MILLIMAN REPORT

Climate risk management for life insurers

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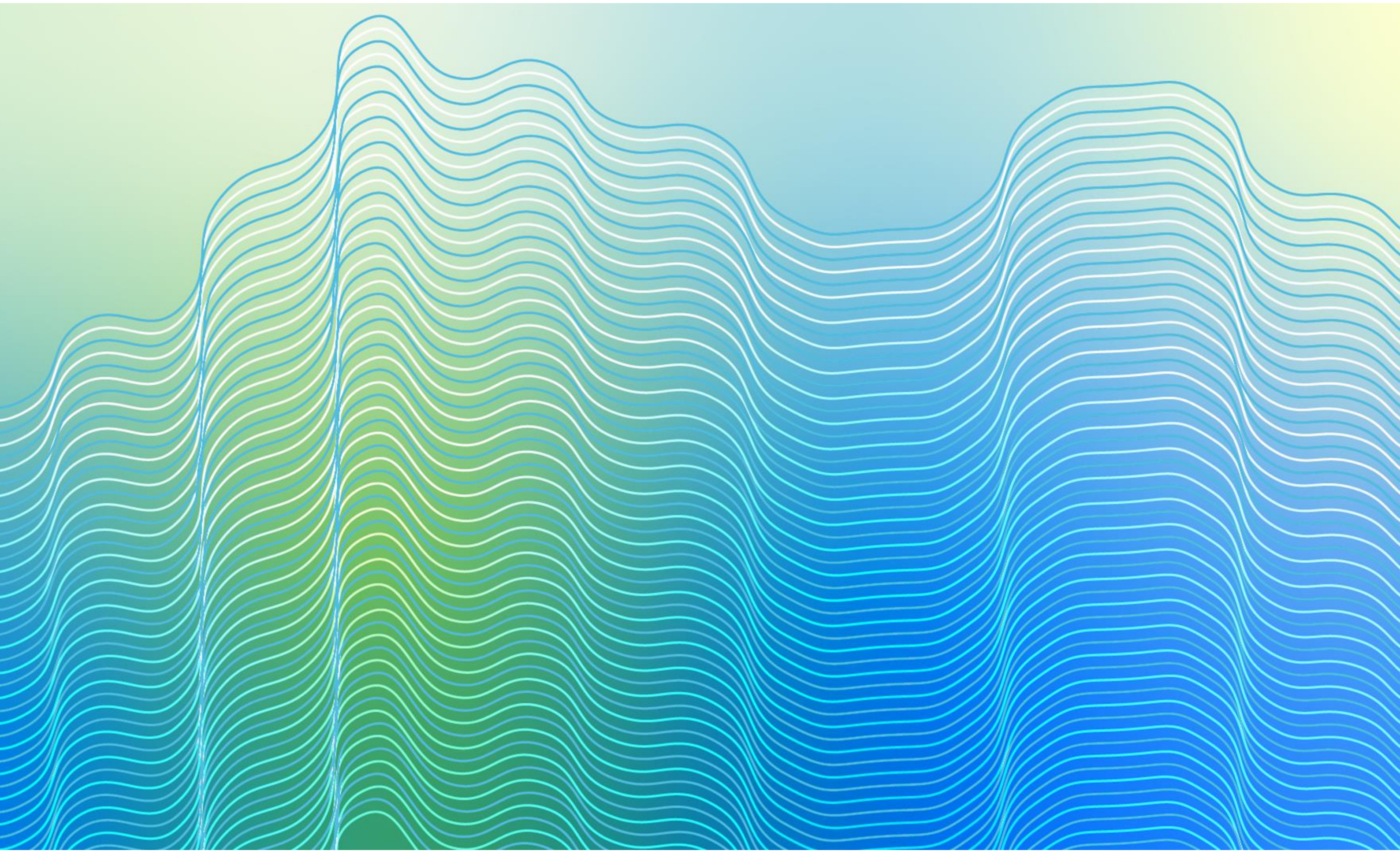

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Section 1: Introduction

OVERVIEW

Climate change risk is increasingly seen as a hot topic within the insurance industry and with regulators. A number of financial regulators have recently become more vocal on the subject, with some emphasising that the financial system has a key role to play in the transition to a low-carbon economy.

This research paper focuses on the climate-related risks faced by life (re)insurers, as well as the corresponding risk management process. Case studies have been included at each stage of the risk management process relating to various projects the authors have been involved in or seen.

This paper is part of a series of two climate risk papers for life (re)insurers, with the second paper exploring possible solutions and opportunities available to insurers when it comes to climate risk.

WHAT IS CLIMATE-RELATED RISK?

Climate-related risks consist of two[1] different categories of risks; physical risks and transition risks. The differences between these risks are summarised in Figure 1.

FIGURE 1: CLIMATE RISK DEFINITIONS

RISK	DEFINITION
Physical Risk	▪ Physical risks are risks associated with the direct impact of climate change. Physical risks can be divided into two further categories, acute and chronic. ▪ Acute physical risks are event-driven, including increased severity of extreme weather events such as cyclones, hurricanes, or floods. ▪ Chronic physical risks arise from longer-term shifts in climate patterns, e.g., sustained higher temperatures that may cause rising sea levels or heatwaves.
Transition Risk	Transition risks arise from the transition to a low-carbon, greener economy. This transition could result in large changes in value of certain assets or higher costs of doing business. Regulation and reputation risks can also arise as a result of this transition.

In general, we would expect transition risks to be greater if action is taken over the short to medium term to combat climate change, resulting in lower potential physical risks in future. However, if sufficient action is not taken, there may be less transition risk and greater expected physical risk in future. In this way, physical risk and transition risk are generally considered to be inversely related. An exception to this is in a scenario where there is a delayed disorderly transition, resulting in both high transition risk and high physical risk as the transition is too late to reduce the physical risks associated with climate change.

WHY IS CLIMATE-RELATED RISK DIFFERENT?

Climate-related risks differ from traditional insurance risks in the following ways:

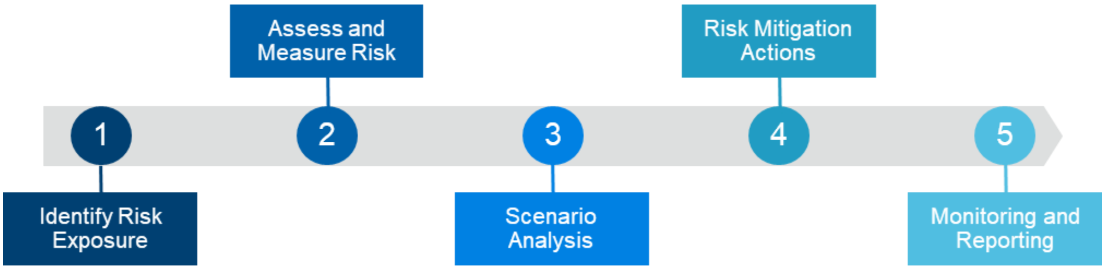
- **Historical data is rarely relevant:** Metrics must be forward-looking in order to capture the evolving nature of climate-related risks.
- **There is a high level of uncertainty associated with probability and impact:** There are many potential future economic outcomes. Future development could be driven by political decisions, which can be difficult to predict.
- **Climate risk is an emerging risk:** Best practice is developing. Risk exposure and risk tolerance may not line up initially and it may take some time to reduce climate risk exposure.
- **Time horizons matter:** For climate-related risks we need to look over longer time horizons to reflect their long-term nature. However, there is also the possibility of fast reactionary changes as the political landscape and consumer sentiment can change suddenly.

[1] Sometimes "liability" risk is considered as a third risk category. However, liability risk has increasingly been considered as an element within physical and transition risk rather than considered separately. We have treated it as such in our research.

THE CLIMATE RISK MANAGEMENT PROCESS

The risk management process for climate risks is the exact same as the process used for any typical insurance risk and is outlined in Figure 2.

FIGURE 2: RISK MANAGEMENT PROCESS



The process involves identifying any risk exposures and then assessing and measuring their associated potential impact. Scenario analysis may then be utilised to consider the potential pathways through which these risks could evolve over time. Climate risk exposures should then be compared to the risk appetite and risk tolerances of the company and, where required, any possible risk mitigating actions should be taken. The final step in the process is monitoring and reporting. Risk exposures should continue to be monitored over time and climate risk key risk indicators (KRIs) should be included in risk reporting depending on identified risk exposures.

The following sections of the report will consider each step of the process in detail, including case studies relating to client projects to illustrate how each step may be applied.

Section 2: Identify risk exposures

TRANSITION RISK

As a recap, transition risk refers to the uncertainty introduced as the world shifts from a higher to a lower level of the carbon-intensive economy.

Insurers are facing more pressure to respond to the potential financial impacts of climate change from governments and regulators. An example from the UK is the Prudential Regulation Authority's Supervisory Statement 3/19 (SS3/19) titled "Enhancing banks' and insurers' approaches to managing the financial risks from climate change."[2] From this directive, UK insurers must have embedded climate change considerations into their risk and governance frameworks, incorporated climate change into their scenario analysis and included climate change considerations within their public disclosures by December 2021. Other regulators across Europe are also mandating climate risk assessments and the European Insurance and Occupational Pensions Authority (EIOPA) recently published its opinion on climate risk scenarios in the Own Risk and Solvency Assessment (ORSA).[3] The European Commission is also proposing that companies integrate sustainability risks into their risk management systems and ORSAs.[4]

In addition, investors are also driving an increased focus on climate change as they seek to understand how dependent insurance companies, and other investments, are on fossil fuels and how resilient their business models are to the effects of climate change.

Many of the largest insurance groups are already considering the impact of climate risk on their balance sheets and are committed to taking action against climate change. For example, the UN-convened Net-Zero Insurance Alliance (NZIA) brings together eight of the world's leading insurers and reinsurers to play their part in accelerating the transition to net zero emissions economies. They are committing to individually transition their underwriting portfolios to net zero greenhouse gas (GHG) emissions by 2050, consistent with a maximum temperature rise of 1.5°C above preindustrial levels by 2100.

[2] PRA. Supervisory Statement | SS3/19: Enhancing banks' and insurers' approaches to managing the financial risks from climate change.

[3] EIOPA (19 April 2021). Opinion on the supervision of the use of climate change risk scenarios in ORSA. Retrieved 29 October 2021 from https://www.eiopa.europa.eu/sites/default/files/publications/opinions/opinion-on-climate-change-risk-scenarios-in-orsa.pdf.

[4] European Commission (21 April 2021). Sustainable finance – obligation for insurance firms & brokers to advise clients on social & environmental aspects. Retrieved 29 October 2021 from https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/11962-Sustainable-finance-obligation-for-insurance-firms-&-brokers-to-advise-clients-on-social-&-environmental-aspects_en.

One of the main areas of focus is on risks that can arise as the world transitions away from carbon-intensive economic activities. Therefore, to identify transition risks exposure, it is important to identify the drivers of the transition to a low-carbon economy. These drivers are summarised in Figure 3.

FIGURE 3: TRANSITION RISK DRIVERS

TRANSITION RISK DRIVER	EXAMPLE
Policy and regulation	An example could be the introduction of carbon pricing mechanisms that increase the price of carbon-intensive ventures in order to encourage the transition to a low-carbon economy.
Technology	The rate at which the world transitions towards more climate-friendly economic activities such as the shift towards renewable energy (e.g., wind, solar and geothermal energy), is directly proportional to technological improvements aimed at sustainability and, crucially, the cost of this technology. If the greener option is costly or difficult to implement, then there is little incentive for companies to use it, unless there is significant pressure from customers and policyholders.
Shifting sentiment and societal preferences	This could involve consumers changing their preferences towards products and services that are less carbon-intensive. This could occur gradually, such as how the sentiment against air travel has steadily been growing, or it could be driven by a severe climate-related event such as extreme and unexpected flooding.
Legal interpretations	The legal precedents set by litigation cases against economic activities with adverse impacts on the climate could lead to a sudden shift away from these activities. An example is the recent ruling where Royal Dutch Shell was ordered to reduce its CO2 emissions by 45% by 2030 compared to 2019 levels across the Shell group, as well as the suppliers and customers of the group.[5]
Reputation	Organisations deemed by stakeholders to have high levels of carbon exposure could see a decline in their ability to maintain or attract investors or customers.

Following from the above, it is important for insurers to understand how the drivers of transition risk interact with the main types of risks that they face. Whilst climate risk could be considered as a standalone risk type, given its potential wide-ranging impacts, it is much more typical and in line with best practice to look at how climate risk interacts with each of the traditional risk categories considered by insurers, sometimes referred to as "prudential risks," such as market risk, underwriting risk, counterparty default risk, operational risk, reputational risk and strategic risk.

There are numerous ways in which the various transition risk drivers could impact the main types of risks faced by insurers. Some examples of these relationships, which are based on examples provided by EIOPA in its opinion on climate risk scenarios in the ORSA, are provided below. These examples can be used to identify risk exposures initially, and also for scenario analysis. In Section 4 of this paper below, we present additional components which may be considered by insurers when identifying and developing climate risk scenarios.

[5] Insurance Journal: Shell Climate Case.

FIGURE 4: MAPPING OF TRANSITION RISKS TO INSURANCE RISKS

Transition risk driver	Example	Insurance risk
Policy and regulation	Implementation of carbon taxes would adversely affect the value of carbon intensive assets.	Market risk
Technology	Advances in clean energy technology result in losses on private loans to companies dependent on carbon-based power generation.	Counterparty risk
Shifting sentiment and societal preferences	Shifting customer sentiment could diminish demand for an insurer's products and services if the insurer does not adequately take sustainability factors into account.	Strategic / Reputational risk
Legal interpretations	Reinsurer faces claims for not considering the impact of its underwriting decisions on climate change, resulting in a lower credit rating and increased exposure to reinsurance losses.	Counterparty risk
Reputation	Investments in carbon-intensive industries results in reputational damage, making it difficult to attract and retain customers and staff.	Operational / reputational risk

Different insurers will face the risks above in varying degrees and therefore it is important that each insurer goes through a risk identification process. The risk exposure will differ based on insurers' assets and liabilities, target market, operating model and climate action policies. The risk identification process should rely on unbiased sources and utilise the input from key stakeholders. In Case Study 1, below, we set out the key steps that can be used in the risk identification process.

PHYSICAL RISK

Recapping, physical risks are risks associated with the direct impact of climate change—there can be acute and chronic physical risks.

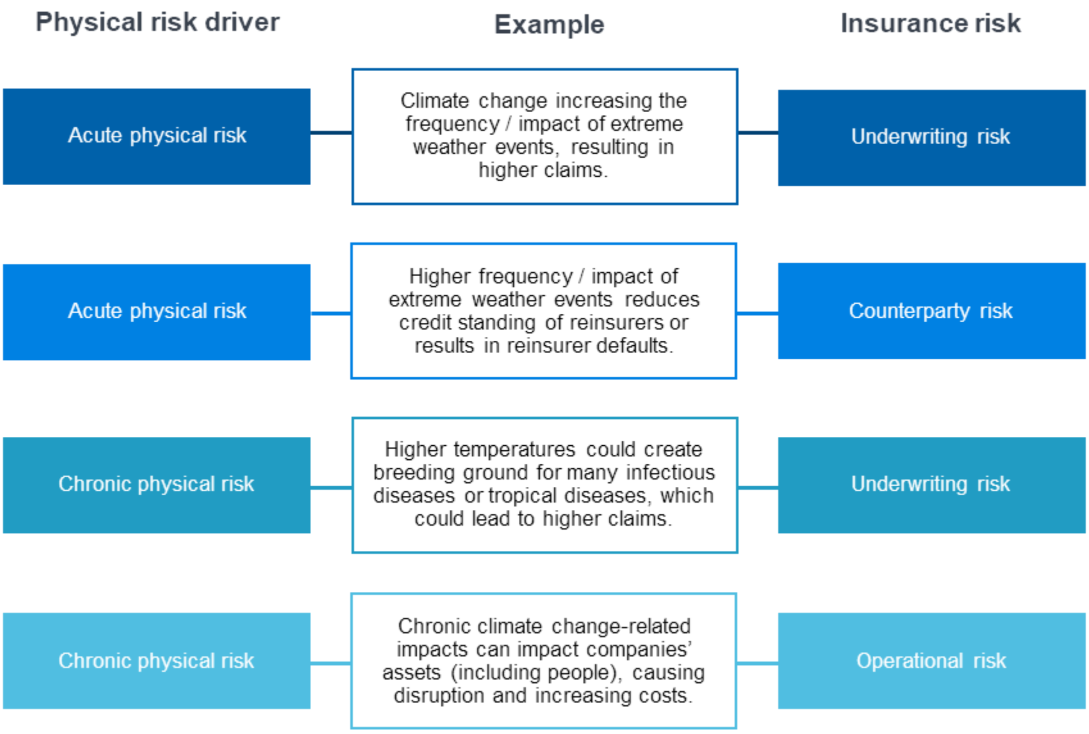
Similar to transition risk above, it is important to identify the drivers of physical risk exposures. In the case of physical risk, there are two categories of risk drivers corresponding to the two categories of physical risks. Acute physical risks are event-driven such as extreme weather events, whereas chronic physical risks arise as a result of longer-term climate changes such as rising sea levels. These risk drivers have been summarised in Figure 5.

FIGURE 5: PHYSICAL RISK DRIVERS

PHYSICAL RISK DRIVER	EXAMPLE
Acute physical risks	Weather-related events such as hurricanes, floods, storms, cyclones, fires or heatwaves.
Chronic physical risks	Long-term shifts in climate patterns such as sustained high temperatures, chronic heatwaves, rising sea levels, reduced water availability and biodiversity loss.

Insurers should also consider how physical climate risks relate to the prudential insurance risks. Outlined in Figure 6 are some examples of these relationships, based again on examples provided by EIOPA in its opinion on climate risk scenarios in the ORSA.

FIGURE 6: MAPPING OF PHYSICAL RISKS TO INSURANCE RISKS



As discussed in the transition risk section above, it is important for insurers to go through a risk identification process to identify their material risk exposures. Case Study 1 below outlines the risk identification process in detail.

CASE STUDY 1: IDENTIFYING CLIMATE-RELATED FINANCIAL RISKS FOR AN INVESTMENT PORTFOLIO

Milliman developed a framework to provide a client with a structured way of identifying the financial risks arising from climate change on its investment portfolio. During a workshop process, conversations with key individuals from the firm were structured with the following steps:

1. **Identify key asset classes**

   This involved identifying the various asset types held, and subdividing these asset types into sufficiently granular classes so that each has homogeneous risk factors, including categorising assets by type as well as sector.

2. **Create a climate risk matrix**

   This involved listing the various climate risk drivers and combining them with the asset classes identified to create a climate risk matrix. The climate risk drivers included a granular breakdown of the types of transition and physical risk drivers listed above in Figures 5 and 7, respectively, as well as macroeconomic factors such as price volatility, inflation and unemployment.

3. **Identify climate risk drivers for each of the key asset classes**

   Brainstorming sessions were held with key stakeholders in order to describe how each climate risk driver could impact each asset class, which enabled populating the climate risk matrix. A proportionate approach was used at this stage, with a more thorough approach being taken for asset classes where there is the greatest potential for climate risk to significantly impact capital or liquidity, or to impact Environmental, Social and Governance (ESG) targets.

4. **Mapping of climate risk drivers to risk register**

   For each asset class, the client maintained a risk register of the types of risk to which the asset class is exposed. The next step was therefore to map each identified climate risk driver for a given asset class to a risk category within the risk register, e.g., regulatory risk or financial risk.

The output of this process provided our client with an updated risk register which incorporates climate risk drivers for each asset class. This allowed the client to take a more structured approach to assessing the climate risk associated with its current investment portfolio, to begin embedding the identified climate risk drivers into its existing risk appetite statements and risk policies and to incorporate the assessment approach into asset origination procedures. Once the climate risk drivers for each asset class have been identified, a next step for insurers is to determine which climate risk drivers should be measured and monitored on a regular basis according to materiality, and what data will be required to support these measurements.

Section 3: Assess and measure risk

OVERVIEW

In the next step of a risk management process, *risk assessment*, the exposure to climate-related risk is evaluated. Companies must assess the scale of potential climate change risk exposures and the likelihood of the risk happening. Companies will need to do this for all material risk exposures identified.

Assessing and measuring climate-related risk exposures is an evolving science, and some companies may consider it to be a daunting task. However, this is an important part of the risk management process, and it will be difficult to meet regulatory requirements in respect of climate risk scenario analysis without assessing the potential risk exposure. It is important to remember also that regulators expect that climate risk assessments will evolve and mature over time. We expect that many insurers will take a best-efforts approach initially, in particular where data is unavailable.

The Task Force on Climate-Related Financial Disclosures (TCFD) published a report[6] in 2017 on recommendations for climate-related financial disclosures, and many global organisations, including insurers, have signed up to support the TCFD. The Annex to the TCFD report[7] suggests some specific carbon-related metrics that can be used to assess carbon exposure to an asset portfolio, which can be used as a measure for transition risk exposure in respect of the investment portfolio. In July 2021, the TCFD published a consultation paper on proposed guidance on climate-related metrics, targets and transition plans[8] which provided further details on how companies could use risk metrics to assess and measure climate-related risk. For example, from a strategic perspective, the consultation paper suggests measuring the proportion of assets or financing activities aligned towards climate opportunities, to assess whether the company is aligning activity towards strategic priorities in relation to climate-related opportunities.

Firstly, we will look at the assessment of transition risks, with Case Study 3 covering the assessment of physical risks later in the paper. For life insurance companies, as large institutional investors, a key transition risk relates to the potential change in the value of assets as a result of climate-related risks (or opportunities). The potential financial impact of this risk includes changes in the value of assets based on carbon emissions, changes in asset values based on carbon price and/or demand, write-offs or disinvestment of existing assets due to high emissions. In a worst-case scenario, the assets could become stranded and therefore have little or no value. In addition to carbon emissions, other factors could also impact asset values such as policy changes or changes in consumer sentiment. Energy and water intensity can also be considered in addition to carbon emissions (for example energy efficiency might impact property values). However, we suggest considering carbon emissions initially. Assets are also exposed to physical risks. Property values, for example, may fall in value due to weather events.

In order to assess the risk exposure of an asset portfolio, insurers will need to understand the current and future carbon emissions of the assets they invest in. In order to do this a company would need to carry out a look-though of its assets and gather data on the carbon emissions of the companies it invests in within its bond and equity portfolio. A weighted average could then be calculated based on the value of the assets in the portfolio. After carrying out this work, insurers may want to examine how the carbon emissions vary, across asset class, sector, geographical region. This would enable insurers to identify concentrations in exposures. It can be very difficult and time-intensive to do this without access to the correct data. The large insurance groups have collaborated and partnered with external providers in order to access this data. For example, Axa has partnered with Carbon Delta since 2018 to assess the impact of climate-related risks, disclosed in their 2019 and 2020 Climate Reports.[9]

[6] TCFD (June 2017). Final Report: Recommendations of the Task Force on Climate-related Financial Disclosures. Retrieved 29 October 2021 from https://assets.bbhub.io/company/sites/60/2020/10/FINAL-2017-TCFD-Report-11052018.pdf.

[7] TCFD Report Annex.

[8] TCFD (June 2021). Proposed Guidance on Climate-related Metrics, Targets, and Transition Plans. Retrieved 29 October 2021 from https://assets.bbhub.io/company/sites/60/2021/05/2021-TCFD-Metrics_Targets_Guidance.pdf.

[9] AXA (June 2019). 2019 Climate Report. Retrieved 29 October 2021 from https://www-axa-com.cdn.axa-contento-118412.eu/www-axa-com%2F667045c2-cc3c-4f65-a888-18753c463d9c_axa2019_ra_en_climate_report_2.pdf.

For smaller insurers, this may not be feasible, in particular if transition risk is not currently considered to be a material risk exposure. However, EIOPA and other local regulators expect companies to show evidence that climate risk exposures are not material and therefore some assessment will be required by insurers. We have considered a best-efforts approach for assessing the transition risk for a unit-linked company in Case Study 2.

CASE STUDY 2: ASSESSING EXPOSURES FOR A UNIT-LINKED PORTFOLIO WITH LIMITED ACCESS TO DATA

This case study considers a unit-linked life insurance company, with limited access to data on the potential carbon emissions of its assets. The company wants to assess the climate risk exposure within its unit-linked funds. While the policyholder is exposed to the investment risk on the unit-linked investments, the company is exposed to volatility in the best estimate liability on the Solvency II balance sheet, which includes the future profits associated with this business. The expected future profits on unit-linked business are inherently linked to the value of the underlying unit-linked assets through the deduction of fund management charges. If the fund values fall, the future expected profits of the company will also generally fall resulting in a decrease in Own Funds. However, under Solvency II, a fall in Own Funds for a pure unit-linked company will generally also result in a fall in the Solvency Capital Requirement (SCR) and therefore the impact on solvency coverage ratios may be limited. For this reason, many unit-linked companies believe that their exposure to transition risk within the unit-linked assets is not material from a solvency perspective.[10] However, regulators are now asking insurance companies to show evidence that climate risk exposures are not material.

The company's unit-linked investments are about €4,500 million split across 30 unit-linked funds (which in turn invest in equities, bonds, derivatives and collective investment funds, amongst other things). This creates a significant challenge in terms of looking through the unit-linked investments to understand the potential climate risk exposure of each individual equity or bond. However, since the implementation of Solvency II, asset managers have been providing detailed look-though information for the calculation of capital requirements and for disclosure purposes. We utilised the information in these files—known as Solvency II Tripartite Template (TPT) files—to assess the climate risk exposure for this client at a high level.

Within the TPT files, a Nomenclature of Economic Activities (NACE) code is assigned to each fund. The NACE code provides details of the industry in which the company invested in operates, in a standardised format. To assess climate-related risk exposure for this client, we developed a Python model to assign a climate risk indicator based on the NACE codes for each asset in the TPT files.[11] We focused on equity and corporate bond investments for this analysis to understand the transition risk associated with these exposures.

The University of Zurich "Climate Policy Relevant Sectors"[12] (CPRS) were used to assign a climate risk indicator to each investment by NACE code. The publicly available information on Climate Policy Relevant Sectors includes a list of NACE codes for industries whose revenues could be impacted either positively or negatively by a disorderly low-carbon transition. This includes sectors such as fossil fuel, utility and electricity, buildings, transportation, agriculture and other energy-intensive industries.

We classified investments as "CPRS" or "Not CPRS" depending on their NACE codes, with the CPRS investments defined as "high-risk" from a climate risk perspective. The aim was to use readily available data to carry out a high-level initial assessment of the transition risk exposures within the unit-linked funds, with a focus on corporate bonds and equities (approximately 60% of investments in the unit-linked funds).

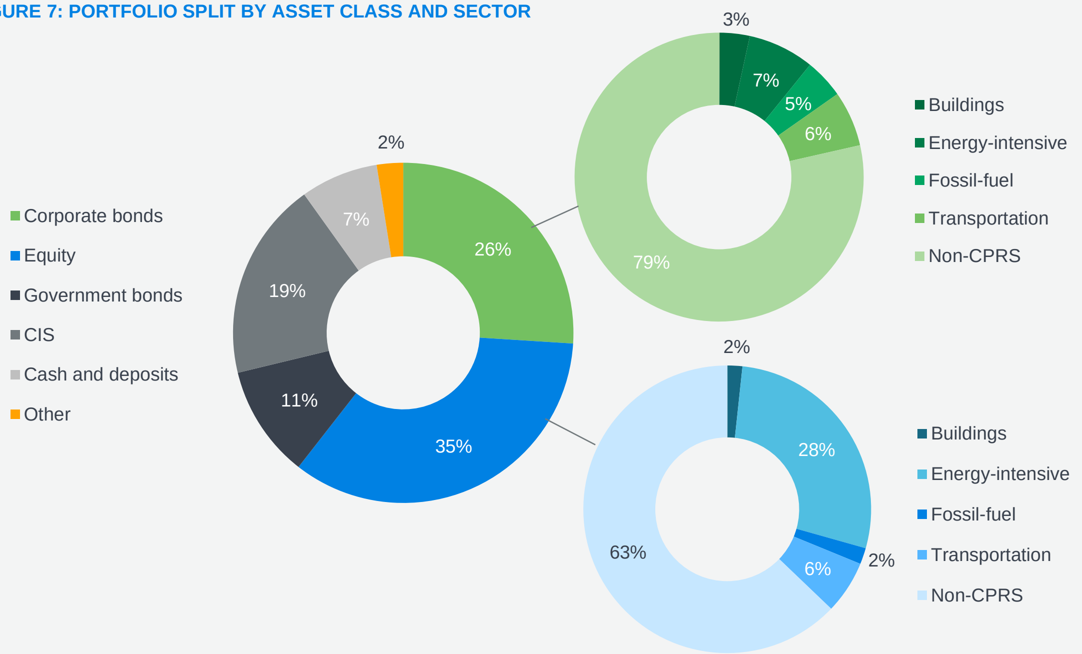
While there were some assets that were unclassified because their NACE codes were missing from the TPT files, the output shows that approximately 80% of corporate bonds and approximately 65% of equities are invested in companies that are not active in the CPRS. Figure 8 shows the split across the portfolio.

[10] It is important to note that unit-linked companies will also be exposed to transition risk and other climate-related risks via their shareholder investments and that a change in the value of shareholder assets as a result of climate change can impact Own Funds and solvency coverage.

[11] Unfortunately, as part of this analysis we identified that the TPT files are not consistently populated by all asset managers, and in some cases data is limited or missing. We had to allow for this in our model and therefore the output is not as accurate as it would be had all the information been available consistently in the TPT files.

[12] University of Zurich. Climate Policy Relevant Sectors. FINEXUS: Centre for Financial Networks and Sustainability. Retrieved 29 October 2021 from https://www.finexus.uzh.ch/en/projects/CPRS.html.

FIGURE 7: PORTFOLIO SPLIT BY ASSET CLASS AND SECTOR



This analysis provides the company with some insight into where the climate exposures are in respect of the unit-linked funds. For example, 28% of equities are invested in energy-intensive sectors. The next step for this company is to take a more detailed look at the TPT files to understand what equity funds this relates to and how diversified they are. The company should take risk mitigation action if required.

The CPRS data provides a high-level look-though to the potential climate-related risk exposure. This should not be considered as an example of best practice, but rather as a best effort or the first step in climate risk assessment using some publicly available data. However, in reality the classification of climate-related risk exposures is significantly more nuanced than this. For example, there will be significant variations in climate risks within each sector depending on regulatory and political drivers, economic drivers and the company's current and future climate adaptation plans.

The University of Zurich's Climate Policy Relevant Sectors can also be used more generally by life insurers to carry out an initial assessment of climate risk exposures in relation to shareholder assets, but for shareholder assets a more detailed assessment of transition risk exposures would be advised in order to calculate carbon metrics for monitoring and reporting and to carry out scenario analysis.

Many companies are also using a publicly available resource, the ND-GAIN Index,[13] to assess physical risk associated with bond portfolios, and in particular government bond portfolios. The ND-GAIN Index is a resource from the University of Notre Dame that summarises a country's vulnerability to climate change by assigning each country a score out of 100. The higher the score, the less vulnerable a country is to the physical risks posed by climate change. The ND-GAIN Index can be combined with Complementary Identification Codes (CICs), which include a country code and are also included in the TPT files, to assess potential physical risk exposure in government bond portfolios.

[13] See the ND-GAIN Country Index website at https://gain-new.crc.nd.edu/.

This analysis could be expanded to split assets into different categories for scenario analysis. For example:

- The Bank of England "Life Insurance Stress Test 2019"[14] guidelines provide some asset shocks for potential transition risk scenarios (such as an orderly and a disorderly, or sudden, transition), split by sector and physical risk scenarios.
- The Bank of England's "2021 Biennial Explanatory Scenario exercise,"[15], which assesses the resilience of the largest banks and insurers in the UK to the risks associated with climate change. It is discussed further in the following section, providing variable pathways for equity indices, corporate bond yields and government bond yields under three climate scenarios.

Whilst the approach taken under the Bank of England's 2021 Biennial Exploratory Scenario exercise is indicative of the direction that scenario analysis is likely to take, it is a substantial exercise in which currently only the largest insurers are required to participate. Therefore, smaller insurers may opt to take the more straightforward asset shock approach the Bank of England's prior Life Insurance Stress Test initially took when conducting climate risk scenarios, and evolve its approach over time. We discuss some of the challenges associated with scenario analysis in Section 4 of this report below.

Case Study 3 considers an alternative approach to those discussed above for measuring physical risk, instead attempting to incorporate climate change into a stochastic actuarial model.

CASE STUDY 3: CLIMATE CHANGE AND MORTALITY IN ACTUARIAL PROJECTION MODELS

This case study looks at how insurers could incorporate climate change and its impact on mortality into actuarial projection models. The following simplifications have been made in our analysis:

- Temperature is taken as the main climate variable. However, this will not be a long-term assumption as multiple climate and environmental variables are required to capture the impact of climate change on physical risks.
- We focus on mortality risk as an example of an insurance risk driver. Once we have found a way to incorporate temperature changes into mortality, we will explore other life underwriting risks using a similar approach.
- Dependencies between temperature and mortality that may be found in historical time series data are discussed, but without an immediate ambition to build an explanatory model.

Selection of relevant input data

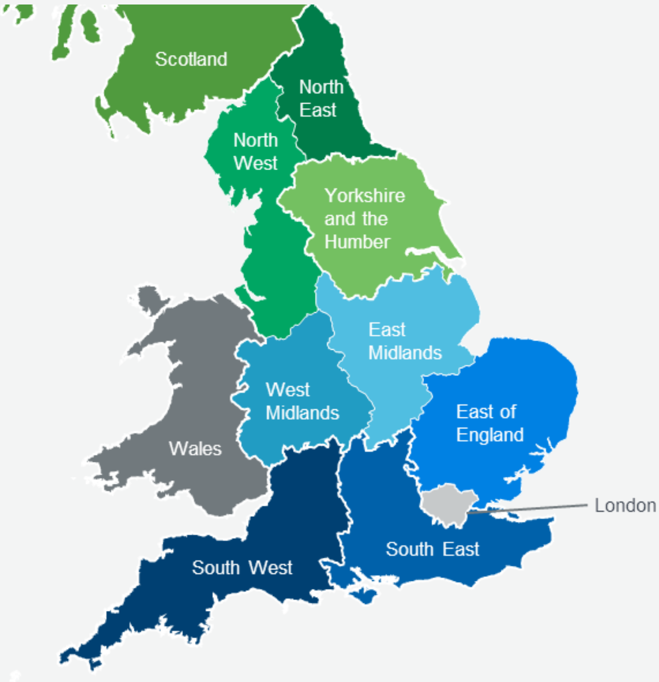
Firstly, we have to source appropriate data for both mortality and temperature. Suitable data series should not only be *long enough*, but also *granular* enough, both with regard to space and time. Indeed, a temperature time series reflecting average temperatures over a large region, say the whole of the United States, will not necessarily be fit-for-purpose, because heatwaves or cold spells may occur in smaller areas. Similarly, monthly death counts may not be granular enough, because heatwaves or cold spells do not necessarily last that long. Let us now discuss which data we can work with, focusing upon the United Kingdom as our main example.

With regard to historical weather data, we can source daily temperature values—maximum and minimum temperature—for each of nine English regions displayed by Figure 8 as well as for Wales.

[14] Bank of England (18 June 2019). Life Insurance Stress Test 2019. PRA. Retrieved 29 October 2021 from https://www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/letter/2019/life-insurance-stress-test-2019-scenario-specification-guidelines-and-instructions.pdf.

[15] Bank of England (8 June 2021). Key elements of the 2021 Biennial Exploratory Scenario: Financial risks from climate change. Retrieved 29 October 2021 from https://www.bankofengland.co.uk/stress-testing/2021/key-elements-2021-biennial-exploratory-scenario-financial-risks-climate-change.

FIGURE 8: MAP OF ENGLAND AND WALES



Secondly, we need similarly granular death count data. We can obtain daily death counts per region collated by the Office of National Statistics (ONS). However, these data are not available per age group—which is a limitation, as we have to expect that heatwaves or cold spells will affect different age groups differently. Alternatively, we can work with daily England death counts per age group. Note that a "double breakdown" by region and age group is not available due to data protection reasons.

Relevant dependency measure and its estimation

Having discussed the data sourcing challenge, we are now going to discuss which would be a useful dependency measure for our purposes. An overly naïve dependency measure such as correlation coefficient is not likely to be useful, especially as we would not even expect any obvious dependency between temperature and mortality in "usual" circumstances—while maybe expecting some significant dependencies in the context of extreme heatwaves or cold spells.

We can approach the latter aspect by using the *tail dependence* concept. For two random variables, Z_1 and Z_2, with the same marginal distribution F, the tail dependence coefficient is defined as follows—provided that the limit exists.[16]

FIGURE 9: TAIL DEPENDENCE COEFFICIENT

$$\chi = \lim_{u \uparrow 1} \Pr\left(F(Z_2) > u \middle| F(Z_1) > u\right)$$

Hence, our next step is to estimate the tail dependence between hot temperatures and mortality as well as that between cold temperatures and mortality. To perform this task, bivariate extreme value theory can be applied, following the approach proposed in a study by Li & Tang[17]—speaking more precisely, a bivariate peak-over-threshold (POT) approach. Because the bivariate POT method assumes independent identically distributed random variables, we need to ensure that trend, seasonality and heteroscedasticity are removed from our data before the application of POT. Another challenge to overcome here is the choice of suitable thresholds for our random variables. In bivariate POT literature, no canonical choice of thresholds exists.

We will present a detailed application of the bivariate POT approach to our problem, including numerical results, in a separate technical paper. For our current purposes, let us assume that we can work out both aforementioned tail dependence coefficients.

Putting everything together

Let us assume that an actuarial projection model (the "Heavy Model") contains a mortality risk driver while no *climate risk* drivers are in its scope. The question is how we connect a climate risk driver—an "elephant in the room" from the actuarial model perspective—to what the actuarial model is able to project.

Firstly, we need to produce a joint simulation of temperature and mortality that would be consistent with our insights on the tail dependency between them. We can decompose this challenge into the following components:

- Marginal simulation of mortality, using traditional actuarial modelling techniques
- Marginal simulation of temperature, using climate models
- Choice of copula, best reflecting the dependency between our temperature index and mortality in the extreme[18]

Secondly, we need to think through how to connect the joint simulation discussed above with the actuarial projection model. Naively speaking, we might want to feed the latter with thousands of mortality scenarios. However, such a direct approach is hardly desirable, especially as a common current actuarial projection model will already have to consider thousands of capital market scenarios and we need to bear in mind both complexity and computational feasibility. In other words, we might be better off by virtue of some indirect approach.

Let us additionally assume that we can calibrate a Proxy Model—such as a Least Squares Monte Carlo (LSMC) polynomial—to the actuarial projection model, as can be the case, e.g., in the context of Solvency II Internal Model work. In order to allow for climate change in this framework, we need to reflect the joint simulation of temperature and mortality in the risk scenario generator (RSG) used to produce scenarios on which to evaluate the LSMC polynomial. While this approach seems conceptually appealing and computationally tractable, it comes with a caveat.

Indeed, a typical LSMC polynomial used in Solvency II work reflects the insurer's economic balance sheet at the one-year horizon—in one year after the valuation date. In order to quantify climate impact upon the full risk distribution of the insurer's net asset value at a different horizon, e.g., after five years, we would need a separate LSMC polynomial calibrated at that horizon. Calibrating a Proxy Model at such a future horizon is challenging, because, e.g., the in-force projection between valuation date and the end of Year 5 will vary from one simulation to another. Hence, we have to allow for this via one or more dedicated Proxy Model risk drivers—and we have to admit that modelling uncertainties baked into a Proxy Model polynomial for Year 5 or Year 10 are higher than those we are used to in the Solvency II work at the one-year horizon.

Section 4: Scenario analysis

OVERVIEW

Transition risk can be analysed by considering the potential pathways to a low-carbon economy, and the speed at which these pathways could evolve. Scenarios will reflect actions taken by the insurer itself to transition to a low-carbon economy or achieve low-carbon credentials, as well as reflecting external developments such as actions taken by the wider industry, technology changes and changing government policies, regulation and consumer sentiment. Scenario analysis is used to explore the potential ways that transition might evolve.

Physical risk scenarios will need to focus on both acute and chronic physical risks. For life insurers, acute physical risk scenarios may focus on increased frequency or severity of natural disasters, resulting in higher mortality and morbidity claims. The chronic effects of physical risk will also need to be considered, such as worsening mortality and morbidity over time due, for example, to higher frequency and severity of pandemics or worsening air quality. Scenarios can be aligned with the Paris Agreement, which has a central objective of limiting global warming to well below 2°C, preferably to 1.5°C, compared to preindustrial levels, or to meet internal objectives.

[16] Joe, H. (1997). Multivariate Models and Dependence Concepts. Chapman and Hall, London.

[17] H. Li, & Tang, Q. (31 December 2020). Joint Extremes in Temperature and Mortality: A Bivariate POT Approach. North America Actuarial Journal. Retrieved 29 October 2021 from https://www.tandfonline.com/doi/abs/10.1080/10920277.2020.1823236?journalCode=uaaj20.

[18] Gary G. Venter. Tails of Copulas. Retrieved 29 October 2021 from https://www.casact.org/sites/default/files/old/studynotes_venter_tails_of_copulas.pdf.

To accompany these types of scenarios, more pessimistic scenarios (from a climate point of view) can be considered, such as failing to meet the objectives of the Paris Agreement. Under such scenarios, the failure to meet the objectives of the Paris Agreement is likely to mean that transition risk is less significant, and instead analysis will be focussed on assessing physical risks and impacts. Therefore transition risk analysis will go hand in hand with physical risk analysis, as the two are directly related to one another. In other words, if transition risk is less prominent, physicals risks will be more prominent.

There are numerous ways in which climate risk scenarios can be developed. The mappings provided by EIOPA and summarised in Figures 5 and 7 above can be used by companies to build a narrative around climate risk scenarios. In addition, the Climate Financial Risk Forum (CFRF) guide[19] scenario analysis chapter discusses several components that can be considered when identifying and developing scenarios. These components are:

- **Socioeconomic context**: More sustainable consumption patterns will reduce emissions.
- **Technological evolution**: A move to renewables will drive a technology shift in the energy sector but also in aviation, transport and industry.
- **Changing policy landscape**: The timing and scale of policy change will impact emissions directly and indirectly, for example through increased taxes and through regulations on materials.
- **Emissions pathways and associated changes in the physical atmosphere**: The interactions of the above factors will result in a particular level of industrial activity and therefore emissions. The type of impact (e.g., heat stress, sea level rise etc.), the geographical distribution of the impact and the greenhouse gas concentrations will impact the level of greenhouse gas emissions.

These four components and their interdependencies can be explored to create a bespoke model, although they will require a number of assumptions and potentially complex modelling techniques. For simplicity, scenarios can instead be incorporated into existing models. However, existing models are unlikely to capture certain climate factors within the assumptions, and may not consider a time horizon that is long enough. When developing scenarios it is important to consider the time taken for the low-carbon targets to be achieved.

Several organisations have published their own scenarios. The following sections consider approaches taken in France and in the UK.

Scenario 1: France

In France, the Autorité de Contrôle Prudentiel et de Résolution (ACPR) launched a 2020 climate pilot exercise using reference scenarios of the Network of Central Banks and Supervisors for Greening the Financial System[20] (NGFS). The NGFS scenarios are based on a framework exploring the transition pathway and the strength of the response:

1. **Orderly**: There is an immediate response. Emissions are reduced in a measured way to meet climate goals of achieving a net zero carbon emissions economy.
2. **Disorderly**: There is a sudden and unanticipated response. It is disruptive but sufficient enough to meet climate goals.
3. **Hothouse world**: There is very little action and we continue to increase emissions. There is significant global warming and, as a result, strongly increased exposure to physical risks.
4. **Too little, too late**: Not enough is done to meet climate goals and the presence of physical risks spurs a disorderly transition

The transition scenarios used by ACPR include a baseline scenario corresponding to an orderly transition (pathway 1 above) and two disorderly transition scenarios (pathways 2 and 4 above), one of which has a later transition and the other a sudden transition. For each scenario, and for each of the years 2025, 2035, 2040 and 2050, insurers were required to submit a breakdown of their assets by nature and sector, including an assessment of the potential decision to change asset allocation.

[19] CFRF (June 2020). Forum Guide 2020 Scenario Analysis Chapter. Retrieved 30 October 2021 from https://www.fca.org.uk/publication/corporate/climate-financial-risk-forum-guide-2020-scenario-analysis-chapter.pdf.

[20] NGFS (June 2020). NGFS Climate Scenarios for Central Banks and Supervisors. Retrieved 30 October 2021 from https://www.ngfs.net/sites/default/files/medias/documents/820184_ngfs_scenarios_final_version_v6.pdf.

ACPR published the main results from the pilot exercise in April 2021[21] and concluded that there was generally a moderate exposure of French insurers to transition risk. However, it has noted that this conclusion is based on a lot of uncertainty. The current exposure for French insurers to shocks brought about by transition risk is limited to about 17% of their total assets. On the asset side, the shocks included in the scenarios did not severely impact insurers and did not lead them to alter their investment portfolios. For example, the impact on corporate bond values was mitigated by French insurers' low exposures to polluting industries, and the larger shocks to equity values did not translate to significant balance sheet impacts given the relatively limited exposure of French insurers to equities. Under this exercise, the key threat to insurers from the transition to a low-carbon economy was if the transition resulted in a prolonged period of low interest rates.

The scenarios do not take into account the risks of a spillover effect, of supply chain disruptions or of amplifications that are typically observed in times of financial stress or crisis. ACPR has also emphasised the uncertainty around developing scenarios, noting that interactions between socioeconomic systems and the climate could be affected by tipping points, irreversibility or threshold effects, which are complex and potentially nonlinear.

Scenario 2: UK

In the UK, the Bank of England launched a 2021 Biennial Explanatory Scenario exercise[22] to explore the vulnerability of participants' business models to future climate policy pathways and associated degrees of global warming. The exercise tests the resilience of end-2020 balance sheets to climate-related finance risks at different points under several scenarios. The results of the exercise are expected to be released in May 2022.

For insurance participants the exercise examined the change in invested assets and liabilities assuming an instantaneous shock, with no allowance for changes in future premiums, asset allocation, expenses, reinsurance programmes or other changes to the business model. Asset prices are reevaluated on prevailing conditions at each point in the scenario, for example incorporating the new carbon price, and liabilities are reevaluated assuming the same contractual obligations to policyholders. The exercise also covers the management actions that participants anticipate taking in the scenarios.

The scenarios are based on a subset of the NGFS scenarios, although they have been expanded to include additional risk transmission channels and variables. The scenarios are designed to be plausible representations of what might happen based on future paths of governments' climate policies aimed at limiting the rise in global temperatures. The scenarios consider different routes to achieving net zero greenhouse gas emissions, which have different speeds and manner of transition, and consequently different pathways for the physical risks from climate change:

- **Early policy action**: Transition to a lower-carbon economy is started immediately and the transition is achieved smoothly. By 2050 the ambition is for the goal of net zero carbon emissions to be achieved. Carbon prices rise and other policies intensify gradually, meaning that the global average temperature increase under this scenario does not exceed 1.8°C.
- **Late policy action**: Transition to a lower-carbon economy is delayed until 2031 and the transition is more sudden and disorderly to ensure the global average temperature increase under this scenario does not exceed 1.8°C by the end of the century. Transition risks are most pronounced in this scenario, as the more compressed timeframe for reducing emissions results in material short-term transition measures being required across the economy.
- **No additional policy action**: Under this scenario, no additional measures are taken to transition to a lower-carbon economy and global emissions are therefore not reduced. The global average temperature increase under this scenario will exceed 3.3°C by the end of the century. Physical risks are therefore most pronounced in this scenario as the absence of transition policies results in growing emissions, and therefore increased temperatures, chronic changes in weather patterns and increased frequency and severity of extreme weather events.

[21] ACPR. A First Assessment of Financial Risks Stemming From Climate Change: The Main Results of the 2020 Climate Pilot Exercise. No. 122-2021. Retrieved 30 October 2021 from https://acpr.banque-france.fr/sites/default/files/medias/documents/20210602_as_exercice_pilote_english.pdf.

[22] Bank of England 2021 Biennial Exploratory Scenario: https://www.bankofengland.co.uk/news/2021/june/key-elements-of-the-2021-biennial-exploratory-scenario-financial-risks-from-climate-change

Under each of the above scenarios, the Bank of England has provided pathways for various physical risk, transition risk, macroeconomic and financial market variables, such as temperature pathways, carbon prices, gross domestic product (GDP) and equity indices.

One of the main challenges in both the UK and France approaches is the length of the time horizon under the exercise. Compared to the usual stress test horizons of three to five years, the 30-year horizon brings about a more complex and costly approach. This is exacerbated by the difficulty in identifying the sectors that are sensitive to transition risks. Assumptions need to be made, for example, about the evolution of the energy mix used and the intensity and efficiency of production. In addition to this, the application of the variables involved in these scenarios is at the sectoral level. Translating this to reflect a company's specific exposures would require further expert judgement, which can be facilitated through approaches such as running both internal and external business workshops.

The EIOPA opinion on climate-related risks in the ORSA[23] advises that the long-term scenario analysis can be conducted at a high level at first, and then further developed to be more granular. Therefore, the implementation of a thorough scenario analysis exercise for a company would be a product of developing a simple approach and gradually refining it to be more robust. A demonstration of this can be seen in the two case studies below. The first shows a simpler approach while the second shows a more sophisticated method.

CASE STUDY 4: SCENARIO ANALYSIS FOR EXPOSURE OF A PORTFOLIO OF PROPERTIES TO CLIMATE CHANGE RISKS

Milliman supported a client in developing its scenario analysis, with a particular focus on property exposure. A range of scenarios was considered, including both physical and transition climate risks. The transition risk scenarios were centred around the changing policy landscape. For example, one scenario considered the possibility that there were changes to regulations around energy efficiency requirements, and so changes were required to properties to ensure the new requirements were met. Implications were also considered, for example that the client was unable to sell any properties until the required energy efficiency ratings were met.

This scenario was carried out and developed as part of the client's ORSA. The properties in the portfolio were analysed by energy efficiency ratings. For properties of a lower rating, it was assumed that additional work would be required for the property to meet the required energy efficiency, causing the value to reduce. Properties of a higher rating are expected to increase in value. The impact of these changes in value would take over a year to occur, but for practicality immediate shocks were applied to the property values. There were also additional secondary impacts as a result of the fall in property assets.

The client used the output of this exercise to assess the potential future exposure to climate-related risks on its property portfolio. This exposure will continue to be monitored, with the scenario included in the ORSA updated periodically, in order to ensure the client's property portfolio remains within risk tolerance. This initial exercise also prompted the client to apply climate considerations to other aspects of its business, such as corporate bond selection, underwriting and third-party management.

CASE STUDY 5: SCENARIO ANALYSIS FOR EXPOSURE OF A PORTFOLIO OF CORPORATE BONDS TO CLIMATE CHANGE RISKS

Milliman partnered with a large UK insurer to help measure the exposure of its corporate bond portfolio to transition risk. The probability of default was chosen as a measure for quantifying the underlying riskiness of a corporate bond, and the following steps were taken to model the impact of transition risks on probability of default for the client's corporate bond holdings.

Firstly, Milliman ran workshops with credit risk experts to walk through the key drivers of credit default, and to drill down into each to describe how climate-related factors could influence them. An example of a credit default driver that could be worsened by climate change is a reduction in consumer and investor confidence. Due to a shift in sentiment away from carbon-intensive activities, a company could lose the confidence of its customers and investors if it is unable to transition to a greener business model. This in turn leads to a reduction in the company's revenue and thus its ability to service debt obligations.

[23] EIOPA. Sensitivity Analysis of Climate-Change Related Transition Risks.

This work was then aggregated into a causal model that builds a narrative around how climate-related drivers might cause a company to default on debt obligations as a result of transition risk. The causal model captures the relationships between these drivers and the relative influence that each driver is expected to have on the probability of default. For example, the company's ability to transition to a greener business model, as outlined above, may be influenced by various factors to different degrees, including the industry in which the company operates, the carbon intensity of its business model, any regulatory or political actions which may impact the company and the company's current financial strength.

The causal model also factored in relevant company-specific and external data to feed into the climate-related drivers. For example, the company-specific data included a measure of the company's past performance, its current ability to transition away from carbon-intensive activities and its level of investment in carbon-intensive assets. This was supplemented with external data on current and projected climate conditions.

Once calibrated, the model provided a useful tool to allow scenario analysis and reverse stress testing to be performed, allowing for a deeper understanding of how transition risk could impact the probability of default for corporate bond holdings. For example, the model could be used to assess questions such as:

- What is the expected impact on probability of default of worsening climate projections and increased regulatory and political action?
- What drivers are most likely to lead to a two-notch downgrade in the credit rating of a corporate bond?

A key benefit of this approach is the ability to model the more subjective and qualitative aspects of transition risk, which is a commonly cited challenge for insurers performing climate change scenario analysis. In addition, by providing a deeper understanding of the climate-related drivers that are most likely to lead to an increased probability of default, more tailored and effective indicators can be incorporated into firms' risk monitoring practices. Further, the model allows for a wide range of scenarios to be assessed based on the various underlying climate drivers and therefore provides a valuable tool for incorporating climate change scenario analysis into the regular ORSA process.

Section 5: Monitoring and reporting

OVERVIEW

In the steps above we have identified and assessed key climate-related risks with a number of different insurance company case studies, in addition to considering the challenges associated with scenario analysis. The final step in the process is monitoring and reporting. Risk monitoring keeps track of the identified climate-related risks, tracking exposures, and it can assist in identifying new risks when they emerge. Risk reporting involves documenting the results of the risk monitoring for either internal or external use. In the context of climate-related risk, both internal reporting and external reporting, via public disclosures, are relevant. We will discuss both in this section of the report.

Internal reporting

Internal risk reporting helps to ensure that the board of directors and senior management understand a company's climate risk exposures and to monitor those exposures over time. Depending on the metrics reported, they can highlight whether a company's activities are in line with internal risk policies and risk tolerances for climate-related risk. Disclosing the impact of climate change in a company's internal risk reporting therefore is essential to ensure that senior management has adequate information to take strategic decisions.

The characteristics of a company's internal risk reporting framework should be examined to ensure climate-related risks can be incorporated. These risks include:

- **Governance**: It is important to identify the relevant owners of climate risk to ensure a strong control framework and to ensure the quality of reporting information. In some countries, such as the UK, regulators are now mandating that a member of the board or senior management team be assigned responsibility in respect of climate risk.
- **Scope**: This includes what areas of the business are in scope and the time horizon over which risk reporting is carried out. For climate risk this may include the more material risk exposures, the financial risks associated with climate change and also the carbon intensity of the company's investments, operations and supply chain. In addition, the time horizons for climate-related risk may be longer than for other risks.

- **Risk reports and frequency**: The type and frequency of risk reports should be defined as well as the type of reporting, e.g., qualitative/quantitative.
- **Risk taxonomy**: The definitions of various categories of reported risk metrics, including a description of the risk metric and how it is calculated.

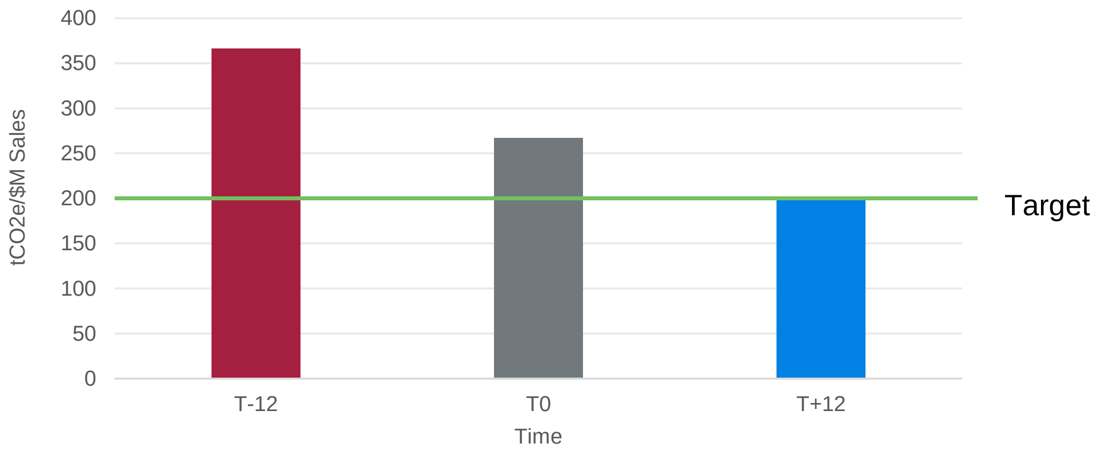
Internal risk reporting is one of the pillars of a risk management framework. Reporting climate-related metrics enables a company to integrate climate risk into its risk management system. Internal reporting of climate-related risks should form part of a company's existing risk reporting framework, rather than being considered separately. However, holding a "deep dive" session on climate-related risks with senior management and the board is advised when the risk reporting is initially introduced. This ensures that the reporting metrics are clearly understood.

Once climate risks have been identified, assessed and measured, it is generally clear what metrics need to be reported to senior management and the board on a regular basis. They are generally the same metrics used in the risk assessment process, with a focus on the most material climate-related risks or any significant deviations from the company's defined risk tolerances.

Two examples of climate change metrics that are generally advised to be included in internal risk reporting are the carbon footprint of investments and the portfolio warming potential. These metrics are commonly used by life insurers to report transition risk exposures for internal reporting and also for climate-related risk disclosures. Recently companies have been placing more of an emphasis on portfolio warming potential as it is forward-looking and provides companies with greater chances to reduce transition risks. In contrast, the measure relating to carbon footprint tends to be backward-looking. To provide context, we have included examples of both in this section.

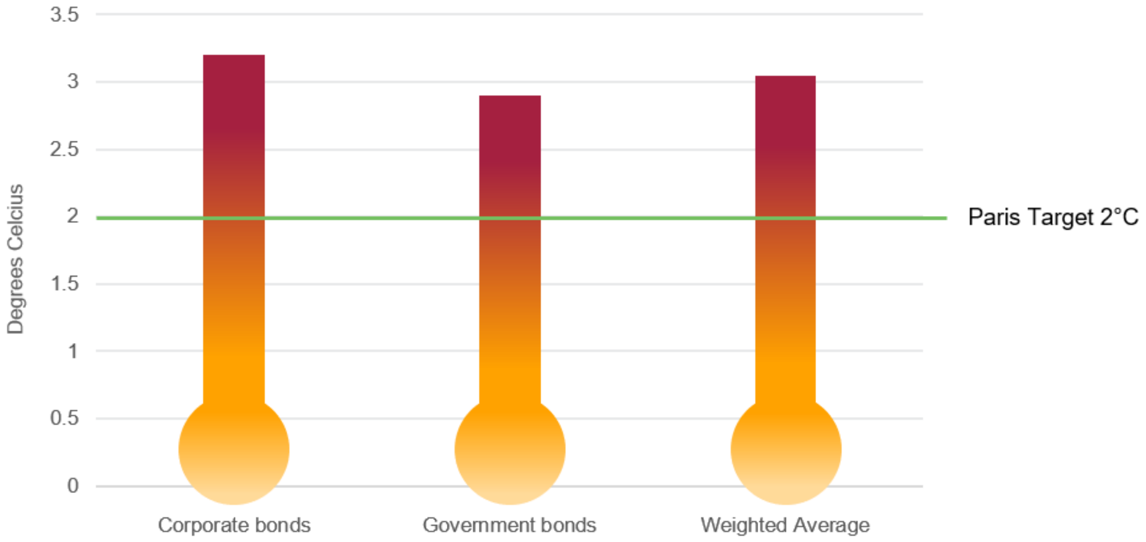
The carbon footprint of investments calculates the average carbon intensity of a corporate bond portfolio weighted by the size of the investment (tCO2e / $M sales). It is a measure of a portfolio's contribution to climate change that allows comparison with a benchmark, between portfolios and between individual investments. In order to change the emphasis to be more forward-looking, some companies have started to report the carbon footprint over a three-year time horizon. In Figure 10, a sample insurance company has set a target of 200 tCO2e per $1 million of sales. The time period T+12 shows the expected carbon footprint in 12 months' time, allowing for the expected disinvestment from brown assets and reinvestment in green assets. This graph is useful for both senior management and for public information. It highlights the company's commitment to reducing its carbon footprint and highlights the fact that it is taking action to do so.

FIGURE 10: EXAMPLE OF CARBON FOOTPRINT METRICS



The portfolio warming potential metric aims to align a company's bond portfolio to the Paris Agreement's goal of limiting the global temperature risk to below 2°C. The graph in Figure 11 shows how this metric could be presented for a hypothetical bond portfolio. This metric reports the potential Celsius degree increase (i.e., the warming potential) of each bond issuer. For example, for corporate bonds this could be based on the alignment of the issuer to the sectoral greenhouse gas emission intensity needed for each sector to make its contribution to reach the global target of 2°C.

FIGURE 11: EXAMPLE OF PORTFOLIO WARMING POTENTIAL METRICS



EXTERNAL REPORTING AND PUBLIC DISCLOSURES

It is expected that there will be a high level of crossover between internal and external climate risk exposures. Companies will want to ensure that senior management and the board are aware of their obligations in terms of public climate risk disclosures and what information is disclosed to the market. Internal disclosures may include more proprietary information such as metrics relating to strategic priorities in relation to climate change. However, as green investments, green products, and Environmental, Social and Governance (ESG) and Corporate Social Responsibility (CSR) initiatives become more important to investors and customers, companies may start to disclose much more information in relation to climate change metrics.

In relation to public disclosures, the TCFD is a good place to start. The TCFD recommendations[24] on disclosure requirements include that companies:

- Disclose details of the governance around climate-related risks and opportunities
- Disclose the actual and potential impacts of climate-related risks and opportunities on businesses, strategy and financial planning where such information is material
- Disclose how the climate-related risks are identified, assessed and managed
- Disclose the metrics and targets used to assess and manage relevant climate-related risks and opportunities where such information is material

The disclosure requirements have been adopted already by a number of TCFD supporters, including insurers. In the UK, The Prudential Regulation Authority (PRA) has requested that larger insurers, with assets under management greater than £25bn begin to comply with the TCFD recommendations in 2022 and begin to publish climate-related disclosures in 2023. For smaller insurers with assets under management between £5bn and £25bn, they must comply with the TCFD recommendations in 2023 and begin the publish disclosures in 2024. Climate risk disclosure laws have also been adopted in France for a number of years on a “comply or explain” approach.[25]

The regulatory requirement to publicly disclose climate-related risk exposures, including metrics and targets, has been seen as a catalyst for many companies to initiate, or improve, climate risk management. It ties in with the idea of the financial services industry, including the insurance industry, being a “force for good” in the fight against climate change. The more of a requirement there is to disclose climate-related metrics (such as a company’s operational carbon footprint) the more of an onus there is for insurers to engage in greener activities and investment opportunities. This was evidenced in France where investment in carbon-intensive industries fell following the introduction of the disclosures. A Banque de France report notes that, following the first year of enforcement of the

[24] TCFD. TCFD Recommendations. Retrieved 30 October 2021 from https://www.fsb-tcfd.org/recommendations/.

[25] Mesonnier, J-S & Nguyen, B. (January 2021). Showing off Cleaner Hands: Mandatory Climate-related Disclosure by Financial Institutions and the Financing of Fossil Energy. Banque de France Working Paper No. 800. Retrieved 30 October 2021 from https://publications.banque-france.fr/sites/default/files/medias/documents/wp800.pdf.

new regulations for climate-related disclosures, the figures showed a reduction in the amounts invested in fossil energy securities of about 40% on average in 2019 compared to the amount held in 2015.[26]

While the TCFD recommendations are being supported by companies on a voluntary basis currently, it is expected that more regulators across Europe, and more widely, will require specific climate-related disclosures from the financial services industry in the near future. EIOPA has also been vocal about climate-related risk in recent years and, as part of the Solvency II 2020 review, is requiring companies to include further detail on the consideration of ESG factors in investment policy in their Solvency and Financial Condition Reports (SFCRs). Given the pace of change of the Solvency II regulations, it is likely that requirements in relation to climate risk disclosures will be driven by local regulators in the coming years, rather than harmonised climate risk disclosure requirements being introduced by EIOPA.

A key challenge in external reporting relates to harmonisation of reporting metrics across companies and industries and a common taxonomy in relation to what is considered green or sustainable. In order to compare the ability of individual companies to adapt to climate change, we need a consistent way of measuring carbon intensity and labelling ESG investments. The EU Sustainable Finance Taxonomy[27] is currently considered to be the most advanced. For insurers, it would generally be encouraged to use industry-agreed definitions and methodologies for reporting purposes to improve transparency.

CASE STUDY 6: EXTERNAL REPORTING – LEGAL AND GENERAL INVESTMENT MANAGERS

Climate-related disclosures are becoming more important as investment management companies begin to engage on climate-related risks. Not only are the disclosures important to help investors understand their transition risk exposures, but disclosures are also becoming increasingly important in driving investment decisions.

The Legal and General Group in the UK is one of the companies leading the financial services industry in addressing climate change. It is a supporter of the TCFD and regularly publishes reports on sustainability and climate change. In addition to being the UK's largest life insurer, the group also includes Legal and General Investment Managers (LGIM), which has about £1.3 trillion in assets under management (AUM).[28] LGIM has been vocal on its commitment to tackling the climate change challenge. The company is committed to engaging with listed companies in climate-critical industries that are responsible for the majority of greenhouse gas emissions. Companies that fall short of LGIM's minimum standard will be subject to voting sanctions or disinvestment. LGIM's minimum standards include appointing a member of the board to be responsible for climate-related issues, comprehensive carbon disclosures, programmes to reduce greenhouse gas emissions and more.

LGIM's most recent Climate Impact Pledge report[29] was published in June 2021. For the insurance industry, the company's expectations are that investments and underwriting activities will shift from "brown" to "green." It reports that more insurers need to commit to carbon-neutral investment portfolios, and that the momentum on net zero across the sector must be matched by more widespread disclosure on Scope 3 emissions[30] reporting for investment portfolios.

The 2021 report included three large, listed insurance companies on the sanction list due to their not having Scope 3 emissions disclosures associated with their investment portfolios, in addition to insufficient policies on thermal coal.

This highlights the importance of disclosures in relation to climate risk, both from the insurance sector and more generally. In order to be able to publish Scope 3 emission disclosures on their investment portfolios, insurers will need to understand the emissions of their investments and will need disclosures, or other relevant data sources, to do this. If they are not forthcoming from specific companies or sectors, then insurers may begin to disinvest from certain investment types also.

[26] Ibid.

[27] European Commission. EU Taxonomy for Sustainable Activities. Retrieved 30 October 2021 from https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/eu-taxonomy-sustainable-activities_en.

[28] LGIM internal data as at 31 December 2020. The AUM disclosed aggregates the assets managed by LGIM in the UK, LGIMA in the US and LGIM Asia in Hong Kong. The AUM includes the value of securities and derivatives positions. See https://www.legalandgeneralgroup.com/about-us/.

[29] LGIM's Climate Impact Pledge: The 2021 Results.

[30] Scope 1 are direct emissions from owned or controlled sources, Scope 2 are indirect emissions from the generation of purchased energy consumed by the reporting company, Scope 3 are all other indirect emissions that occur in a company's value chain, including investments.

Section 6: Conclusion

While the effects of climate change on our planet are uncertain, it is definite that life (re)insurers will be impacted either directly through physical risks, or from a transition to a greener economy, or both. The exact effect of this impact on insurers' balance sheets is a great unknown. Therefore, it is important for insurers to account for any material climate risk exposures in their risk management frameworks.

The climate risk management process outlined in this research paper provides a useful guide for insurers beginning to account for climate-related risks in their risk management frameworks and ORSAs. The case studies have demonstrated that often the best approach is to begin with a high-level overview of a potential risk exposure, before developing models and processes to be more granular and include a wider range of exposures. The case studies also highlighted the importance of innovation in quantifying the impact of climate risk with little relevant historical data. However, there are many challenges yet to overcome, particularly as this is an everchanging landscape both in terms of policy and in the nature of climate change itself.

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