMATE RISKS AND CONSIDERATIONS FOR RETIREMENT PLANNING

There are numerous unprecedented risks that climate change poses to current and future retirement populations in the U.S. Ruth E. Schau, Director of Retirement for Novant Health, estimates that near-future populations will face dramatic shifts to basic ways of living. As populations age and their financial, physical, and emotional needs evolve, these changes may have an outsized impact on forward planning.

Some of Schau's climate risk predictions include freshwater shortages, severe weather events, hospital and medical facility capacity, housing affordability issues, evacuation planning, financial risk, mental and physical health risk, mobility assistance, and disability accommodations. All may have disproportionate negative effects on older, retiring, or retired populations.

Further examining these retirement planning impacts, Schau defines a climate risk impact framework with effects across a) health, b) social/family, c) purpose, and d) financial security.[3] Deeper analysis shows that the future risks of climate change apply across these categories—meaning that retiree populations face existential crises during their more vulnerable years where recovery is equally and proportionally more difficult.

The recent California fires present a glimpse into these new realities. Retirees fleeing the encroaching disaster zones not only had to consider damages to property and possessions but simultaneously needed to evacuate and relocate due to severe weather events. Aging populations have illnesses or disabilities that limit or prevent free movement, as proved the case with many nursing homes in LA that were evacuated.[4]

How can we ensure there are enough support staff to adequately address the unique needs of the elderly? Will this become part of Business Continuity Management (BCM) planning across industries? These questions around human capacity and the resources available to severely vulnerable populations must be at the forefront of our considerations, given the upward trend of climate change-driven catastrophic events.

There are also regional risk factors to take into account: some areas of the U.S. are more prone to certain severe weather events than others. For example, the economics of life in coastal regions of Florida and Louisiana have shifted, with insurability now becoming a leading consideration alongside sunny weather or lower tax rates.[5] The reality is that certain more desirable regions are at higher risk for climate catastrophes than others. Retirees planning for seasonal or permanent relocation now have more to consider as a direct result of the severe weather risks we now face.

Unfortunately, there is also risk associated with relocating or evacuating elderly people. This population is established in their routine and community, and most have lived in their area for many years. Removing individuals from this comfort zone and disrupting their lifestyle could be dangerous to both their mental and emotional health. Thus, retirement location risk is two-fold: (1) if you don't relocate and live in a high-climate-risk area, catastrophe

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[3] Ruth E Schau, *Society of Actuaries Research Institute,* "Climate and Retirement Planning." Referenced from https://www.soa.org/498f2a/globalassets/assets/files/resources/research-report/2025/climate-change-act-practice-articles/climate-change-act-practice-schau.pdf

[4] Steve Lopez, *LA Times* column, "The Nightmare of Evacuations for the Elderly and Disabled in the Path of the Fires." Referenced from https://www.latimes.com/california/story/2025-01-18/column-for-the-aged-and-frail-both-danger-and-trauma-can-be-greater-when-disaster-strikes

[5] Ari Pinkus, *American Communities Project*, "Mapping Climate Risks by County and Community." Referenced from https://www.americancommunities.org/mapping-climate-risks-by-county-and-community/

could strike, and you could incur severe financial and physical losses; or (2) relocating to a less physically dangerous place could be mentally and emotionally harmful.

The implications of these risks draw attention to public policy and public awareness, which will certainly encompass products and services within the financial arena. Insurance companies, government agencies, and aid organizations could collaborate to define the risks of climate change in a transparent fashion and take measures to reduce losses. The first steps in this journey—albeit certainly not the entire solution—may well involve working together to educate the public on how risks are evolving and to offer solutions, coverage, and planning support that appropriately apply to these adjusted risk profiles.

CLIMATE RISK FOR INSURERS

Retiring or retired populations are unlikely to see insurability and the costs of coverage plateau or return to past expectations. In fact, all indicators suggest that without substantial changes to either coverage approaches (e.g., traditional and parametric hybrid product bundles) or dramatic public subsidies, insurers will continue to find themselves forced to match escalating loss ratios with proportional escalations in premiums just to remain regulatorily solvent.

As evidence for this risk, results from a 2021 climate stress test of French banks and insurers (conducted by local regulators and reported by S&P Global) found that claims ratios from natural disasters could see a 200%–500% increase by 2050.[6] According to S&P Global, these claims would deplete 91% of the French insurance industry's estimated $32.1 billion excess capital buffer above the AA capital requirement. To protect against future catastrophe exposures, S&P estimates that these insurance organizations would need to reserve $21.7 billion in capital.[7]

Unfortunately, there is risk of underestimating the escalation of climate events due to "the lack of consistent and reliable data to inform re/insurers' views on their exposure to climate change in their underwriting portfolios."[8] Nevertheless, S&P's analysis of estimated claims ratios demonstrates a need for adjusted financial planning.

The American insurance industry has already begun to respond to the risks outlined in S&P's analysis, implementing efforts to mitigate future capital losses. According to Moody's, insurers "have strategically reduced their portfolios in the highest-risk areas […] by non-renewing policies, enhancing underwriting standards, conducting inspections, and requiring homeowners to take steps to reduce [catastrophe] risk."[9] The image below provides a snapshot of regions that have the highest percentage of non-renewed policies in 2023—all of which are defined as high-climate-risk by the American Communities Project.

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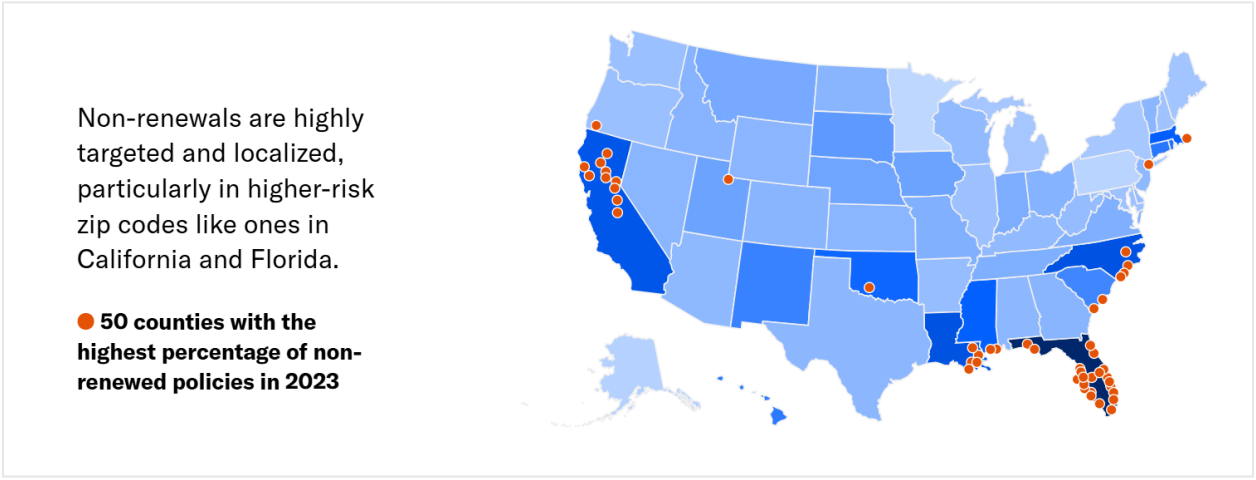
[6] Dennis P. Sugrue, et al., *S&P Global,* "Global Reinsurers Grapple with Climate Change Risks." Referenced from https://www.spglobal.com/ratings/en/regulatory/article/210923-global-reinsurers-grapple-with-climate-change-risks-s12116706
[7] Dennis P. Sugrue, et al., *S&P Global,* "Global Reinsurers Grapple with Climate Change Risks." Referenced from https://www.spglobal.com/ratings/en/regulatory/article/210923-global-reinsurers-grapple-with-climate-change-risks-s12116706
[8] Dennis P. Sugrue, et al., *S&P Global,* "Global Reinsurers Grapple with Climate Change Risks." Referenced from https://www.spglobal.com/ratings/en/regulatory/article/210923-global-reinsurers-grapple-with-climate-change-risks-s12116706
[9] Evelyn Ocas Salazar, et al., *Moody's,* "Devastating Wildfires in California Reshape the Insurance Market." Referenced from https://www.moodys.com/web/en/us/insights/data-stories/california-wildfires-reshape-insurance-market.html

Figure 1

POLICIES NOT RENEWED BY INSURERS IN 2023 HEATMAP



Moody's Article: Devastating Wildfires in California Reshape the Insurance Market, by Sarah Hibler et. al

Leaving aside regulatory and legislative relief, climate catastrophes have already made it incredibly difficult and expensive for millions of homeowners in high-climate-risk areas to get standard coverage. This situation potentially threatens the financial security of the populations in those areas, specifically for those who cannot afford either the escalating premium requirements or have the wherewithal to relocate to lower-climate-risk regions for retirement. The industry, related services, and solutions must evolve to provide financial security to retired populations located in high-climate-risk areas while simultaneously balancing the need to mitigate enterprise and financial risk.

INSURANCE PRODUCTS FOR CLIMATE CATASTROPHES

Today, options are often limited. Few insurance products and funding options allow for decreased risk to insurance companies in the world of climate catastrophes. That said, templates for broader innovations are in the market and growing their respective footprints. For example, microinsurance products are built to serve low-income households that cannot manage the typical high premiums of P&C policies (hence the name "micro"). Microinsurance is the low-premium option that offers more limited coverage for illness, injury, death, and possessions, which low-income pre-retirees located in high-climate-risk regions could leverage to protect their livelihood.

Delivering microinsurance, however, can be a challenge for insurance companies because of its small unit size, accessibility challenges across the broader population, and risk-sharing structure.[10] Lack of understanding of how microinsurance products work and a shortage of localized risk management knowledge add to the risk for market expansion efforts.[11]

[10] Santosh Anagol, *Knowledge at Wharton*, "Micro Insurance: A Safety Net with Too Many Holes?" Referenced from https://knowledge.wharton.upenn.edu/podcast/knowledge-at-wharton-podcast/micro-insurance-a-safety-net-with-too-many-holes/

[11] Santosh Anagol, *Knowledge at Wharton*, "Micro Insurance: A Safety Net with Too Many Holes?" Referenced from https://knowledge.wharton.upenn.edu/podcast/knowledge-at-wharton-podcast/micro-insurance-a-safety-net-with-too-many-holes/

Another innovative alternative is parametric insurance—a product that pays out benefits to customers based on a predetermined index, such as the amount of rainfall, for loss of assets and investment caused by catastrophic weather events.[12] The predetermined index could be the probability of a specific weather event occurring, for example, an earthquake above 4.0 magnitude.[13]

With parametric insurance, instead of indemnifying loss incurred by a catastrophe, the insurance company agrees to pay a specified amount to the policyholder if the defined event or index occurs. As such, parametric insurance is a proactive approach to protecting property, as opposed to the reactive strategy of typical P&C products where losses are appraised and the policyholder receives a payout to make up for the loss.

Insurance payouts in response to a high likelihood of catastrophe events occurring can be informed by climate and weather forecasts, so policyholders can have the financial security to proactively take preventative measures against loss. In this way, parametric insurance can help to prepare for and estimate the damage of climate catastrophes.

ADDITIONAL CONSIDERATIONS

If insurance companies pursue developing these innovations—perhaps targeted towards seniors and retirees located in high-climate-risk regions—it would be beneficial to collaborate with governments, aid organizations, and climate change experts to ensure financially viable products that reduce exposures for both the insurance companies and policyholders.

Successful catastrophe planning benefits from each of these groups of stakeholders—retirees, government organizations, aid organizations, insurance companies, and climate change experts—contributing to the broader strategy.

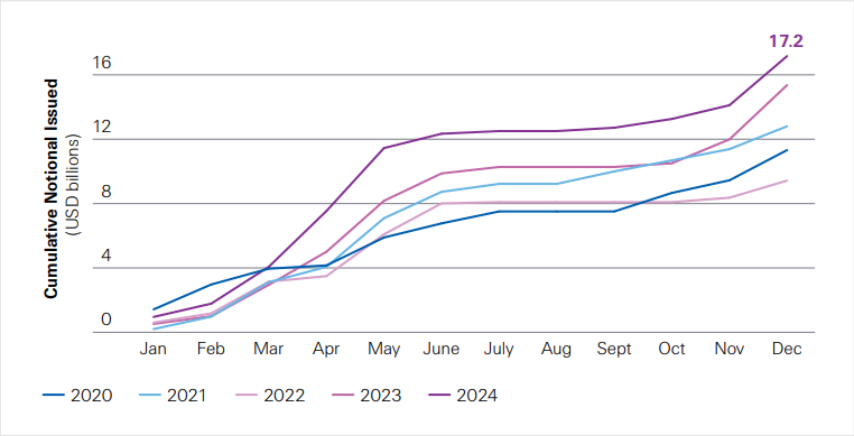
Nonetheless, these product offerings may still pose significant financial risk for insurance companies. Vehicles such as catastrophe bonds may offer avenues to decreasing these. Catastrophe bonds (or cat bonds) allow insurers to pay to transfer the risk of natural disasters covered by their policies to investors.

Historical provenance reinforces the efficacy of the strategy. Cat bonds were first issued in the 1990s when the world was recovering from a set of costly natural disasters, and the market for cat bonds has grown at a compound annual rate of nearly 10% since then.[14] The graphs below, taken from the Swiss Re Institute, illustrate this growth.

[12] *Swiss Re Corporate Solutions,* "What is parametric insurance?" Referenced from https://corporatesolutions.swissre.com/insights/knowledge/what_is_parametric_insurance.html
[13] *Swiss Re Corporate Solutions,* "What is parametric insurance?" Referenced from https://corporatesolutions.swissre.com/insights/knowledge/what_is_parametric_insurance.html
[14] Patrick Henry, *World Economic Forum,* "Catastrophe Bonds." Referenced from https://www.weforum.org/stories/2021/11/catastrophe-bond-finance-insurance-climate-change-natural-disaster/

Figure 2

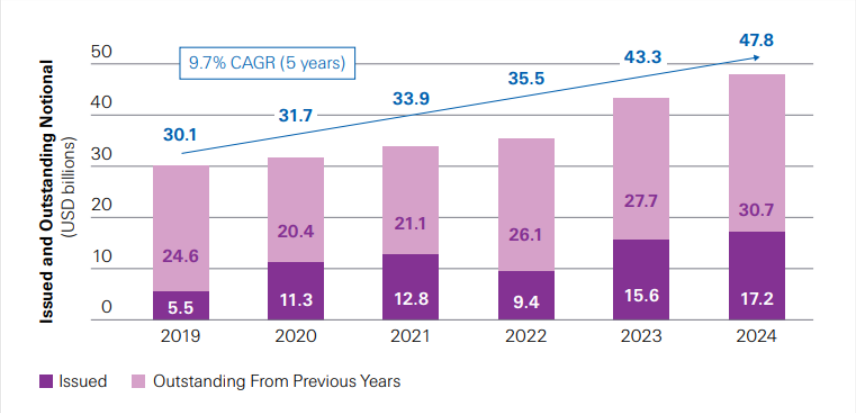
ILS NEW ISSUANCE: HISTORICAL CUMULATIVE NOTIONAL CAT BONDS ISSUED



Source: *Swiss Re,* "Insurance-Linked Securities Market Insights February 2025."

Figure 3

ISSUED VS. OUTSTANDING NOTIONAL



Source: Source: *Swiss Re,* "Insurance-Linked Securities Market Insights February 2025."

Leveraging capital markets to offset risks seems a likely next step as part of a forward-looking evolving strategy. With these bonds in place, insurance companies may secure the funds to deliver parametric or micro-insurance products to retirees located in high-climate-risk areas who cannot afford or are unable to relocate or evacuate before a natural disaster. While this insurance does not cover the emotional or mental toll caused by natural disasters, these plans can help protect against extreme capital losses and involve a lower risk exposure for both insurers and retirees.

CONCLUSION

As it stands, climate catastrophes have the potential to cause extensive capital and physical losses to both insurance companies and policyholders. Trend data suggests this may be unavoidable. Acknowledging this potential future, government agencies, aid organizations, insurance companies, climate change experts, and healthcare organizations can work to adequately plan for increasingly impactful catastrophes that impact different populations and especially retirees.

The options outlined in this paper are merely suggestions to begin such planning and should be critically assessed by respective experts. Additional research should be done into the feasibility of the proposed options depending on insurers' individual risk profiles and local regulations. Responding to more frequent wildfires, stronger hurricanes, and other climate change-related events, these groups of stakeholders can come together to address housing, elderly care, relocation, evacuation, healthcare, and financial needs for retirees located in high-climate-risk regions.

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