

Practice Resource Document

Climate Change Scenario

Committee on Climate Change and Sustainability

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The actuary should be familiar with relevant practice resource documents. They do not constitute standards of practice and are, therefore, not binding. They are, however, intended to assist members in considering whether they have addressed all relevant topics within a practice area. These may include skills and knowledge inventories (SKI), a compilation of other relevant material (internal or external to the CIA) related to the practice, as well as recognized best practices, where appropriate.

Overview

The Canadian Institute of Actuaries (CIA) Committee on Climate Change and Sustainability (CCSC) prepared this document and the attached [Excel spreadsheet](#) to provide Canadian actuarial professionals with practical considerations in building a climate scenario and for purposes of developing best practices in assessing the financial risks of climate change through climate scenario analysis.

It is written from the perspective of Canadian actuaries for actuarial work on Canadian insurance, pension, or investment operations.

This guidance is intended to illustrate the application of incorporating potential climate change scenarios as part of a company's risk assessment process. The actuary would exercise his/her own judgment with respect to specific numeric assumptions related to risk factors that include but are not limited to:

- key product lines of business in which the company operates;
- geographic regions in which the company operates;
- legislative and regulatory environment;
- asset risks assumed in the pension plan or in investments;
- macroeconomic conditions;
- social and/or population trends;
- leading climate change indices (e.g., Actuarial Climate Index <https://actuariesclimateindex.org/home/>); and
- historical natural catastrophe experience.

The Climate Change Scenario Resource Document (including the Excel spreadsheet) is meant to be principles-based and outline the key risks from climate change that the actuary would consider in his/her work. The actuary would consider risks that are consistent with the time horizon applicable to his/her work. Transition risks from climate change may materialize before physical and liability risks (see descriptions below). The attached spreadsheet presents a typical operating (and practical) five-year time horizon approach recognizing that climate change impacts will span a longer term, even beyond key target dates like 2030 (in the case of Intended Nationally Determined Contribution (INDC) as per the Paris Agreement) or 2050 (in the case of Canadian federal government's net zero emissions is for 30 years). The scenario is meant to be illustrative and not be prescriptive.

Risks

As has been enunciated by Mark Carney, in his work as Chair of the Financial Stability Board (FSB), the financial risks from climate change need to be better understood and disclosed. Given the number of potential global warming pathways, the actuary would consider the associated financial risks and incorporate them into the specific scenario analysis. Examples of relevant actuarial work include Own Risk Solvency Assessment (ORSA), Financial Condition

Testing (FCT), and work in support of the FSB's Task Force on Climate-related Financial Disclosure (TCFD). Actuaries are well positioned to communicate these financial results, including the identification of potential risk mitigating actions and opportunities to senior management and other key stakeholders who rely on the actuary's work.

Although the timing and impact of climate change is unclear, the likelihood is high that a combination of the following consequential risks will be realized:

- transition risks (movement away from high carbon investments to low carbon investments and the imposition of carbon tax regimes),
- physical risks (actual impacts to property and infrastructure from climate change), and
- liability risks (broader legal risk that may be directed to fossil fuel and/or extraction sectors or to company directors and trustees that fail to act in the best interests of their company or members by adapting to the risks and opportunities of climate change)

As such, actuaries have the opportunity to be at the forefront of the issues related to disclosing the potential impacts of the risks from climate change into their work.

From climate research, the key assumption to the potential impacts from climate change is what would happen if global warming increased well beyond the 2.0-degrees Paris agreement. A rapid transition to a green economy also presents its share of risks and opportunities. The potential implications include but are not limited to:

- extreme weather patterns and their impacts on property and infrastructure,
- increased mortality or morbidity rate caused by rising temperatures and the consequent outcome of catastrophic weather events and/or natural disasters,
- financial market instability introduced by the shift of capital away from the fossil fuel and extraction sectors to sectors promoting low-carbon technologies, and
- regulatory measures introduced to reduce greenhouse gas emissions and their impacts on various businesses.

The extent of global warming may affect the frequency or the severity of the above risks. While attribution of events associated with changing weather events is hard to assess, considerations of the changing volatility associated with these events may also be warranted in the actuary's work to provide insight to stakeholders. In its Fifth Assessment Report, the United Nations Intergovernmental Panel on Climate Change (UN IPCC) presented four scenarios (Representative Concentration Pathways) to illustrate different degrees of global warming.

While the implications of the risks from climate change may appear to be at some point in the distant future, no different from the impacts of the on-going Covid-19 pandemic on economic and financial instability, these risks may be grossly underestimated. Very few economists could have predicted the devastating effects of the Covid-19 pandemic on the macroeconomic function of the world's economies.

In the same way, the adverse impacts of the risks from climate change have not been fully appreciated, as these risks arise directly from the weather impacts of climate change by specific

geographic regions. The full impact from the risks of climate change have not yet been fully modeled, especially with respect to the impact on financial stability.

Scenario example

To illustrate the application of incorporating potential climate change scenarios as part of a company's risk assessment process, one simple way to do so is to use an illustrative example pertaining to a multi-line insurer (see attached spreadsheet in the scenario Life and Health tab).

On the pension/investment side, one of the TCFD's key recommended disclosures focuses on the resilience of an entity (this could be a pension plan) to different climate-related scenarios. Actuaries, as architects of defined benefit plans, may be asked to play a key role in assessing the impact of the two main categories of climate change risks: physical and transition risks.

A June 2020 research paper by the Institute and Faculty of Actuaries (IFoA) and Ortec Finance analysed the impact of three climate scenarios on a UK pension scheme:

1. Failed Transition (global warming reaches 4C by 2100 compared to pre-industrial levels)
2. Paris Orderly (global warming stabilizes at 1.5C compared to pre-industrial levels with transition and physical risks priced in smoothly over 2020-25)
3. Paris Disorderly (global warming stabilizes at 1.5C but abrupt repricing of assets in 2024 with accompanying shock to the financial system)

In order to project pension plans financials along these or similar climate scenarios, actuaries will need to acquire a deep understanding of the climate input data and their effect on the economic and demographic assumptions (see attached spreadsheet in the Investments and Pensions tabs).

Specific examples for the parameters for certain scenarios can be found in the attached spreadsheet. Responsibility for the manner of application of the specific parameters in different scenarios remains that of the actuary, based on the nature of the risks that the actuary is identifying and quantifying in his/her work. The actuary may need to gather input and reports from other professionals such as climate data scientists and economists in order to assess the extent to which the baseline assumptions are affected under various scenarios.

Further information on how to choose these parameters is available from the CIA CCSC Resources page on the CIA website.

Sources:

<http://actuariesclimateindex.org>

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NGFS, “A call for action Report.” April 2019. https://www.banque-france.fr/sites/default/files/media/2019/04/17/ngfs_first_comprehensive_report_-_17042019_0.pdf

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UNEP-FI and PSI, “Using hindsight and foresight.” September 2020,

<https://www.unepfi.org/psi/wp-content/uploads/2020/09/PSI-TCFD-pilot-progress-update.pdf>

Climate scenario analysis for pension schemes:

<https://www.actuaries.org.uk/system/files/field/document/IFoA%20Paper%201.pdf>

Climate scenario analysis:

<https://www.actuaries.org.uk/system/files/field/document/IFoA%20Paper%202.pdf>

Recommendations of the Task Force on Climate-related Financial Disclosures:

<https://assets.bbhub.io/company/sites/60/2020/10/FINAL-2017-TCFD-Report-11052018.pdf>