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The webinar will start in a moment, just relax and feel comfortable

Why to become a climate actuary?

Webinar OpenFloor of the Polish Actuarial Association

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—

28 February 2024

General Intro

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My background

I have been an actuary for more than three decades and served the Hungarian Actuarial Society (HAS) in various roles including its President; the Groupe Consultatif (the predecessor of the Actuarial Association of Europe, the AAE) including its Chairman in 2011-2012; and the IAA including its President in 2019. I continue to be the delegate of the HAS to both the AAE's and the IAA's Professionalism Committee. I am the chair of the IAA's Climate Risk Task Force.

I started my career as a mathematician and switched to insurance/actuarial in 1991. I spent eight years with two insurance companies in Hungary as an actuary, chief actuary, deputy general manager and general manager. Then I started my own independent consultancy. Finally, I joined KPMG in Hungary in 2008 and led its actuarial practice between 2008 and 2021. In 2021 I technically retired but in reality I'm still working for KPMG on an 80% FTE basis. I've been dealing with international issues on climate, sustainability and on insurance accounting (IFRS 17).

I had the privilege to present in front of the Polish Actuarial Association on the subject of "The future of the actuarial profession and of the IAA" in December 2019 in Warsaw.

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The actuary and the public interest

IAA Vision: The actuarial profession is globally recognized as leading experts in risk and financial security, contributing to the **well-being of society**.

IAA membership criterion: An actuary shall act in a manner that fulfils the **profession's responsibility to the public**

AAE Code of Professional Conduct:

- Individual actuaries who are members of those associations contribute to the **well-being of society or public interest** and to maintaining the standing of the actuarial profession by complying with relevant professional requirements, including any applicable Code of Conduct.
- An actuary must act in a manner that fulfils the actuarial **profession's responsibility to the public** by observing applicable technical and professional standards.

Well being vs public interest

What does it mean: actuaries contribute to the public interest?

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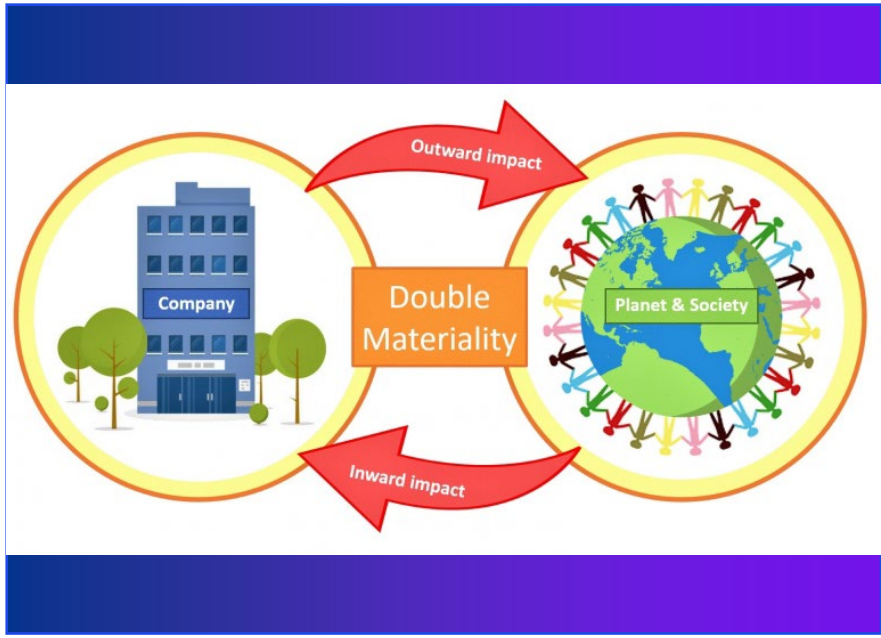
The "double materiality" of climate for an actuary

Double materiality when used for climate/sustainability

IAA: the impact of climate **on** an organization (inward) and the impact **by** the organization on climate (outward)

ISSB: Both financial and impact materiality of sustainability where

- financial materiality: how sustainability impacts the financial performance and prospects of a company
- impact materiality: how a company's activities, operations, and value chain impact external stakeholders and the broader world



Rewarding (impact **on** the actuary; financial materiality)

- Exciting
- Pioneering
- Paying well

Direct contribution to the public interest / well being of society (impact **by** the actuary; impact materiality)

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Some background

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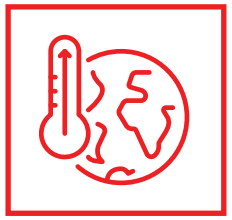
The 3 Key Performance Indicators of Climate Change

Greenhouse Gas Emissions annually: about 50-60 billion tons

Goal: Reduce by 50% in next 10 yrs, and get to “Net-zero” by mid century

Carbon Concentration Levels: about 420 parts per million

Goal: Stabilize at 450 ppm



Temperature Increase: 1.2-1.4 degree (on a 3 degree trajectory)

Goal: Keep to well below 2 degree; the ideal would be 1.5 degree but it seems impossible now

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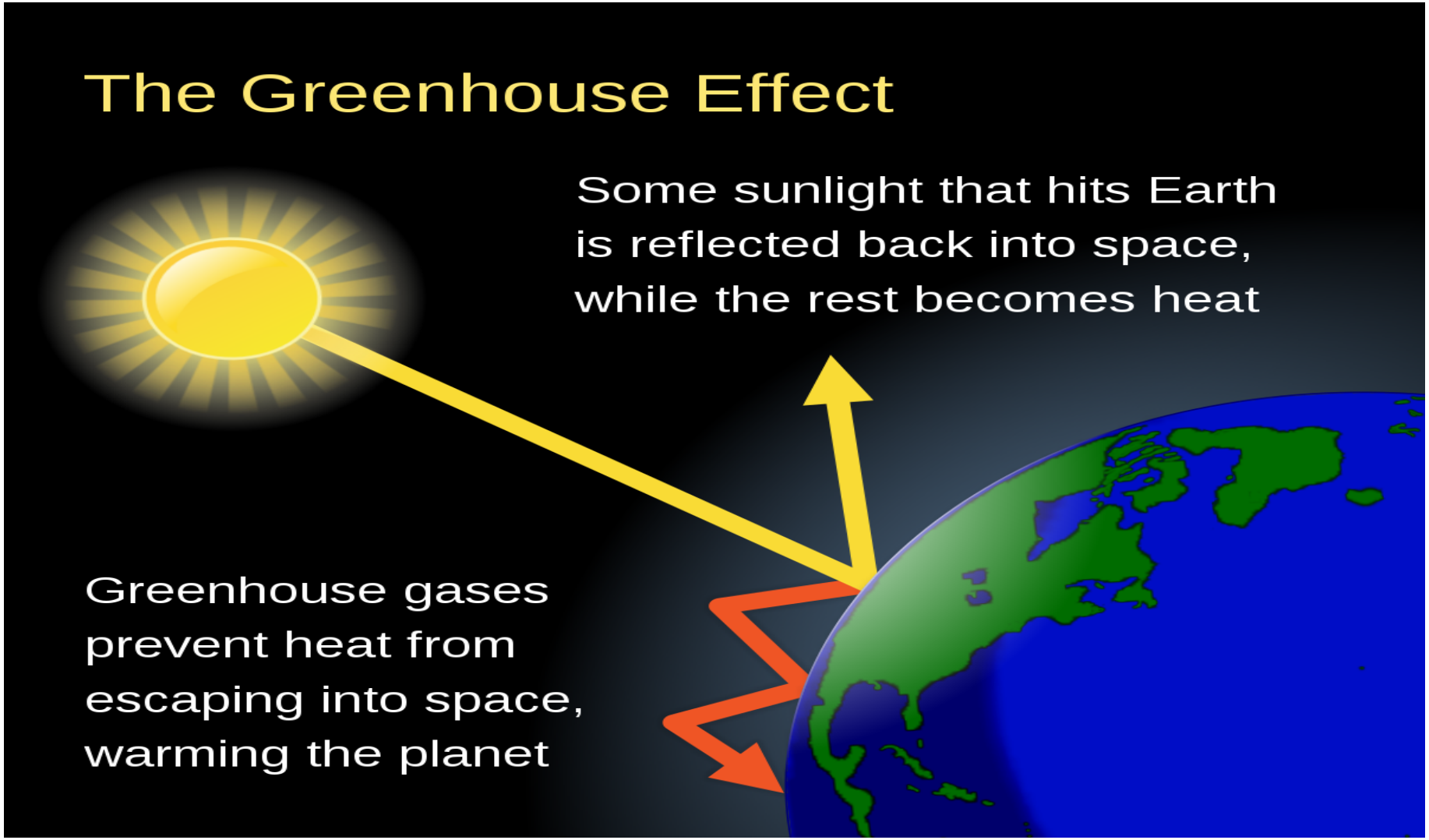
What is the Greenhouse Effect?



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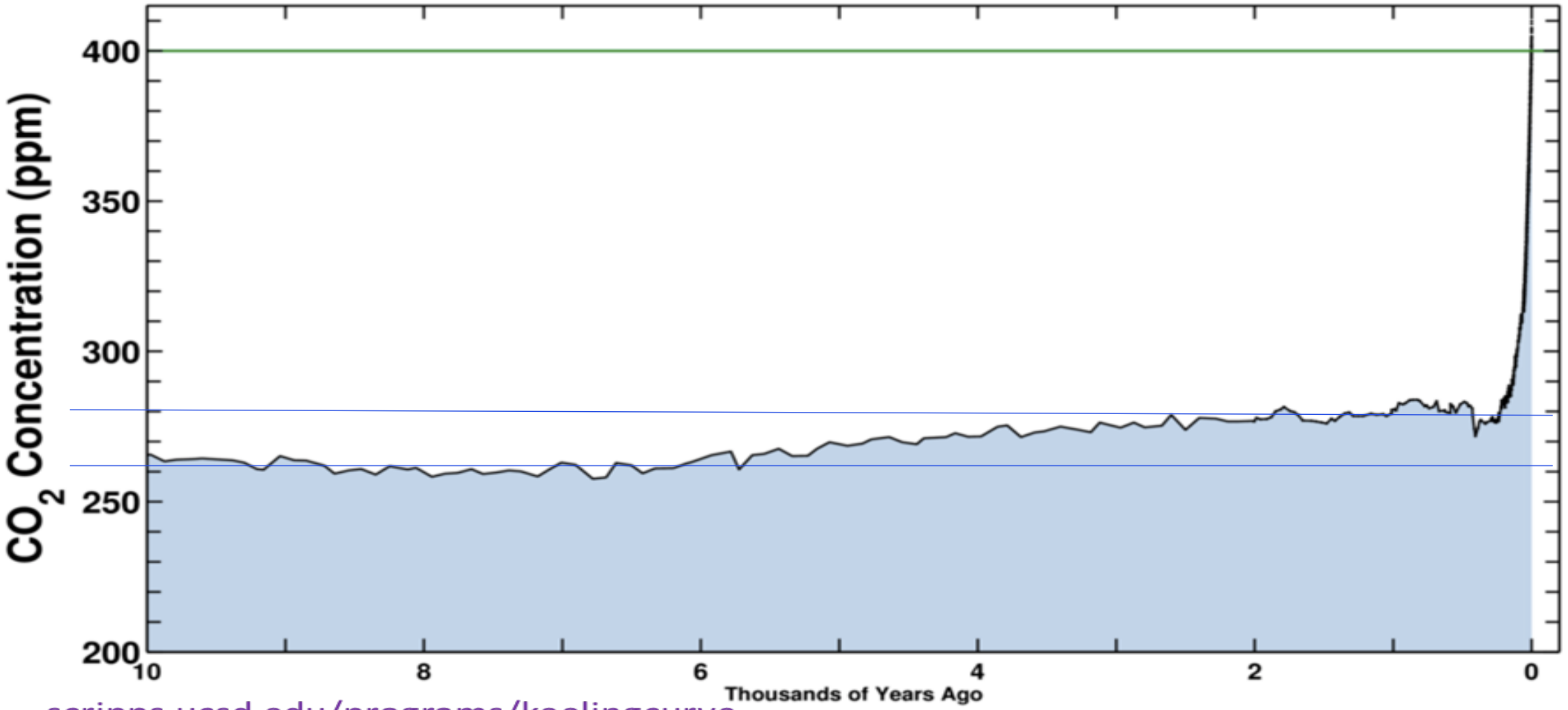
Atmospheric Concentrations of CO_2

Stable atmospheric conditions enabling life on earth



260 ppm to **280 ppm** range over last 10,000 years

scripps.ucsd.edu/programs/keelingcurve

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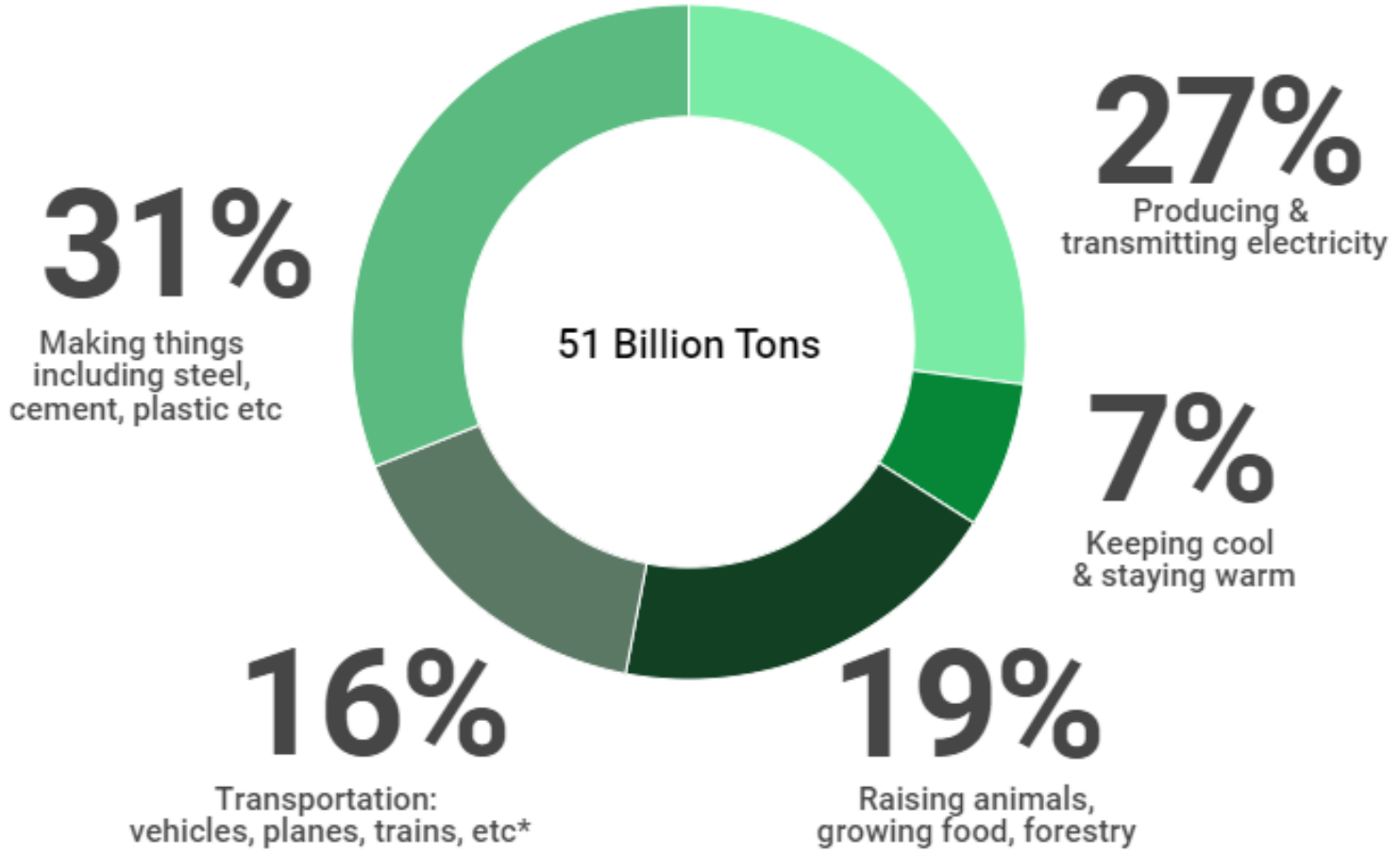
Annual Greenhouse Gas Emissions – Human Activity



*Transportation is the biggest source of emissions in the United States, Gates points out in his book. "We Americans fly and drive a lot."

Source: *How To Avoid A Climate Disaster*, by Bill Gates.

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Climate-related Risks and Opportunities

Physical Risks

- Chronic: Longer-term shifts in climate patterns
- Acute: Event-driven (e.g. wildfires, hurricanes, or floods)

Legal Risks

- Chronic: Failure to mitigate, adapt and/or disclose

Reputational Risks

- Chronic: Community perceptions of an organization

Transition Risks

- Policy: Adoption of laws and regulation such as implementation of carbon taxes
- Technology: Emergence of new technology (e.g. wind, solar) that may disrupt existing industries
- Consumer Preference: Changes in consumer preferences

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IPCC Climate scenarios

The **Intergovernmental Panel on Climate Change (IPCC)** is an intergovernmental body of the United Nations to advance scientific knowledge about climate change caused by human activities

Some definitions using IPCC terminology

Pathway: A representation of a scenario by a curve, called a pathway or trajectory, that traces the evolution of a metric over time, often complemented by a confidence interval

Radiative forcing: The difference between energy absorbed by the Earth and energy radiated back to space. It is a measure of the influence a factor has in altering the balance of incoming and outgoing energy in the Earth's atmosphere, and is an index of the importance of the factor as a potential climate-change mechanism

RCP: Representative Concentration Pathway, a greenhouse gas concentration trajectory adopted by the IPCC. The pathways describe different climate futures, depending on the volume of greenhouse gases being emitted. They are labelled after the possible range of radiative forcing values in the year 2100 (1.9, 2.6, 4.5, 6.0, 7.0 and 8.5 W/m^2)

RCPx: Representative Concentration Pathway leading to a radiative forcing value of x W/m^2

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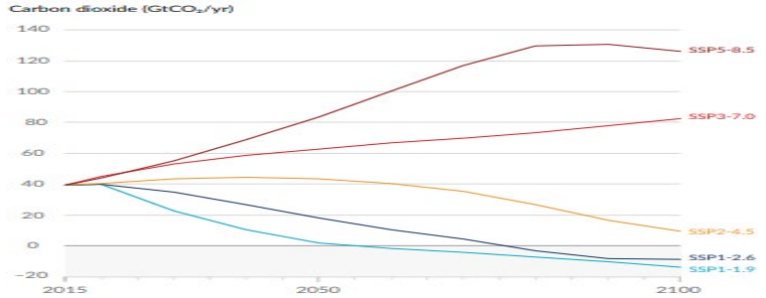
IPCC Climate scenarios

NDC (Nationally Determined Commitments) scenario: A scenario where emissions are such that they lead to a radiative forcing of 2.6 W/m2 by 2100 (Representative Concentration Pathway 2.6).

Net zero scenario: A scenario where net zero emissions are being reached by 2050 rather than 2100 and keep cumulative carbon dioxide concentration below 400 ppm.

Shared Socioeconomic Pathways (SSPs): pathways that examine how global society, demographics and economics might change until 2100. Each SSP has a “story line”; see SSP2_Overview.pdf (unece.org)

- SSP1: Sustainability
- SSP2: Middle of the Road (the Reference scenario)
- SSP3: Regional rivalry
- SSP4: Inequality
- SSP5: Fossil fuel development



SSPx-y: SSPx refers to the SSP describing the socio-economic trends underlying the scenario, and ‘y’ refers to the approximate level of radiative forcing (in watts per square metre, or Wm^2) resulting from the scenario in the year 2100

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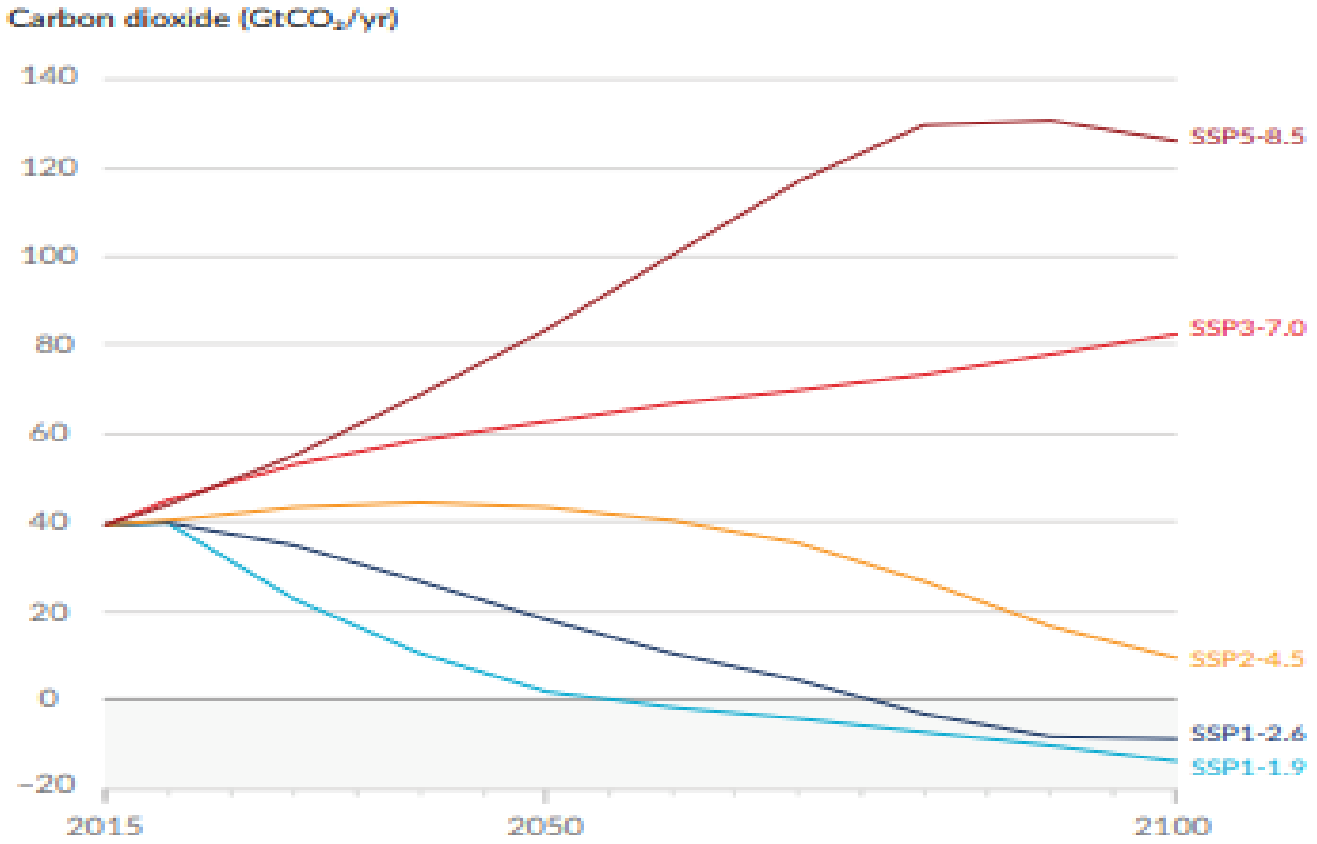
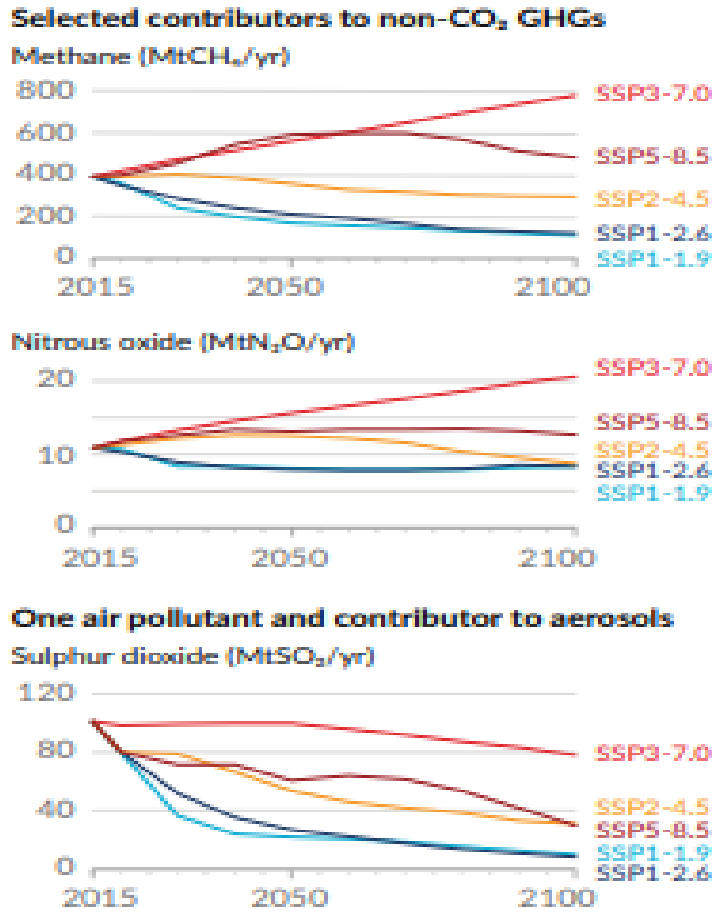
IPCC Climate scenarios

Future annual emissions of CO_2 (left) and of a subset of key non-CO_2 drivers (right), across five illustrative scenarios





Source: IPCC AR6 report August 2021 Summary for policymakers IPCC_AR6_WGI_SPM_final.pdf

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IPCC Global Emissions scenarios

Changes in global surface temperature for selected 20-year time periods for five illustrative emissions scenarios

	Projected global warming level (°C) at specific 20 year timeframe		
	Near term, 2021–2040	Mid-term, 2041–2060	Long term, 2081–2100
SSP1-1.9: sustainability, RCP 1.9 W/m^2	1.5 (1.2-1.7)	1.6 (1.2-2.0)	1.4 (1.0-1.8)
SSP1-2.6: sustainability, RCP 2.6 W/m^2	1.5 (1.2-1.8)	1.7 (1.3-2.2)	1.8 (1.3-2.4)
SSP2-4.5: Middle of the Road, RCP 1.9 W/m^2	1.5 (1.2-1.8)	2.0 (1.6-2.5)	2.7 (2.1-3.5)
SSP3-7.0: Regional rivalry, RCP 7.0 W/m^2	1.5 (1.2-1.8)	2.1 (1.7-2.6)	3.6 (2.8-4.6)
SSP5-8.5: Fossil fuel development, RCP 8.5 W/m^2	1.6 (1.3-1.9)	2.4 (1.9-3.0)	4.4 (3.3-5.7)

Source: IPCC AR6 report August 2021 Summary for policymakers IPCC_AR6_WGI_SPM_final.pdf

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The role of the actuary in climate scenario analysis

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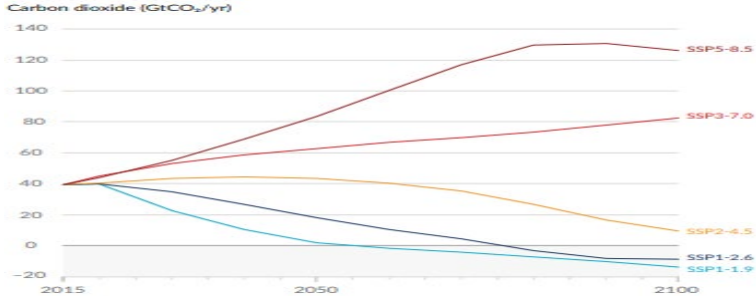
Climate scenarios



Pricing and valuation face challenges

- Valuation traditionally means a method of assigning a monetary value to a probability distribution where the value expresses somehow the “middle” of the probability distribution such as
  - The value with the highest probability;
  - The median; or
  - The expected value (probability weighted average).
- Unfortunately, **we do not know or have a reliable estimate of the probability distribution of risks stemming from climate change** (random variables)
- The best available approach at the moment is that we **define certain scenarios** and under each we can estimate the outcome of climate-related risks
- However, we, at the moment (and it may be an eternal lack of knowledge) cannot estimate reliably the probability that a scenario will occur
- Therefore traditional valuation (and to some extent pricing) is a challenging task
  - E.g. the approach to be taken by IFRS 17 is far from being straightforward due to the challenge to determine the current estimate

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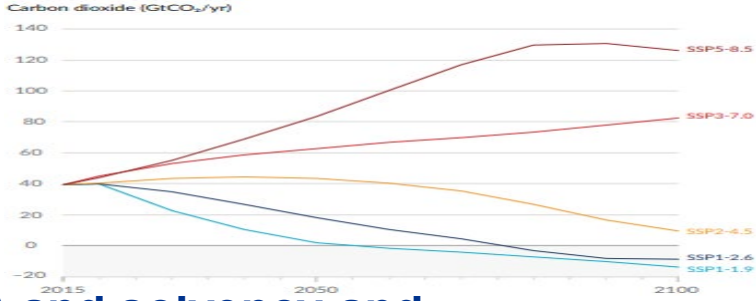
Using climate scenarios



Using climate scenarios in own risk and solvency assessment (ORSA) and solvency and financial condition reports (SFCRs)

(see https://www.actuaries.asn.au/Library/Standards/MultiPractice/2020/INCCFinal121120.pdf)

- Scenario analysis may be an adequate tool for capital management for the ORSA and the SFCR report
- One way of considering scenarios to capture the risks stemming from climate change is to **start with considering the IPCC SSPs**
- Each scenario examined, considering that there is a trade-off between physical risk and transition risk (both affecting assets and liabilities as well) would include issues relating to
  - The macroeconomic / financial environment
  - Policyholder behavior (including new business and lapses)
  - Asset values
  - Frequencies and severities of claims
  - Risk mitigation (reinsurance) arrangement
  - And the relevant physical, transition, legal and reputational risks of acute and chronic nature specific to the scenario on various (short, medium, long term) time frames

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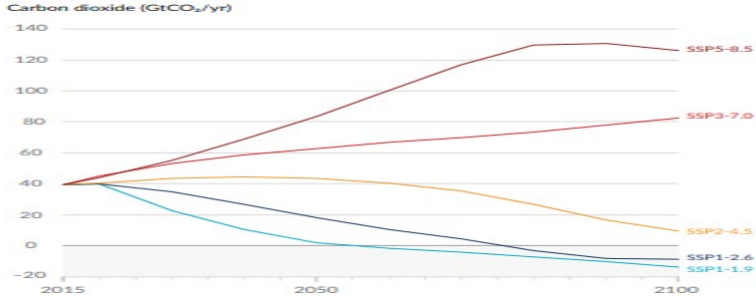
Using climate scenarios



- While the **SSPs are global, their application would be local**
- How to bridge the gap?
- One way could be to **consider the differences** between the SSP and the local experiences of the recent past then project the relevant local variables consistently with that SSP
  - **Professional judgment should be applied** how this projection is designed
  - A mechanical projection would probably not be appropriate
  - Use any reliable local scientific observations
- The new Solvency II ORSA would require to investigate at least two long-term climate change scenarios for the ORSA (provided the exposure to climate change risks is material):
  - One where the global temperature increase (to pre-industrial average) remains below 2°C
  - One where the global temperature increase (to pre-industrial average) exceeds 2°C
- What's perhaps the most important for the actuary is to report transparently to their intended users about the scenarios considered and all key assumptions applied

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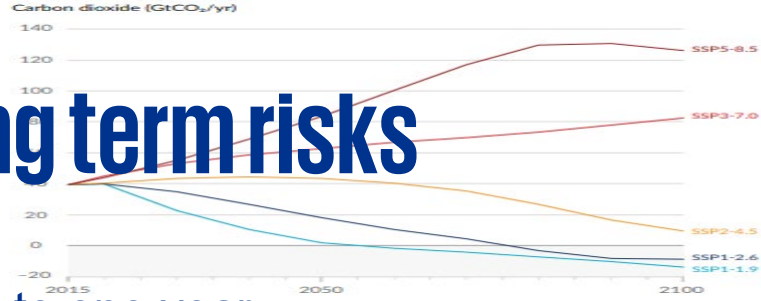
Using climate scenarios to bridge short and long term risks



- In many lines of business, the coverage period of the contracts is limited to one year
- Due to the short coverage period and to the fact that climate change will exert its impact on a longer period of time, **some believe that climate change does not imply pricing risk** as contracts can easily be repriced at the next policy anniversary
- While technically it is true, this attitude could easily lead to **unintended consequences** such as
  - If a significant part of the market sticks to this policy, others may be forced to do the same
  - Annual premiums may need to **jump super high** at some point in time to make up for the accumulated additional risk
  - That may impact policyholder behavior and trigger regulatory and reputational risks (individually and for the whole market)
  - Eventually it may lead to **protection gap** and loss of risk transfer for the whole market
- Therefore a **price strategy should be developed** and observed

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The role of the actuary in climate related reporting

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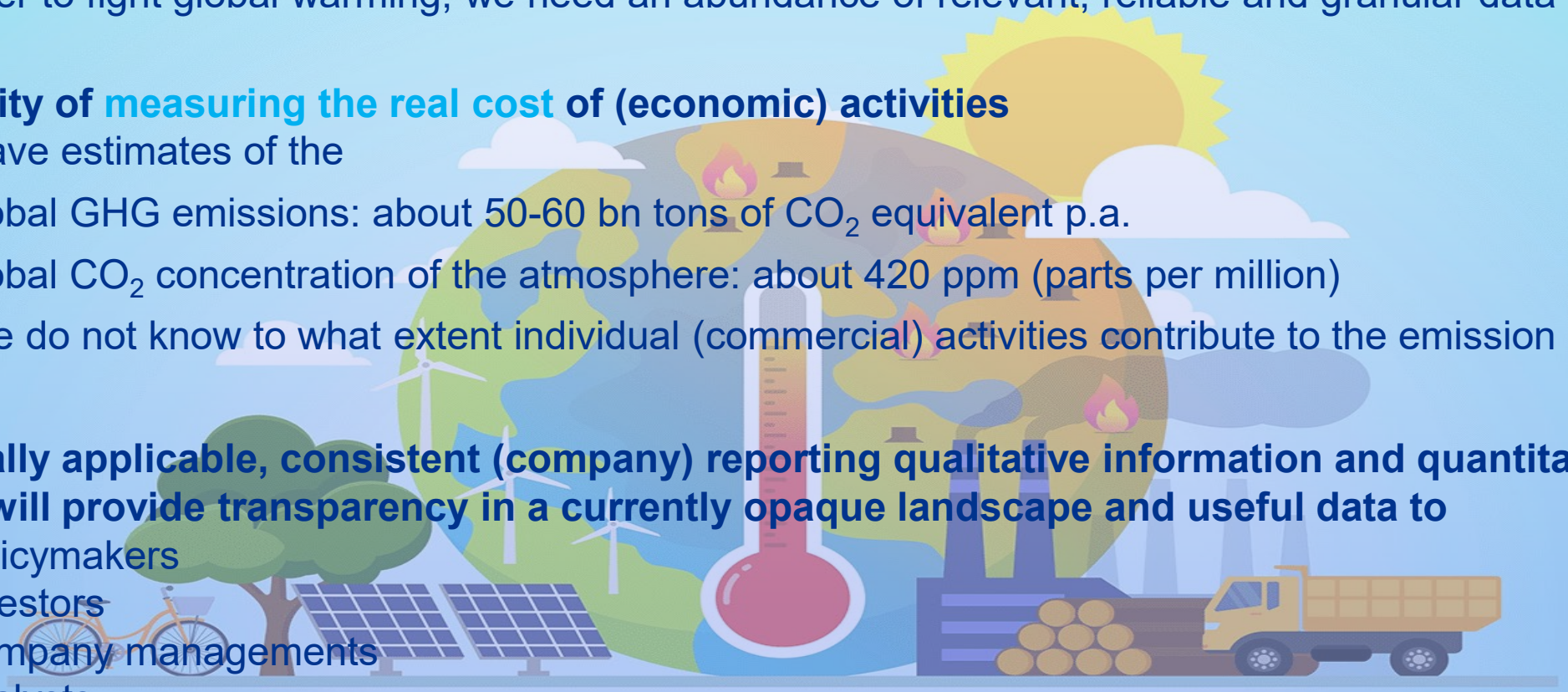
Why is climate reporting important?

Shortage of relevant, reliable and granular data
In order to fight global warming, we need an abundance of relevant, reliable and granular data

Inability of measuring the real cost of (economic) activities
We have estimates of the

- Global GHG emissions: about 50-60 bn tons of CO_2 equivalent p.a.
- Global CO_2 concentration of the atmosphere: about 420 ppm (parts per million)

But we do not know to what extent individual (commercial) activities contribute to the emission



Globally applicable, consistent (company) reporting qualitative information and quantitative data will provide transparency in a currently opaque landscape and useful data to

- Policymakers
- Investors
- Company managements
- Analysts

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Why is climate reporting important?

The Task Force on Climate-related Financial Disclosures (TCFD) recommended climate reporting structured using four main pillars

- Governance
- Strategy
- Risk management
- Metrics and targets

The TCFD recommendations form the principal foundation of concrete reporting frameworks

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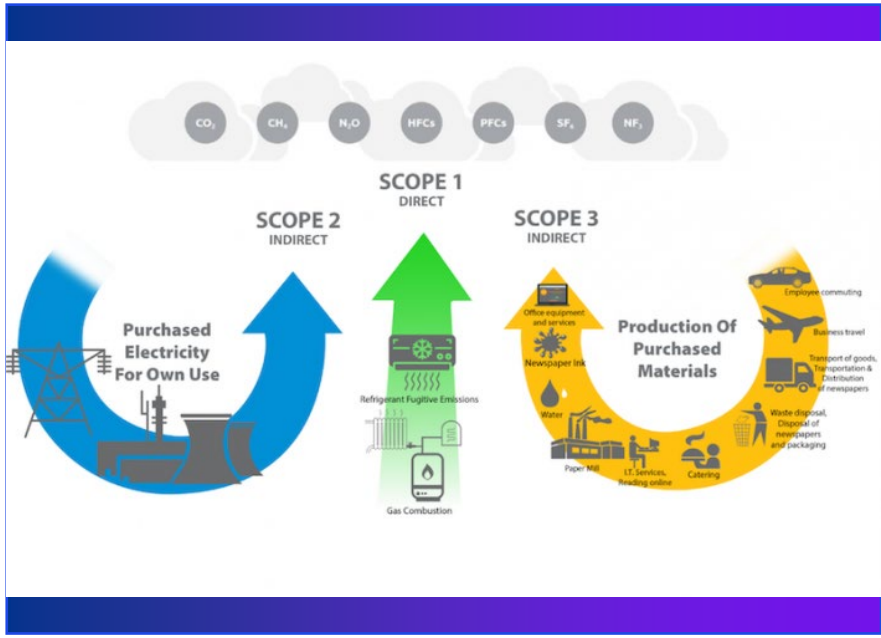
How can actuaries contribute to climate reporting?

Example of Aviva (UK) (see https://www.actuaries.org/IAA/Documents/Publications/Papers/CRTF_Paper5_Final_October2022.pdf)

- It publishes a **comprehensive climate report** structured along the four TCFD pillars, which details how it integrates climate considerations throughout the decision-making, risk appetite, strategy and ERM framework for its businesses
- It set **net zero targets** for all scopes(*) of emissions as early as 2040, with interim targets for carbon emission reductions by 2025 and 2030 alongside longer-term objectives
- As part of its work scenario analysis, Aviva calculates a **Climate VaR**(**) for each of the four scenarios it analyses, reflecting the effect of different emission projections and associated temperature pathways on both the insurance liabilities and investment returns



See https://www.actuaries.org/IAA/Documents/Publications/Papers/CRTF_Glossary.pdf

(*) Scope 1 emissions: direct emissions from company-owned and company-controlled resources. In other words, emissions released to the atmosphere as a direct result of a set of activities, at a firm level.
Scope 2 emissions: indirect emissions from the generation of purchased energy from a utility provider. In other words, all greenhouse gas emissions released in the atmosphere from the consumption of purchased electricity, steam, heat, and cooling.
Scope 3 emissions: a consequence of the activities of a company, but occurring from sources not owned or controlled by the company. Some examples of Scope 3 activities are extraction and production of purchased materials, transportation of purchased fuels and use of sold products and services, financing, investments, and insurance of emissions-intensive activity.
(**) Climate Value-at-Risk (Climate VaR): 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.

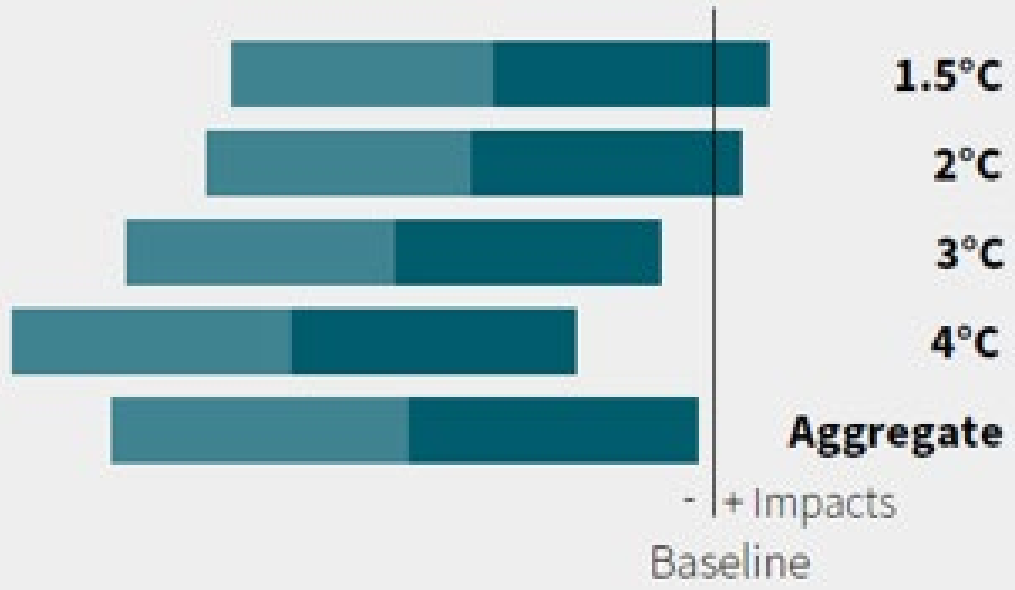
How can actuaries contribute to climate reporting?

Example of Aviva (UK) (See: https://www.actuaries.org/IAA/Documents/Publications/Papers/CRTF_Paper5_Final_October2022.pdf)

It clearly **describes the assumptions** that drive the modelling, with a detailed appendix on its methodology. The use of a multi-disciplinary team of internal and external experts to select, develop and model financial impacts stands out, **highlighting the need for actuaries to work with other professions and experts** to evolve and improve approaches in rapidly developing areas like climate

- Auditor's assurance is provided

Aviva's Climate VaR Output by Scenario for Shareholder Funds as at 31 December 2021



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How can actuaries contribute to climate reporting?

Pieces of information with special actuarial nature required to disclose under IFRS S2 *Climate-related Disclosures* issued by the International Sustainability Standards Board

- Users of the disclosure should understand the
  - Entity's climate-related risks and opportunities; 9(a)
  - Effects of those climate-related risks and opportunities on the entity's financial position, financial performance and cash flows for various time horizons; 9(d), 15-16
  - Resilience of the entity's strategy and business model to climate-related changes, developments and uncertainties using climate-related scenario analysis and the entity should disclose useful information about the scenarios and the key assumptions applied; 22
- An entity shall disclose information about
  - The processes and related policies the entity uses to identify, assess, prioritise and monitor climate-related risks, including the inputs and parameters the entity uses, **how the entity assesses and monitors the nature, likelihood and magnitude of climate related risks**, how these risks are prioritized; 25

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How can actuaries contribute to climate reporting?

Pieces of information with special actuarial nature required to disclose under IFRS S2 *Climate-related Disclosures* issued by the ISSB

- An entity shall disclose information about
  - Scope 1, 2 and 3 emissions in CO_2 equivalent and the approach it uses to measure; 29
  - Climate-related physical and transition risks of its assets and the supporting capital; 29
  - Quantitative and qualitative climate-related targets and the monitoring of their progress; 33-37

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How can actuaries contribute to climate reporting?

Pieces of information with special actuarial nature required to disclose by insurers under IFRS S2 *Climate-related Disclosures* issued by the ISSB

- **Probable Maximum Loss** (PML) of insured products from weather related natural catastrophes broken down by type of event; geographical segment; gross and net of reinsurance
  - Using, at a minimum, three likelihood of exceedance scenarios: (1) 1-in-50y; (2) 1-in-100y; (3) 1-in-250y
  - Describe climate-related scenarios used, including the critical input parameters, assumptions and considerations, analytical choices, and time frames, in calculation of the PML
- Total amount of monetary losses attributable to insurance pay-outs from modelled and non-modelled natural catastrophes, broken down by type of event; geographical segment; gross and net of reinsurance
- Description of approach to incorporation of environmental risks into (1) the underwriting process for individual contracts and (2) the management of entity-level risks and capital adequacy

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New climate related QRT for Solvency II reporting

S.06.04 – Climate change-related risks to investments

- This template contains information on the **share of investments exposed to climate change-related transition and physical risk**
- **On transition risk**: Proportion of the Solvency II value of investments exposed to transition risk, in relation to total of investments. **Undertakings may use their own methodology to compute the KPI**. The identification of investments exposed to transition risk shall be consistent with the classification made and reported through the four-digit level NACE codes for NACE sections A to N, as prescribed in S.06.02.
- **On physical risk**: Proportion of the Solvency II value of property exposed to physical risk, in relation to total of property. **Undertakings can use their own methodology to compute the KPI**. The identification of properties exposed to physical risk should be consistent with the identification made, in C0190 Item Title in S.06.02.

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Thank you for your attention

Any questions, comments?

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