

CLIMATE AND NATURE RELATED RISK: WHERE CAN ACTUARIES HELP


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AGENDA

- 
- Introduction to Climate Change
 - Key Climate Change Risks
 - Relationship between temperature and mortality
 - Disclosures Journey
 - Role of Actuaries
 - Actuaries Climate Risk Index (ACRI)
 - Summary

CLIMATE CHANGE - INTRODUCTION

WHAT IS CLIMATE CHANGE

A change in global or regional climate patterns (temperature change and weather patterns) mainly driven by increased levels of atmospheric carbon dioxide produced using fossil fuels.

WHY DO WE NEED TO CONSIDER CLIMATE CHANGE

Increasing carbon emissions are trapping heat from the sun and warming up the earth at a much faster pace than would have naturally occurred, leading to disruption and higher volatility in temperature.

HOW WILL CLIMATE CHANGE IMPACT THE WORLD AROUND US

- Impact the frequency/intensity of extreme weather events such as floods, droughts and heat waves
- Increase the spread of certain diseases, impacting human health
- Rising sea levels threaten ecosystems and coastal communities
- And more...

CLIMATE CHANGE RISKS

Physical risks

Direct physical effects of climate change

Extreme weather events such as hurricanes, or heatwaves, causing:

- Physical damage to premises, data servers, admin systems of insurance companies resulting in repair & replacement expenses.
- Increased mortality rates resulting in **adverse impacts on life insurance claims**
- Adverse impact on agriculture or production facilities, harmful driving conditions resulting in **increased general insurance claims**
- Increased morbidity rates resulting in **increased health insurance claims**

Transition risks

Driven by actions taken to mitigate climate change

Policy & Legal Risks – increased operational costs, regulatory fines for non-compliance

Technology Risks – Lower emissions technology disrupting competitiveness and reducing revenues for existing business.

Market Risks – Shifting consumer preferences reducing demand, increasing production costs and leading to repricing of assets.

Reputational Risks– Negative public perceptions of high emission sectors leading to reduced revenue, rising labour costs.

Expenses – Cost of transitioning may be higher than expected

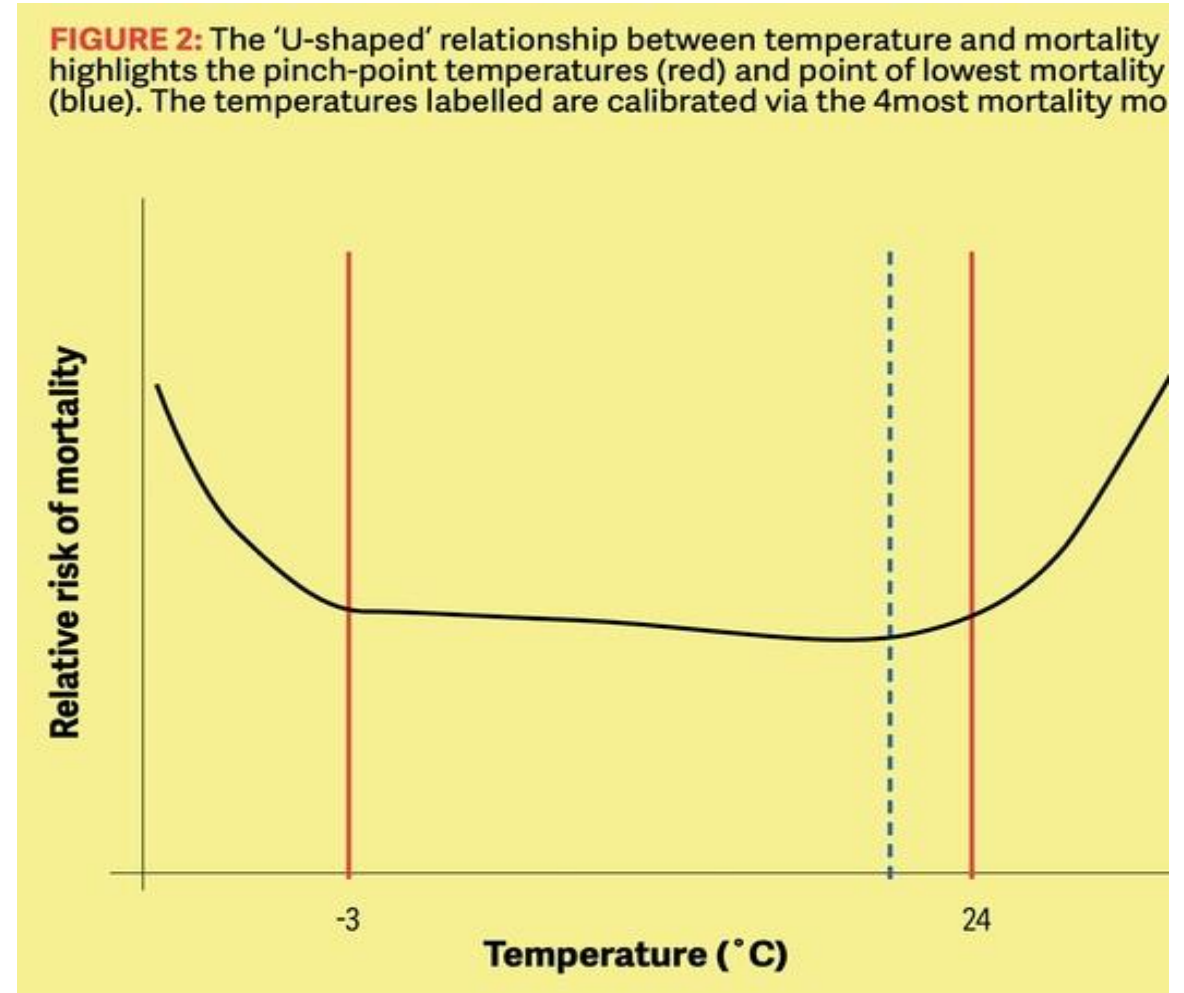
Liability risks

Third parties seeking compensation for losses due to physical or transition climate change risks

- Investors seeking compensation from companies who suffer loss due to climate change.
- People who have suffered from physical events, such as flooding, making claims against polluting companies
- Fines from government and local authorities if companies found responsible for increasing climate change risk

RELATIONSHIP BETWEEN TEMPERATURE AND MORTALITY

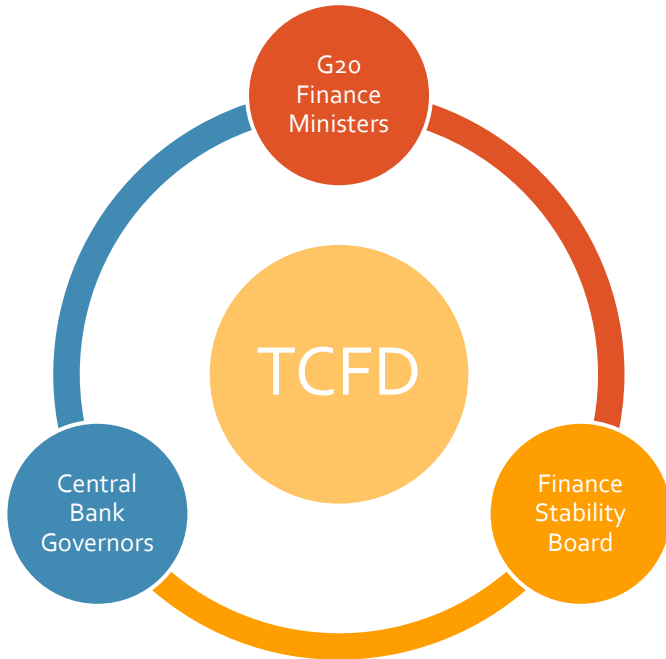
- Record breaking temperatures experienced in the UK in recent years
- Impact of rising temperatures affecting future mortality has been investigated by 4most
- Mortality is shown to sharply increase beyond hot and cold temperature extremes
- Frequency of extreme heat events in the UK will continue to rise driving an increase in temperature-related deaths



Boiling point: the effect of rising temperatures on future mortality | The Actuary

THE DISCLOSURES' JOURNEY

2015



2017

TCFD issued 11 recommendations to make Climate Risk Disclosures (CRD) consistent across firms

Recommendations structured around four thematic areas:

Governance

Strategy

Risk Management

Metrics and Targets

Current

- TCFD has become critical for CRDs regulatory framework.
- The United Kingdom and New Zealand are mandating climate-risk disclosure in line with the TCFD.
- Many jurisdictions follow the TCFD recommendations, including the European Union, Singapore, Canada, Japan and South Africa.
- As per latest TCFD Status Report 2022, levels of disclosure have increased dramatically across all regions. Europe continues to be the top region for disclosure, followed by Asia-Pacific.

[TCFD Recommendations: FINAL-2017-TCFD-Report.pdf \(bbhub.io\)](https://www.bbhubs.org/TCFD-Recommendations-FINAL-2017-TCFD-Report.pdf)

CLIMATE RISK DISCLOSURES - SINGAPORE

2022

All listed companies to report on “comply or explain” basis.

2023

Listed issuers in three¹ industries mandated to publish full CRDs.

2024

CRDs mandated to two² more industries



2025

The SRAC recommended all listed issuers including the ones incorporated overseas should report CRDs from FY 2025.



2027

Non-listed companies with revenue over S\$ 1 billion required to report CRDs.

Example Disclosure-Singtel is one of the big groups in Singapore and they have published a climate risk report: [SingtelGroup-TCFD-Report-2022.pdf](#)

¹ (1) Financial, (2) Agriculture, Food and Forest and (3) Energy

² (4) Materials and Buildings and (5) Transportation

ROLE OF ACTUARIES

Risk Assessment

Scenario and Stress Testing

Sustainable Investment Strategy

Regulatory and Disclosure Requirements

RISK ASSESSMENT

Actuaries have the expertise to identify, quantify and mitigate risks

IDENTIFY

Identify the main climate change risk

QUANTIFY

Assess the financial impact of each risk.

PRICING

Suggest changes to Pricing

UNDERWRITING

Suggest changes to underwriting strategy

INTERNAL MEASURES

Suggest Internal measures to achieve sustainability goals

EXPENSE ANALYSIS

Increased expenses to achieve sustainability goals.

SCENARIO AND STRESS TESTING

The impact of climate change on mortality and morbidity patterns is difficult to quantify

DATA ANALYSIS

Analyse data to understand trends in mortality & morbidity

MODELLING

Modify/Develop model to incorporate climate stress events

SCR CALCULATION

Calculate SCR under climate change module & compare with others

RISK IDENTIFICATION

Identify company activities contributing to climate change risk

RISK QUANTIFICATION

Quantify impact on profitability by varying premium & new business levels

SUSTAINABLE INVESTMENT STRATEGY

Insurance companies will need to transition to a sustainable investment strategy

IMPACT ON CURRENT ASSETS

Quantify change in MV of company's current assets due to climate related events

IDENTIFY SUITABLE ASSETS

Investments resilient to climate change risk

ALM STRATEGY

1. Create revised ALM strategy
2. Transition plan to move to new investment strategy

DISCOUNT RATE

Revise discount rate based on new strategy & determine impact

DOCUMENTATION

Short- and long-term impacts of investing in sustainable assets

REGULATORY AND DISCLOSURE REQUIREMENTS

- There is currently a roadmap in place towards mandatory climate-related disclosures, with the UK government announcing that TCFD disclosures will be required by 2025 for the entire economy.
- The Prudential Regulation Authority, UK aims to undertake further analysis on the impacts of climate change and the net-zero transition from macro-economic and financial stability perspective.

REPORTING TEMPLATES

Prepare reporting templates in format required by regulators

FINANCIAL STATEMENTS

Analyse impact and movements in profit due to climate change risk

SCR REQUIREMENTS

1. Calculate SCR in line with regulatory requirement for climate risk
2. Compare SCR before and after including climate scenarios

PRACTICAL STEPS FOR ACTUARIES

Education

- Attend and organise seminars and training on climate change.
- Research independently using available resources.
- Gather feedback on research done from other experts and refine further studies.

Monitor Risk

- Constantly monitor climate change risk for own organisation or stakeholders.
- Carry out analysis on the pattern of climate change risk over time.
- Understand the impact of climate change initiatives for clients as well as own organisation

Regulatory changes

- Understand the timelines for regulatory changes disclosures and when these will be effective
- How material will be these climate change disclosures and the what impact will it have on client's business and other stakeholders.

Explore Data Sources for research

- There are various data sources available to do further research on climate risk:
- **Climate data online**
 - **Climdex**
 - **IPCC reports**

SUMMARY



Climate change is a pressing issue

- Impact of climate change has increased significantly over the last few years.
- Physical, transition and liability risks impact insurance companies in different ways.
- Mortality and morbidity rates have increased significantly.



Regulatory requirements have already started (TCFD)

- Listed companies in Singapore need to be compliant with climate related disclosures by 2025.
- Non listed companies in Singapore need to need to be compliant with climate related disclosures by 2027.
- Not only in Singapore but these TCFD requirements will be mandatory globally.



The role of actuaries is important

- Climate Risks (and Nature Risks) are complex and have global impact.
- Actuaries have the skills to 'deal' with these risks.
- The areas to get involved in are quantitative, qualitative and stakeholder management roles.

ACTUARIES CLIMATE RISK INDEX (ACRI)

Background ♦♦♦♦

- Established in November 2016 by American Academy of Actuaries, the Canadian Institute of Actuaries, the Casualty Actuarial Society, and the Society of Actuaries.
- Indicator of the frequency of extreme weather events and the extent of sea level change.

Key Functions ♦♦♦♦

- Establish a relationship between the weather components of the ACI and damages to life and property.
- Measure the excess change in expected damages from environmental conditions in a particular period.

Uses of ACRI

General Public

- Understand how extreme climate events can impact human health.
- Understand the impact of climate change on living costs.

Decision Makers

- Useful in understanding the costs of prevention and mitigation policies.
- Key indices and variables effecting climate change for risk management.

Actuaries

- Valuable Insight into the risks caused by extreme climate events.
- Setting parameters in stochastic models to project possible future losses.

GLOBAL EXAMPLES ON CLIMATE RISK INITIATIVES AND SOURCES 1/2

Source

[Link: nature.com](#)

Objective

The authors propose four methods for managing risks when we don't have the full picture of possible outcomes and their likelihoods. They explain these methods using an example of whether to build near the coast considering flood risks.

Results and Conclusions

1. Safety Level: If we can find a value (let's call it x) where the chance of extreme outcomes is very low, we might sometimes ignore these extreme cases for planning or policy.
2. Minimax Regret: This method helps in choosing the best policy when we're uncertain about outcomes. It focuses on minimizing the worst-case regret without considering probabilities.
3. Maximin Criterion: This method ranks policies based on their worst-case outcomes and selects the one with the least worst-case scenario.
4. Robust Decision Making: Instead of optimizing based on uncertain outcomes, this method selects a policy based on other qualities like the difference between the best and worst-case scenarios. No need for probabilities here.

These methods offer ways to make decisions even when we don't have all the information, especially in the context of climate change and its impacts.

GLOBAL EXAMPLES ON CLIMATE RISK INITIATIVES AND SOURCES 2/2

Source

Link: [Resource for future](#)

Objective

This research paper focuses on three risk factors that make insurance portfolios riskier when insuring multiple policies. These factors are micro-correlations, heavy-tailed distributions, and tail dependence. Climate risks exhibit all three of these factors, and there's evidence that climate change is making them worse.

Results and Conclusions

1. Micro-correlation: This happens when two risks don't seem connected, but when you have many policies together, their combined losses become unpredictable due to small correlations between them.
2. Heavy-tailed distributions: Some risks have tails that decay slowly, meaning rare extreme events (like natural disasters) have a significant chance of occurring, making them challenging to predict.
3. Tail dependence: This occurs when two variables are mostly independent, but their extremes are connected. For example, in normal times, property and car insurance claims might not relate, but during a big disaster, both could see unusually large losses together.

All three factors are important when dealing with climate risks, and the paper suggests that climate change is making these risks even more significant.

References

- TCFD Status Report 2022: [2022-TCFD-Status-Report.pdf \(bbhub.io\)](https://www.bbhub.io/resources/publications/media/low-carbon-issues/TCFD-Status-Report-2022.pdf)
- Singapore TCFD Journey:
 - [Mandatory climate disclosures for large Singapore companies move closer \(pinsentmasons.com\);](https://www.pinsentmasons.com/news/mandatory-climate-disclosures-for-large-singapore-companies-move-closer)
 - [Singapore Proposes Mandatory Climate Reporting for both Public and Private Companies - ESG Today](https://www.esgtoday.com/news/singapore-proposes-mandatory-climate-reporting-for-both-public-and-private-companies)
 - [Sustainability Reporting - Singapore Exchange \(SGX\)](https://www.sgx.com/sustainability/sustainability-reporting)

To be update

THANK YOU

For further discussion/questions you're welcome to reach out to the following individuals:



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