

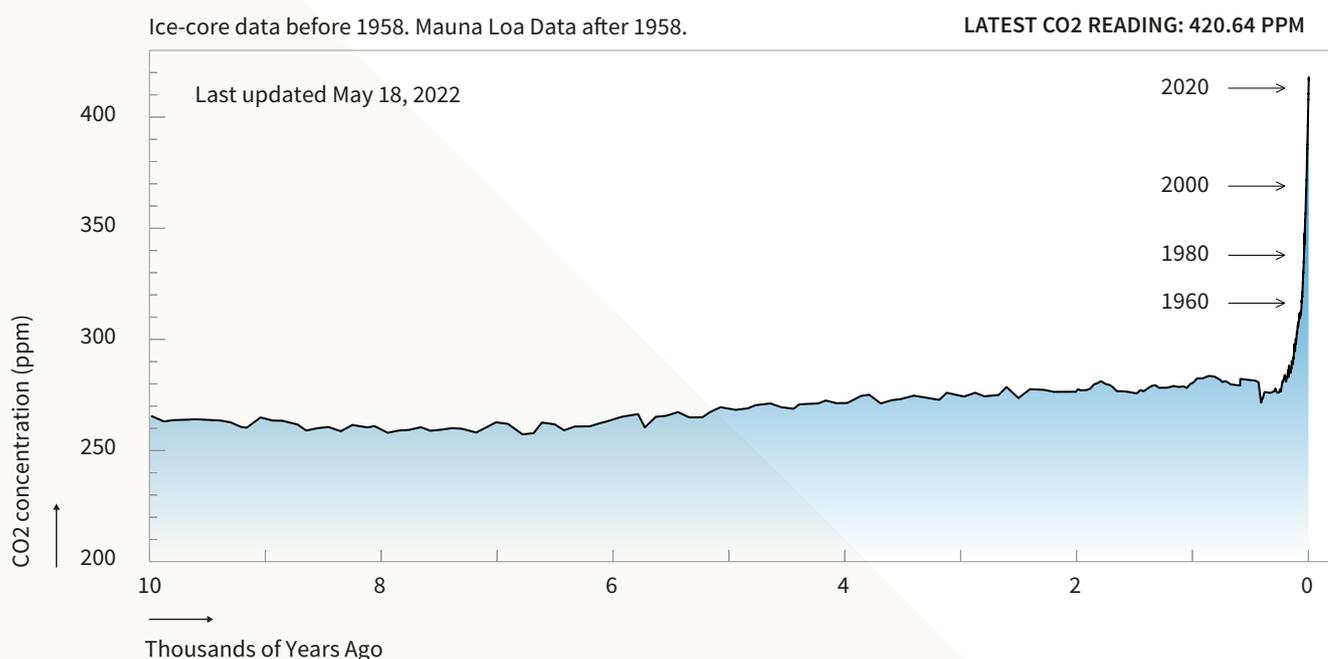
# CLIMATE-RELATED RISK SCENARIOS

BY **ANDRÉ CHOQUET**

**A**s I write these lines, the latest CO2 reading on the Keeling Curve stands at 419.27 ppm, the result of more than a century of an exponential growth since the start of the industrial revolution. The Keeling Curve is a daily record of global atmospheric carbon dioxide concentration maintained by Scripps Institution of Oceanography at UC San Diego. And that's not even

including the rest of the greenhouse gas emissions in the atmosphere. It is one of many metrics actuaries should become accustomed to as the 200 signatory countries to the 2016 Paris Agreement are trying to create the policies, finance the innovation and incite markets to remove Green House Gas emissions from our economies and to limit global warming to 1.5C, at most 2.0C. [>](#)

FIGURE 1: THE KEELING CURVE



The International Actuarial Association (IAA) paper on the application of climate-related risk scenarios to asset portfolios is the fourth in a series of IAA papers on the integration of physical, transition, legal and reputational climate risks into the work of actuaries ([https://www.actuaries.org/iaa/IAA/Publications/Papers/Climate\\_Issues/IAA/Publications/Climate\\_Issues.aspx](https://www.actuaries.org/iaa/IAA/Publications/Papers/Climate_Issues/IAA/Publications/Climate_Issues.aspx)).

### WHAT'S THE IMPETUS FOR THIS ASSET-RELATED PAPER?

- Most actuaries will agree that climate-related risks will impact assets and liabilities of financial institutions, some of which are our employers or clients.
- Although a lot of actuaries may not be involved in security analysis or portfolio management, they are often the ones certifying the long term viability of pension plans or insurance companies which depend on the performance of their assets.
- And therefore actuaries have an interest in leading or at least contributing to climate risk assessments, scenario analysis or stress testing to quantify the impact of future climate pathways on asset portfolios.
- There is also the risk of stranded assets that all asset owners face. If currently some companies' value in the oil sector is based on their oil reserve, such value will gradually or suddenly decline because a big chunk of the fossil fuel reserve on the planet will need to remain underground for the planet to stay at 1.5 or 2.0 degrees. Albeit some of these energy companies will gradually diversify into sustainable sources of energies.
- More and more pension fund fiduciaries, insurers and other financial institutions have a legal, business or moral duty to take climate-

related risks into account in the management of their entities and these are our employers or clients.

- Finally, on the liability side, the discount rate used by actuaries to discount long term obligations is based on the expected long term returns on assets.
- The paper speaks to the importance for actuaries to understand the work of at least the following three global NGO's: (1) the IPCC Intergovernmental Panel on Climate Change a UN agency, (2) the International Energy Agency (IEA) and (3) the Network for Greening the Financial System Scenarios (NGFS).
- The IPCC is the most credible NGO on climate science. The IPCC AR6 report from Working Group 1 issued in August 2021 revealed stark realities:
  - 'It is unequivocal that human influence has warmed the atmosphere, ocean and land. Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred'
  - '...limiting human-induced global warming to a specific level requires limiting cumulative CO2 emissions, reaching at least net zero CO2 emissions, along with strong reductions in other greenhouse gas emissions.'

*Source: [IPCC\\_AR6\\_WGI\\_SPM\\_final.pdf](#)*

There are no probabilities assigned to any of the future climate scenarios developed by the IPCC because the global warming path society will follow is highly dependent on the actions we take over the next decades, especially this one. That's why actuaries need to familiarize themselves with these pathways as they will form the basis for climate scenario analysis. >

A portfolio may be examined as the collection of individual assets (bottom-up approach) or from its overall composition (top-down) all of which are impacted by climate-related risks (physical, transition, legal and reputational).

The methods used to assess climate-related risk at the individual security level are still developing, and practice may vary from one geographical region to another but at a minimum, portfolio managers who use a Discounted Cash Flow model to value securities will stress test their portfolio against future carbon pricing policies.

A good example of a top-down analysis is the 2020 Institute & Faculty of Actuaries-Ortec Finance Climate scenario analysis for pension schemes **Climate scenario analysis for pension schemes - UK Case Study.pdf ([actuaries.org.uk](https://actuaries.org.uk))**. When it comes to the transition risk to the economy and the financial institutions within it, there's a threesome dance between:

1. Government policies to incite corporations to move away from fossil-fuel towards more sustainable energies
2. New technologies and their financing by the private and/or public sector
3. Market response to both new technologies and to the slow withdrawal of old fossil-fuel related technologies

Ideally, these three will move more or less in tandem towards net-zero pledges but it may not happen in an orderly fashion. Hence most climate scenario analysis include a mix of orderly and disorderly scenarios.

- Paris Orderly (coordinated action to limit global average temperature rises to 2°C which financial markets price in gradually)
- Paris Disorderly (same real-world outcomes as the Paris Orderly pathway, but financial markets' reaction is delayed and abrupt)
- Net-zero 2050 scenario: a more ambitious immediate policy action scenario to limit average global warming to 1.5°C that includes current net-zero commitments by some countries
- Failed Transition (no additional climate policies are implemented and global average temperature rises by 4°C by 2100).

The rest of the paper focuses on considerations for various asset classes like fixed income, equity, real estate and infrastructure, derivatives and agricultural assets, green asset classes.

## **WE ALSO LOOK AT HOW COMPANIES MAY MEASURE CLIMATE-RELATED RISKS**

- Overall portfolio alignment: refers to the proportion of the portfolio committed to 'net zero by 2050'.
- Portfolio Emissions.
- Implied Temperature Rise: tries to estimate the global temperature rise, as if every company in the world operates on the same carbon intensity as this asset and experiences the same emissions pathway as this asset.
- Climate Value-at-Risk : quantifies the size of loss attributable to climate-related financial risks, by comparing the value of assets in a world with climate change relative to the same >

world without climate change. It is model- and data-intensive, so lacks transparency and comparability. The scenarios used could potentially be quite different by company, which would make it difficult for investors to understand what these figures represent.

Overall, these metrics are still evolving and we should be mindful of their limitations – in terms of data availability, comparability, transparency and intensity of computation.

***‘ If we are not also part of the solution...we are part of the problem.***



## **NEXT STEP**

The IAA is in the process of drafting a paper on adaptation based on the IPCC WGII report entitled ‘Climate Change 2022: Impacts, Adaptation and Vulnerability’.

One of its key messages is that adaptation plays a key role, along with mitigation, in addressing the risks of climate change. The report points out that we are already being affected by climate change and some of its adverse effects are already ‘baked in’ and must be addressed through adaptation.

Efforts to reduce carbon emissions through mitigation are of course key to slowing the rate of global warming but the report shines the spotlight on the vital role that adaptation efforts can play in reducing some of the adverse impacts of climate change.

Many natural systems are already being challenged by human development and climate change (ie loss of species, loss of habitat, loss of diversity etc). The report highlights that climate change affects our entire planet and that there are innumerable feedback loops, tipping points etc. that require all elements of our society to participate in solutions, even the actuarial profession.

If we are not also part of the solution.....we are part of the problem.

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