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Climate Change and the Caribbean

In 1960, the carbon dioxide level in the atmosphere was 315 parts per million (ppm) — unprecedented in modern history but only 40 ppm above what it was 2 centuries earlier. The next 40 ppm were added in just 3 decades, and the 40 after that in just 2. In March 2024, we reached 427 ppm. This rapid increase in CO_2 has translated into accelerated global temperature increases over a short time. Climate models are only able to explain this rate of temperature increase by considering human activities.[1]

The implication of rapid climate change poses an existential threat. Our oceans are warming, thus expanding, increasing sea levels, and placing many Caribbean coastal cities at risk. These warmer oceans also provide the ingredients for hurricanes to travel further and unleash their wrath with greater intensity, threatening bourgeoning cities.

The future effects of climate change on specific populations are not yet well understood, making long-term planning difficult. Some things are certain: we know sea levels will rise. We also expect hurricanes will bring more rain. Some things are less certain: some communities may see fewer storms, while others may see more, as the genesis and the track of hurricanes shift. What is clear, however, is that since 1950, globally, there have only been 7 years with multiple $10 billion in weather property losses, on an inflation-adjusted basis. These multi-cat loss years have all occurred since 2004.[2]

With more people and property exposed, severe weather will cause more damage unless we invest in resilience and reduce CO_2 emissions.

The emission reduction challenge

Since 1980, we've doubled our CO_2 emissions. If we want to meet the commitments under the Paris Accord, we'll need to halve emissions from 40 billion tonnes to 20 billion tonnes per year in just a decade. The later we leave it, the more negative emissions we need to stay within 2 degrees above pre-industrial temperatures. This is one of, if not the greatest, challenge of the 21st century.

While the Caribbean constitutes a tiny part of global emissions, it is disproportionately more vulnerable to extreme events. According to a 2020 study by Climate Analytics, a Berlin-based nonprofit, damage related to climate change for Small Islands Developing States (SIDS) in the Caribbean is projected to increase from 5% of GDP in 2025 to more than 20% of GDP by 2100 if no regional action is taken to mitigate or adapt to climate change.[3]

This estimated increase stems from the loss increases driven by exposure and climate change, the region's dependency on fossil fuels for their energy matrix, and the region's reliance on sectors such as tourism and agriculture, which are sensitive to climate perils.

Steps are underway to reduce emissions: Antigua and Barbuda, Dominica, and Grenada are all moving to renewable energy sources.[4] Barbados has a plan to phase out fossil fuels entirely by 2030.

Risk and resilience in the Caribbean

Research from the European Investment Bank notes: "Of the ten countries worldwide that suffered the largest average losses as a percentage of GDP between 2000 and 2019, seven are from the Caribbean: Dominica (first), Grenada (third), The Bahamas (fourth), Puerto Rico (fifth), Antigua and Barbuda (seventh), and Haiti (tenth)."[5]

This high risk to climate-related disasters is not just a consequence of the high level of hazards arising from hurricanes, floods, and other climate sensitive perils, but also the concentration of population in coastal regions and the high vulnerability in many countries. Almost 70% of the population lives within 5 kilometers of the coast, as all the capital cities of the insular Caribbean are port cities, and tourist areas have densely populated coastal regions for decades. This is further exacerbated where we have steep environments close to the coast susceptible to landslides following heavy rainfall.[6]

We observe vulnerability of the built environment in the choice of building materials, inadequate roofing, and non-structural elements, but also in the absence of green space that elevates heat stress, a threat to health. Where these vulnerabilities extend to the power network, risks compound as communities take longer to recover without basic utilities in the aftermath of a catastrophe.

That said, it's not all doom and gloom. Resilience and risk reduction programs are a priority for many local governments and international organizations. We observe these positive steps in the form of early warning systems, investing in disaster-resilient infrastructure, enforcing land-use rules to limit deforestation, and enforcing building standards.

Local initiatives in the region include the following examples:

- The Caribbean Catastrophe Risk Insurance Facility (CCRIF), which limits the financial impact of catastrophic hurricanes, earthquakes, and excess rainfall.
- The Climate Risk Adaptation and Insurance in the Caribbean (CRAIC) project, which partnered with Guardian General Insurance to deliver an innovative weather index-based microinsurance product to help vulnerable communities get back on their feet following a hurricane.
- Barbados' national resilience strategy, known as "Roofs to Reefs," is to boost climate resilience with investment toward reinforcing home construction, increasing sustainable land use, improving freshwater storage capacity, and restoring coral reefs, which help protect coastlines from waves, storms, and floods.
- USAID projects in Haiti are designed to reduce threats to coastal marine biodiversity, improve the resilience of coastal communities, and strengthen water security in Haiti.[7]
- Other UN programs have sought to restore watersheds and rehabilitate wetlands to mitigate damage caused by flooding and droughts.[8]

Hurricanes, the costliest Caribbean catastrophic peril

While the Caribbean has been affected by various climate-sensitive perils, the economic cost of hurricanes in the Caribbean is greatest. Notably, the combined damages from Irma-Maria in 2017 nearly exceeded Puerto Rico's entire annual GDP of around $104 billion.[9]

Hurricanes cause not only devastating wind damage and coastal surge flooding but can also generate extreme rainfall. In 2014, for example, tropical storm Erika produced rainfall over Dominica that triggered flash floods and landslides, affecting approximately 40% of the total population and costs equivalent to 90% of its GDP.[10]

How are hurricanes influenced in a warming world?

Hurricane science offers a few clues as to how a warming world is expected to alter the characteristics of tropical cyclones — many of these are concerning. Sea-level rises are expected to increase surge heights, increasing the severity of coastal flooding. The severity of rainfall is expected to increase as hurricanes slow and the atmosphere's capacity to hold water increases. In the future, it may be harder for hurricanes to form, suggesting possibly fewer hurricanes. Once they form, however, they're expected to be more intense. This would increase the proportion of intense hurricanes.[11]

We cannot predict exactly how these enhancements will interact and what impact they will have on insurers' business, especially over time horizons important for business planning — that is, 3–5 years. We can, however, build sensible scenarios based on plausible pathways between temperature change and each of the enhancements above to assess its impact in this decade. Based on these scenarios, we can use cat models to reveal how an insurance portfolio or reinsurance program could respond to near-term climate trends. Such analysis can typically inform portfolio steering decisions or reinsurance program design refinements to improve resilience.

How can Gallagher Re help?

As an industry, we are among the first providers of financial relief following a disaster, often paying disaster victims very soon after an event. But we also have capabilities to help plan for long-term resilience. With more people in harm's way, more assets, and more intense weather, now more than ever, we play a critical role in society.

At Gallagher Re, we have heeded this call to action as we support our clients understand the impacts of climate change and navigate an evolving risk landscape. We actively engage research partners and study trends from recent events to understand and incorporate the observed effects of climate change in the models. We're expanding our scope of models in direct response to the increased prominence of these climate-sensitive perils. These initiatives help translate science into risk analytics, supporting better decision-making.

We're leveraging data from satellites and weather stations to design parametric solutions in developing countries that help reduce the protection gap. We're analyzing how a transition to a low-carbon economy could affect our clients and their risk transfer needs and developing innovative solutions that support a more orderly transition.

We continue to learn, invest, and innovate, leveraging our deep expertise and technology. We remain committed to serving as a trusted climate risk partner to our clients.

References

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[11] Tropical Cyclones and Climate Change Assessment.

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Junaid Seria
Head of Analytics
Latin America and Caribbean
junaid_seria@GallagherRe.com

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