Institute and Faculty of Actuaries

Climate-related risk

An information-gathering report on actuarial involvement

by David Gordon

Pathways to Sustainability

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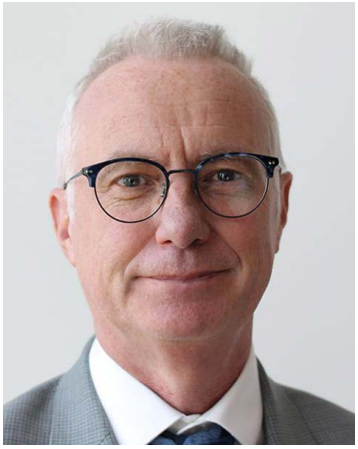
www.actuaries.org.uk

Contents

Foreword

Neil Buckley, Lay Chair of the IFoA Regulatory Board



I welcome the publication of the Actuarial Monitoring Scheme's (AMS) first information-gathering report, which looks at the involvement of actuaries in climate-related risk. This continues the regulatory work of the Institute and Faculty of Actuaries (IFoA) in independently assessing the work carried out by actuaries, and complements the programme of thematic review activities also being undertaken. I would like to thank all those IFoA members and organisations that took part in this information-gathering exercise and provided the information and case studies that make up this report.

The Regulatory Board recently launched a consultation[1] on 'Proposals for changes to the Regulatory Framework on Climate Change and Sustainability' and so this is a timely and informative report on perhaps the most significant risk facing us in the coming years. The report provides an insight into current actuarial work on climate-related risk across a range of domains, helping us to see both where it is focused and where it is still developing. Alongside the results of the consultation, this will provide helpful indicators for regulatory activity in this space.

The report also stimulated board discussion on how the IFoA can consolidate the progress to date and look to further develop, for example by promoting this huge opportunity for actuaries to play a leading role in managing climate-related risk, implementing education and lifelong-learning opportunities to help actuaries in assessing and understanding this critical risk across domains and territories, and encouraging further activity across our diverse, global IFoA community.

Aligned to the IFoA's climate change statement[2] and the board's earlier Risk Alert,[3] we emphasise the need for all members to consider climate-related risk appropriately in the work they do and, where necessary, to reflect on any development needs to help them do this effectively. Many actuaries are already using their skills and influence to make a difference – the time to do more is now.

Neil Buckley
Lay Chair of the IFoA Regulatory Board

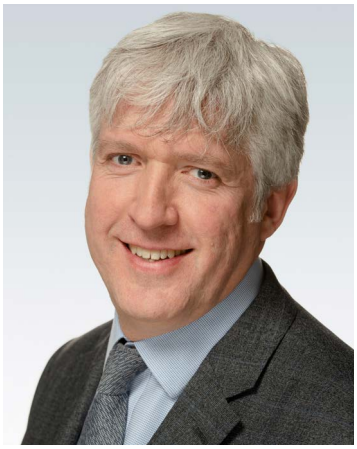
1 | **Consultation:** Proposals for changes to the Regulatory Framework on Climate Change and Sustainability

2 | **IFoA 2021 climate change statement**

3 | **IFoA 2017 Risk Alert** - climate-related risks

Introduction

David Gordon, IFoA Senior Review Actuary



I am delighted to publish the findings of this information-gathering exercise, which looked at the involvement of actuaries in climate-related risk. I would like to thank the 50 individuals and organisations that completed our questionnaires, including those who provided insight through conversations on the topic, ensuring that we were able to conduct a comprehensive and meaningful exercise.

Carrying out this exercise in 2021 in the run-up to COP26[4] has enabled us to capture the change of pace in many organisations to their approach to climate-related risk, as pension funds and insurers increase their activities in response to both an increased understanding of the risks and the evolving regulatory landscape.

The key findings are set out in the Executive Summary. The report also contains a detailed summary of the review of the questionnaire responses and follow-up discussions we held with some of those who took part.

I look forward to discussing this report and its findings with stakeholders.

David Gordon
Senior Review Actuary

4 | **UN Climate Change Conference 2021, COP26**

Executive summary

In many organisations actuaries are among those leading the thinking on climate-related risk. The key areas of work carried out by actuaries are scenario modelling and stress testing, as well as working alongside others in asset management.

In many organisations actuaries are among those leading the thinking on climate-related risk, helping to put in place the requirements of emerging regulation, and updating risk management principles to enable their firms and clients to reflect this critical risk of our time.

Actuaries across all practice areas are often heavily involved in scenario modelling or stress testing: quantifying and explaining plausible future paths for the finances of pension funds and insurers under various climate-change scenarios. This is clearly a core actuarial skill that can help organisations understand their exposures and consider mitigating actions.

Across financial services there is significant activity in the asset management space. Organisations are striving to meet environmental, social and governance (ESG) criteria and similar requirements, including addressing climate-related risks, while making important decisions in relation to responsible investment. A key example is the selection of default defined contribution (DC) funds. **Although actuaries are not always the key players in this area, we heard examples of significant influence, and investment continues to be a major domain for the profession.**

Along with other professionals, actuaries are also deeply involved in many other types of project that consider the specific effects of climate-related risks, including:

- Assistance with ESG and Task Force on Climate-related Financial Disclosures (TCFD)
- Assessment of the impact on demographic risks
- Weather-related risks on home insurance and equity release mortgage portfolios.

However, in many significant areas of traditional actuarial work, there is limited consideration of climate-related risk. Actuaries have told us it is not clear what, if any, impact climate-related risk currently has on these functions (for example valuation, reserving and capital work), or that it is immaterial compared to other risks.

Organisations told us they want more practical education and lifelong learning opportunities to help equip actuaries in dealing with climate-related risks, in particular on how they affect long-term liabilities. Developments in this area could help to address current capability gaps and increase the depth and breadth of advice actuaries feel confident to provide. The IFoA website already contains extensive materials[5] to help members with their understanding of climate-related risks, including a toolkit[6] for reflective practice discussions (RPD) as part of the Continuing Professional Development Scheme.

Organisations also told us that actuaries have a role to play in preventing 'greenwashing', by speaking out where products and services do not stand up to claims made about climate-related risk. Other helpful feedback included ensuring a diverse range of views and input is sought from our profession as understanding and capability increases, utilising our global reach.

Consideration of climate-related risk by actuaries has accelerated significantly over the last two to three years, and is expected to continue. This is influenced both by increased understanding of the risks and by increased regulation. It is important that our professional standards and guidance, education and lifelong learning keep pace with this, and that all actuaries appropriately promote consideration of this risk in the work they do.

5 | **IFoA Sustainability and Lifelong Learning**

6 | **RPD Toolkit: Climate Change and Sustainability**

Report structure

How this report should be read

We have set out in this report the detailed findings of this information-gathering exercise. We have provided comments relating to the submissions we received to the exercise. The Executive Summary sets out our key findings. A detailed summary of our scope and approach is set out in **Appendix 1** and a list of the organisations and individuals that took part in the exercise is set out in **Appendix 2.**

Tables in the report

We have used tables to provide a summary of the information we received from consultancy and insurer submissions. This presents the information in a 'blue-map', where a lighter shade of blue indicates a smaller number or 'Low' response and darker shade of blue indicates larger number or 'High' response. The colours are best used to compare different types of work, rather than looked at in isolation.

Case studies

We have included a number of comments and case studies taken either from submissions to this exercise or from the follow-up conversations we held with a number of those taking part. These either provide evidence for the comments in the main text or illustrate the projects or other work being undertaken in relation to climate-related risk. (In some cases the case studies have been edited for brevity or to ensure anonymity – this may result in some unintended loss of context from accompanying detail.)

References

Referenced documents or webpages are indicated by footnotes throughout this report, with a full list set out in **Appendix 5.**

Status of report

This report imposes no obligation upon members over and above those embodied in the Actuaries' Code[7] or the IFoA Standards Framework,[8] which includes compliance with the Technical Actuarial Standards set by the Financial Reporting Council. It has been prepared by the Actuarial Review Team and is issued by the Regulatory Board of the IFoA. Its purpose is to report on the findings of the information-gathering exercise on climate-related risk.

This report does not constitute legal advice. While care has been taken to ensure that it is accurate, up to date and useful, the IFoA does not accept any legal liability in relation to its content.

The report has been subject to review by individuals acting independently of the author as follows:

- Within the IFoA Review Team
- Members of the IFoA Sustainability Board.

We therefore consider this meets the Work Review requirements of Actuarial Profession Standard X2.

We wish to thank the members of the IFoA Sustainability Board for their review comments, although the contents of this report, in particular the recommendations and observations within, remain the responsibility of the IFoA Review Team.

We are not aware of any conflicts of interest arising from the contents of this report in relation to the Review Team that carried out the work or the Regulatory Board that has endorsed the findings.

Questions

We welcome questions or comments about this report which should be sent to **reviews@actuaries.org.uk** or to:

Actuarial Monitoring Scheme
Institute and Faculty of Actuaries
Level 2, Exchange Crescent
7 Conference Square
Edinburgh EH3 8RA

7 | The **Actuaries' Code** is the ethical Code of Conduct that all members of the IFoA must follow

8 | **Standard Setting at the IFoA** (2020)

Climate-related risk: approach and leadership

Actuaries often taking the lead on climate-related risk

We found that actuaries are often among those currently driving the approach to, and leading on, climate-related risk within their organisations.

Activities in recent years

Some organisations have been publishing material on climate-related risk and sustainability for many years, for example thought-leadership pieces[9] and annual reports.[10] This work typically focused on how asset classes might be affected by the physical and transitional risks of climate change in the long term, and how stewardship policies and responsible investment approaches could positively impact the wider investment market. As a result, historical activities looking at climate-related risk tended to be based within investment consultancy or asset management functions, which did not necessarily have significant actuarial input. Some insurers have had weather specialists working alongside finance professionals for many years, although this has been relatively limited and focused more on understanding existing severe weather-related risks within portfolios.

> *We have had a Responsible Investment group for over 10 years, which includes a member of the organisation's Executive Committee. There is now an organisation-wide climate risk professional committee that meets quarterly. This was in part in response to the 2017 IFoA Risk Alert. Over half of this committee are actuaries.*

However, activities in organisations have expanded in recent years, in particular those that address emerging regulatory requirements, or where organisations and clients have been more forward-thinking on this risk. For example, activities in line with the TCFD[11] and the Prudential Regulation Authority (PRA) supervisory statement SS3/19[12] (in the UK) have led many insurers and pension funds to address climate-related risk in more detail and to seek actuarial input. Over the medium term, climate-related risk has the potential to affect all areas of work in organisations that employ actuaries. A summary of recent regulatory requirements in this area is set out in **Appendix 3.**

> *We are working towards embedding climate risk understanding in all our analytical and advisory work; and how we run our organisation. Current activity is primarily through specific projects, delivered by specialists. Through this work we are growing a wide base of knowledge and training, to build towards making climate risk considerations mainstream in our actuarial thinking.*

Current activities

Within both insurers and consultancies, we heard that work relating to climate-related risk is commonly led by a steering or leadership group. Such groups co-ordinate activities across the organisation, including initiating projects and training staff to address regulatory requirements, such as TCFD disclosures. Among the organisations we interviewed, these groups had significant input from actuaries. This tends to be driven by individual actuaries who have developed skills and knowledge in this field, and by actuaries in senior management positions who are aware of the critical nature of the risks faced by their organisation, customers and clients. Within consultancies, these groups reported to senior leadership across the affected practice areas; within insurers they had often been established by, and reported to, the risk management (second line) function. The Chief Actuary often has a key role, focused principally on financial risk elements.

9 | **Climate Change Scenarios - Implications for Strategic Asset Allocation**, Mercer 2011

10 | **Responsible Investment report,** Aegon Asset Management 2011

11 | **Recommendations of the Task Force on Climate-related Financial Disclosures,** June 2017

12 | **Enhancing banks' and insurers' approaches to managing the financial risks from climate change,** June 2019

> *The Chief Actuary heads up Financial Risk sub-stream of wider Responsible and Sustainable business programme.*

> *The Chief Actuary has senior management responsibility for delivery of PRA SS3/19.*

> *The Chief Actuary looks at climate risk across the business, primarily from a risk management perspective.*

We were told that leadership models are likely to evolve further in the coming years as the management of climate-related risk becomes business-as-usual; this may mean that the involvement of actuaries will reflect the make-up of actuaries in the business as a whole. With IFoA members in Chief Actuary or Chief Risk Officer roles within insurers, and many key leadership roles within consultancies, there will be ongoing senior management influence in addressing climate-related risks, driven in part where regulation conveys formal senior management responsibility.

Scenarios and modelling

Most prominent work by actuaries in relation to climate-related risk is modelling

The most common type of work carried out by actuaries in relation to climate-related risk is modelling how it will affect the long-term finances of a pension fund or insurance company. This is the case across all practice areas.

We heard examples of insurers and consultancies carrying out scenario testing, stress or shock testing, or stochastic modelling to illustrate the impact of climate-related risk for a number of purposes. See **Appendix 4** for an explanation of these terms.

Pension funds

For pension funds, investment consultants are using scenario modelling to help quantify climate-related risks to assist with investment decisions. Scheme actuaries are illustrating the potential impact of differing climate change scenarios, either as part of the actuarial valuation or as an integrated risk management exercise. In some cases we heard that this is becoming a standard or optional part of the actuarial valuation process.

The work was sometimes initiated by the trustees of larger schemes, which will shortly be required to prepare TCFD disclosures. Occasionally, the work was initiated by the sponsor, in cases where the sponsor is either particularly focused on climate-related risk or is incorporating the pension fund into its own TCFD disclosures or regulatory-driven scenarios.

We were informed that the assumptions used in projections or scenarios are very uncertain. In some cases, the uncertainty of assumptions has led organisations to keep their projections or shocks relatively simple. Many organisations are relying on third-party expertise to help develop projection assumptions. Organisations told us that the IFoA could help actuaries in this area by providing lifelong-learning events showcasing practical examples of this type of work.

Variations to long-term mortality rates were included in some calculations, although organisations told us the impact of climate-related risk on these assumptions was particularly uncertain. In some cases the employer covenant was also subject to a similar analysis (although not typically carried out by actuaries).

> *We have helped a number of trustee boards of larger pension schemes better understand how climate risk might impact their scheme's funding position. This has involved assessing how the scheme's assets and liabilities may be impacted by our proprietary climate scenarios in order to present clients with integrated risk management impacts. Covenant implications have also been considered in some cases, in a qualitative way, although this input has been from non-actuaries.*

> *Climate change 'shock' scenario is included in the scheme's preliminary actuarial valuation results, highlighting that the scheme's exposure to climate change extended to the employer covenant, as it is in a sector which is particularly exposed to climate change. The trustees incorporated climate change into their covenant assessment and set a target to limit the time exposure to the employer covenant given the long-term uncertainty.*
>
> *We are developing a new economic scenario model (with data provided by a third party) which will include three scenarios:*
>
> 1. *Hot house scenario*
> 2. *Orderly Paris-aligned*
> 3. *Disorderly Paris-aligned*
>
> *The model will include liability modelling as well as asset modelling.*

Respondents described a range of actions taken in light of modelling exercises. In some cases the modelling was simply one part of a larger project, for example a review of investment strategy, an actuarial valuation, or to provide data for TCFD disclosures.

In other cases the results of the modelling contributed more directly to trustee decisions, for example:

- Investing in low carbon funds
- Shortening of the scheme's journey plan to buy-out to reduce reliance on scheme sponsor in a particular sector
- Strengthening the level of prudence in valuation assumptions.

> *We have run climate scenario sessions with a range of pension trustee clients, providing training on climate risks and sharing the output from our modelling. The outputs from these sessions have influenced subsequent strategic decisions such as investing in low carbon equity funds or speeding up schemes' journey to buy-out. We expect our clients to revisit climate scenario analysis regularly so we will adapt the content of these sessions over time.*

However, other organisations, particularly those advising smaller pension funds, told us that the risk posed by climate change was less important to pension scheme trustees than other immediate risks, such as pension scheme deficits, current investment risk and sponsor covenant – therefore trustees were taking no immediate action in this area.

> *While references are made to climate change related risks, in the majority of cases where we are providing assumptions advice, and in some cases climate change scenarios are illustrated, we have no evidence that the decisions taken by the bulk of clients regarding choices of assumptions are materially different than they would be otherwise. At best we expect that, for funding in particular, the outcome is that more consideration is given to the degree to which margins are included to allow for the risk of materially adverse experience.*

> *The majority of the DB schemes we advise are small to medium size and we currently have no actuarial appointments for whom the TCFD aligned disclosures will be required in the near future. Our clients have restricted budgets. Although we include climate-related risk explicitly as part of funding advice, it is in the interest of scheme members (and the wider public interest eg PPF levy-payers) that the focus of their trustees' attention in relation to funding is how to mitigate other risks where the ability to measure the impact is better understood, in particular hedging investment risks and mitigating risk of employer insolvency.*

Insurance

At present much of the climate-related risk modelling work in insurance is centred around scenarios and stress testing, with the former supporting business planning, including own risk and solvency assessment requirements (in the UK). Although recent regulatory activity has driven increased focus, especially in relation to stress testing, it is also fairly clear that the majority of firms are not yet carrying out particularly sophisticated modelling on climate scenarios. Indeed there is not necessarily a consensus that sophisticated modelling of such scenarios is the right approach in all circumstances, with qualitative approaches also being considered depending on the specific risks faced by a firm (either physical or transitional, and/or the term over which such risks would be assessed). At this stage the extent to which firms are required to meet TCFD requirements, or wider local regulatory requirements, is a key driver in their approach and progress to date. There is some evidence that model outputs are starting to be considered for wider purposes.

> *The present model is not sophisticated, focusing on high level RAG assessment on risks - view that ultimately it is actions that firms take which is important (the 'so-what') as opposed to overly focusing on complex modelling.*

> *Current approach uses four scenarios and likely that CBES may inform development of this. The scenario work is starting to be used more widely across the business, including within remuneration incentive planning for senior management.*

> *The biggest challenges are the development of climate-related risk and sustainability metrics and detailed modelling of the potential long-term financial impacts on the P&L and the balance sheet; future IFoA member activity will be focused on improving these specific areas.*

We were told of some additional challenges in developing the appropriate modelling and reporting capability:

- Understanding and sense checking model output, and considering the business response to results, given the longer term uncertainties
- How to convert future climate scenarios into impacts on house prices and estimating the time horizon over which prices would reflect the risk

- Obtaining high-quality complete data sets
- The long tailed nature of the scenarios where the time horizon exceeds the majority of the term of the current book, and modelling challenges in relation to how best to shock assets.

In many cases the work required to start to address some of these challenges will involve actuaries working alongside other experts and stakeholders in their companies.

> *An inter-disciplinary team has been created with representation from across the business and an expert panel has been set-up to review and challenge the main assumptions made in the selection, development and modelling of the scenarios.*

> *Climate change is driving a long term fundamental shift in physical catastrophe risk affecting insurance risk and also via transition to green economy creating new drivers of market risk. To a lesser extent for my work, there are also issues of liability risk for the industry to manage. In addition, there is significant regulatory interest from a range of stakeholders. My role, as an actuary, involves helping my organisation identify and manage these risks.*

Asset management

Actuaries work alongside others in addressing climate-related risks

Across financial services there is significant activity in the asset management space, as organisations strive to meet ESG and similar requirements, including addressing climate-related risks, while making critical decisions in relation to responsible investment.

Although actuaries are not necessarily the key players in this area, we heard examples of significant influence, and investment continues to be a major domain for the profession.

Investment consultancies

Key to tables:

In addition to asking consultancies about levels of overall resource and level of actuarial involvement for each function, we also asked participants to indicate the following:

- **Current climate status** – proportion of this type of project where climate-related risk currently considered (assumed High for TCFD/ESG)
- **Future climate status** – proportion of this type of project where climate-related risk is likely considered (assumed High for TCFD/ESG)
- **Climate impact** – overall impact of climate-related risk on this type of project (assumed High for TCFD/ESG)
- **Climate influence** – level of influence of IFoA members (or members of other actuarial associations) with respect to climate-related risk.

Resource colour scales				
0	1 to 10	11 to 50	51 to 100	100+

Involvement, status, impact and influence colour scales						
None	None/ Low	Low	Low/ Medium	Medium	Medium/ High	High

Darker shades indicate higher average scores for each criterion.

Project type	Resource	Actuarial involvement	Current climate status	Future climate status	Climate impact	Climate Influence
Investment manager research, selection and monitoring	51 to 100	M	M	H	M/H	M/H
Fiduciary management	51 to 100	M	M	M/H	M	M/H
Asset liability modelling	51 to 100	M/H	L/M	M/H	M	M/H
TCFD disclosures	11 to 50	M	H	H	H	M/H
ESG disclosures	51 to 100	M	H	H	H	M
Economic scenario generator models	11 to 50	M/H	L/M	M/H	M	M/H
DC investment fund selection	11 to 50	M	M/H	M/H	H	M/H

Across many organisations, actuaries are working alongside other professionals in investment consultancies. These include asset management or research professionals, some with the Chartered Financial Analyst or other qualifications. This is illustrated by the relatively lower actuarial involvement scores (indicated by lighter colours) across investment compared to other domains. The mix of actuaries and non-actuaries working in investment varies across organisations. There is also no clear pattern to indicate whether those leading on climate-related risk in investment are actuaries. In some cases they dominate, while in others they are not represented at all – generally, however, the influence of actuaries is proportionately high.

> *We have a dedicated sustainability investment team looking at all areas – the team has a mixture of people with an actuarial as well as an asset management and research background recognising that diversity of background and experience is better than just relying on an actuarial background.*

> *The in-house team responsible for climate-risk are all IFoA members. This is really due to there being a high ratio of actuaries or actuarial students at this organisation.*

> *The influence of actuaries within our investment business, while still very significant, has been declining for many years, which is why our Responsible Investment Team (which covers TCFD and ESG) includes hardly any actuaries.*

Within investment consultancy, we heard that addressing climate-related risk is becoming an established part of core investment advice, reflecting growing client demand and market sentiment. Consultants are expected to be proficient in climate-related risk, with less reliance on separate subject matter experts for regular work. This is illustrated by the climate status scores which show that the proportion of clients where climate-related risk is considered is already at least medium for most types of work and is expected to grow significantly in all areas. The impact of climate-related risk is also at least medium across all activities for investment.

> *Our view is that climate change can impact on all aspects of our work and advice and as such we expect all of our colleagues to make such considerations and use their judgement and influence to guide clients effectively. As a firm we have been supporting colleagues through the provision of climate-related training, with targeted training provided to explore concepts in more detail. Longer-term, we expect all colleagues (including those who are members of IFoA) to be proficient in making climate-related considerations and applying judgements in their work and advice, thereby reducing reliance on subject-matter specialists.*

> *Routine climate risk-related activities are carried out by each client team within the investment practice. We also have an established ESG investment research team, which provides specialist support to the wider investment team on projects such as investment manager research and monitoring and trustee training. Climate risk is an established part of our routine investment advice, which reflects the growing client demand and market sentiment towards inclusion of ESG factors in investment decisions.*

Examples were given of a wide range of investment activities affected by climate-related risk across investment consultancy and fiduciary management activities:

- Assisting with formulation of climate-related beliefs to inform future decision-making
- Creating new style reporting to manage/monitor climate-related risks
- Devising ratings for comparing the climate credentials of investment managers
- Assessing investment manager ESG capabilities and reporting on voting behaviour on shareholder resolutions aiming to tackle climate change
- Devising low-carbon equity and bond portfolios
- Setting net-zero targets, including interim targets (for those consultancies with fiduciary management operations).

> *Production of Responsible Investment ratings for our entire recommended manager universe, main challenge was the amount of time / resource required, expect the definition of 'good' RI practices will evolve over time and our ratings will change to reflect this - it is a moving feast.*

> The client took action by investing in
>
> - ESG tilted equity with a lower carbon footprint (this is evident from the Carbon footprint of the future world funds relative to the regular market cap index)
> - Renewable Energy infrastructure

We were informed that challenges exist in some of these areas due to a lack of standardisation of disclosures from asset managers. It is also a challenge to produce robust metrics that are both useful for decision-making and fully understood by trustees.

> *Dashboard created allowing pension scheme to have an at a glance view of the ESG risks and carbon footprint of their portfolios. Consultation on how to reduce these risks. Challenge is lack of standardisation in disclosures and agreed format of presentation: this should improve over time as industry develops standards.*

However, although climate-related risk is widely taken into account, we also heard comments that the end decisions for defined benefit (DB) scheme assets are currently still only modestly different.

> *Climate risk is a component of most investment activity today, but the end decisions in DB are only modestly different from those that would be made if it were not considered.*

Due to member interest climate-related risk is frequently being considered in the selection of default funds for DC pension arrangements. However, we heard from several organisations that the choice of managers experienced in addressing these risks is inhibited by a lack of track records of 'low carbon' or other climate-friendly approaches, although this is likely to improve over time. Fees for such funds may also be an issue.

> *DC is different to DB – portfolios have noticeably changed with the consideration of climate risk.*

> *Sustainable default fund recommended to pension scheme trustees. Asset liability modelling carried out on proposed fund. Challenge is lack of track record of the funds to help clients with confidence in the fund manager. This will improve as track records grow.*

> *Our Master Trust DC default funds now include an allocation to impact equity... challenges included the sourcing of appropriate managers; introducing funds with short track records; overcoming some institutional scepticism. Far the biggest challenge was management fees – DC requires very low management fees and impact investing is not cheap.*

Insurance

For insurers, asset management is seen as the function with the highest level of current and future climate impact. Actuarial influence, while not as prevalent as in those functions more focused on modelling, is at a reasonable level. Insurance consultancies also indicated that actuaries have relatively high impact and influence in this area.

Our conversations with actuaries raised a number of interesting points, many focused on areas such as workplace pensions and fund platforms, where individuals have investment choice:

- The extent to which investment risk for the insurer is affected by climate-related risk can be viewed as second order: it is restricted to volatility of income from annual management charges. A key impact of climate-related risk, however, is the reputational risk affecting new business and retention of existing investors, of being behind other organisations in relation to responsible investment practices.
- There is a drive within the insurance industry to address climate-related risk. Retail investors have a choice, but the insurer, in deciding which funds to offer, is able to influence the underlying strategy of fund managers. A real difference can be made through engagement with fund managers, which is the favoured approach, rather than the blunter tool of divestment activity.
- In another example, the current investment proposition development work focused on workplace default funds. Work on individual propositions will be considered at a later date, recognising challenges in relation to the form of advice or guidance that can be provided for those customers.

The involvement of insurance actuaries in investment work was also highlighted:

- One organisation indicated that actuaries get involved in the default fund strategy, with senior actuaries involved in the Management Investment Committee (CRO, CFO, and Chief Actuary). There is also an actuarial rotation role for trainees within its Investment Solutions team.
- Another organisation noted that a key activity in this area, led by the Chief Actuary, is its sustainable investment strategy – focused on how to deal with investments in different types of companies according to broad criteria (avoiding harm, doing good, having a positive impact).
- In one example, an actuary, in the senior commercial role of Director of Strategy and Propositions, leads the Responsible Investments team.

Additionally, as part of the submissions there were insightful case studies.

> *IFoA members have been instrumental in shaping our Sustainable Investing Policy, with the Chief Actuary leading the changes to Statements of Investment Policy and other investment governance arrangements to ensure that they align with the Directional Sustainability Strategy.*
>
> *Developments include creation of a Responsible Investment team within 1st line (with oversight from Financial Risk), ESG / carbon footprint benchmarks for internally managed funds, a Carbon Neutral target date for Investment Assets (including Property), aligning investments to the UN Principles of Responsible Investment (PRI), and developing a Stewardship Report towards complying with the new Stewardship Code.*
>
> *Key challenges include lack of data on investee companies (eg carbon reduction pathways), detailed modelling of physical / transitional impacts to asset valuations, inconsistent ESG ratings, immaturity of our sustainable investing approach / governance surrounding it, and rapidly evolving regulations / industry practice. Future IFoA member work will focus on reducing these limitations.*

> *We continue to investigate how climate risk could impact on the investment portfolio. This includes developing a responsible investment framework including climate change within its criteria. The investment portfolio has been analysed using external providers data to provide climate related metrics. A challenge is that this data is only available on liquid assets and it would need to be extended to other illiquids and private assets.*

> *A large pensions and insurance consolidator was seeking support to draft and implement their Responsible Investment policies at a group level. They were also looking for expertise to assist them developing their stewardship framework, asset manager due diligence exercises, and providing their firm with in-house training on responsible investment matters. We provided resource on a secondment basis to support the client with drafting their group-wide responsible investment policy, developing their stewardship framework and asset manager due diligence process and providing knowledge sharing sessions on climate risk management.*

It is encouraging to see examples of actuaries being involved in key aspects of responsible and sustainable investment, including in senior positions of influence.

Other pensions and insurance observations

Analysis of involvement across different types of work

As well as asking for case studies, we also asked insurers and consultancies to tell us how climate-related risk is considered in different types of work being carried out.

As indicated in the preceding sections, the most significant areas of work being led by actuaries, across all practice areas, are climate leadership, scenario modelling and asset management.

Actuaries are also involved in climate-related risk in the following areas:

- Assistance with ESG and TCFD disclosures and policies
- Assessment of the impact on demographic risks
- Weather-related risks on home insurance and equity-release mortgage portfolios.

We understand that actuaries are not typically carrying out pure climate science or the interpretation of weather patterns, although clearly some are interpreting how future temperatures may have an impact on long-term assumptions, for example.

The tables below and on the following pages indicate the extent to which actuaries are involved, and how much climate-related risk is considered in different areas of work. See **Appendix 1** for an explanation of the columns.

Pension funds

We asked the same types of questions as indicated in the key on **page 10** for investment consultancies:

Project type	Resource	Actuarial involvement	Current climate status	Future climate status	Climate impact	Climate Influence
Actuarial valuation	100+	H	L	M	L/M	M/H
Financial reporting	100+	H	N/L	L	L	M
Risk transfer	11 to 50	H	N/L	M	L	M/H
Actuarial factors	100+	H	N/L	L	N/L	M
Integrated risk management	51 to 100	M/H	L/M	M/H	M	M

There are significant areas of current pensions practice where the climate status is very low (indicated by lighter colours) – there is currently little or no consideration of this risk. While increases are anticipated in the next two or three years, the status is still expected to be low. This includes key areas such as:

- Financial reporting (other than TCFDs)
- Actuarial factors.

Types of work that are expected to involve climate-related risk on a broader basis are:

- **Actuarial valuation advice** – where scenario modelling or shock analysis (described in the **Scenarios and modelling** section) is likely to be carried out in more cases and to have a greater impact.
- **Risk transfer advice** – for example, the stated treatment of climate-related risk by the potential counterparty insurers or super-funds may influence the trustees in a number of cases.

Climate-related risk is expected to be considered in more cases for integrated risk management and developing economic scenario generators.

> *The Trustee of a large pension scheme recognises climate change is a significant long-term issue. Since 2018 we have worked with the Trustee and their other advisers to help them understand and manage climate risks:*
>
> - *In November 2018, we ran an introductory training session on climate-related risks*
> - *Through 2020 we worked with the Trustee's investment adviser to develop an integrated ESG and Climate Project Plan for 2021, with us taking the lead on climate matters.*
>
> *In 2021 so far we have:*
>
> - *Provided climate scenario funding advice, and liaised with the Trustee's covenant advisers on how the climate scenarios might affect the employer covenant;*
> - *Advised on establishing a Statement on Governance of Climate Change Risks and Opportunities and becoming an official TCFD supporter; and*
> - *Considered how to incorporate climate change triggers into their contingency planning and monitoring arrangements.*

We also heard from some organisations which indicated that the level of work relating to this risk is likely to remain very low in the coming years. These organisations indicated that training is nevertheless being given to clients and employees with the aim of increasing awareness of the relevant climate issues.

> *Among actuaries outside the core sustainability team, only a small minority of scheme actuaries have the confidence to advise on this. They used to get asked "So what?" by colleagues in response to training on climate issues, but this is now a much less frequent reaction.*

> *Our clients are all small pension schemes who, while they will be affected by climate-related risk, are not ready to spend money commissioning relevant analysis – and we do not have the expertise to carry out the analysis at this stage. Thus our input to clients to date has been limited to a very broad description of the possible effects of climate change.*

In these responses, actuarial advisers indicated that even when it is considered, climate-related risk had a relatively low impact on overall outcomes across many activities. However, IFoA members are heavily involved in influencing how climate-related risk is considered.

Insurance

Key to tables

In the questionnaire for insurers, as well as asking about levels of overall resource and level of actuarial involvement for each function, we also asked participants to indicate the following:

- **Current climate impact** – impact of climate-related risk on activity or function at current time (assumed High for TCFD)
- **Future climate impact** – impact of climate-related risk on activity or function expected in next three years (assumed High for TCFD)
- **Climate influence** – level of influence of IFoA members (or members of other actuarial associations) with respect to climate-related risk

Darker shades indicate higher average scores for each criterion.

Project type	Resource	Actuarial involvement	Current climate impact	Future climate impact	Climate Influence
TCFD disclosures	11 to 50	L/M	H	H	M/H
Product design and management	51 to 100	L/M	L/M	M	M
Product pricing and underwriting	51 to 100	M/H	L/M	M	M/H
Reserving and financial reporting	51 to 100	M/H	L	L/M	M
Capital management and regulatory reporting	11 to 50	H	L	M	M/H
Business planning and scenario analysis	11 to 50	M	L/M	M	M/H
Extreme event modelling & stress testing	11 to 50	M/H	M	M/H	M/H
Asset management	11 to 50	L/M	M	M/H	M
Regulatory compliance	11 to 50	L/M	M	M	M
Risk management (2nd line)	11 to 50	L/M	M	M	M
Audit and assurance (3rd line)	11 to 50	L	L	L/M	L

Looking at current climate impact, it is asset management, risk management and regulatory compliance that rank highest (with extreme event modelling close behind), areas that perhaps typically have lower actuarial involvement. Asset management is described in more detail in the **previous section**.

As we consider future climate impact, the functions that rank highest are asset management, extreme event modelling and business planning/scenario testing, with the latter two being activities where actuaries get more heavily involved (with all functions expected to have a higher future impact from climate-related risk, and scoring at, or close to, medium).

The scoring for climate influence (of actuaries) is at medium or high level across most functions apart from audit. It is highest in business planning, extreme event modelling and product pricing/underwriting, perhaps indicating where actuarial skills can be brought to bear (and functions where climate-related risk is seen as most likely to impact).

This aligns to actuarial involvement to a great extent. There is not a huge difference between 'involvement' and 'influence' – that actuaries are influential in relation to climate-related risk broadly in proportion to how involved they are in that function.

However, there is evidence that in some areas where there has traditionally been less actuarial involvement, there is greater relative influence by actuaries with regard to climate-related risk (eg asset management, regulatory compliance, risk management).

> *We write specialty insurance through the Lloyd's market, focusing on short tail property business. Our book is significantly affected by both physical and transition risk. We are embedding climate risk management into our general management*

through PRA SS3/19 and by participating in related scenario exercises. We are embedding climate risk considerations into the full risk appetite framework, setting out a plan to increase the sophistication of those statements over the next few years. Challenges include capturing long-term effects within a business focused on 1-year policy risk.

In terms of future impact, reserving (or financial reporting) is joint lowest, while capital management is also in the bottom three. There were comments from some participants, though, that analysis and understanding of climate-related risks could now be at a point where capital, or even potentially reserving, considerations would be required. There is a chance that regulatory intervention could influence these two functions going forward if reserving or capital rule-changes are implemented.

The overall significant move from 'current' to 'future' in terms of impact across functions is to be expected, and shows that organisations recognise the need to take further action. This differs between organisations, perhaps reflecting the stage they are at and how significant a risk this is to their business.

A recurring theme is that actuaries are involved with other professionals when assessing the potential impact of climate-related risk on their organisations. This included assessing the risk associated with particular product types with direct potential exposure to climate-related risk.

The Risk Team initiated a series of workshops with Equity Release lending subject matter experts from underwriting, pricing, proposition development and finance. The workshops had 18 colleagues in attendance of which around half were actuaries. The workshops considered the various physical, transition and litigation climate-related risks and potential product opportunities. This was chosen as a key area given it affects both the asset and liability side of the business and residential property is clearly impacted by the effects of climate change in a number of aspects (flood, ground movement, regulation etc). There has been modelling information shared between the GI and Life business units regarding flood mapping, which will continue to develop in the future to have a longer range outlook.

Case studies from other areas of work

We also received a number of responses from other types of organisations showcasing climate work in wider, or more specialised, fields

These show the extent to which actuaries are able to add value, often outside more traditional areas, by providing advice to a wide range of stakeholders. A selection of these case studies is set out below:

Non-executive

> *Non-executive Director of large investment manager for a pensions partnership company. Strong focus on managing climate risk in the company's investment strategy, including exercise of voting rights. Appointed responsible investment ambassador as part of board role. Contributed to integration of responsible investment (including climate-related risk) perspective into company culture.*

Professional independent trustee

> *As a professional trustee, I incorporate climate change considerations into my day-to-day work, with the key areas being investment policy for my schemes but also considering the impact of climate change on employer covenant. For all of my schemes, I am tilting investment strategy towards low carbon, climate friendly companies. While there is always a tension between this and generating the best returns available, I believe that investing in climate friendly businesses will deliver better returns over the long term. I expect this approach will become easier over time as these returns are achieved.*

In-house banking work

> *Heading up a team developing climate stress testing capabilities for our banking book. We also look after pension risk for the bank which includes climate risk aspects. The team has built capabilities to run 30-year scenarios analysis on the credit risk implications of climate change across both physical and transition risk. This is to meet the regulatory climate stress test over 2021.*

Reinsurer

> *We are keeping a much closer eye on the risks written by our cedents and having tough conversations at renewal if we feel that the cedent needs to adjust their approach e.g. relating to providing insurance for coal-related activities and some heavy oil and gas clients.*

Developing a climate index

> *We are in the process of developing a climate index based on similar approaches taken by the Actuaries Climate Index in Australia/New Zealand and North America. One area of focus is on sea levels being a key long term climate risk for Singapore, so there are ongoing discussions with academics. Recent data can be obtained and using R code, the index is being built. A key challenge would be in validating the index and trends in context of the tropical region. The index is aimed to be a building block in the development of climate scenarios here. Over the coming years, we would look to integrate this index with global efforts.*

What more could the IFoA do?

In our conversations with organisations, we asked what more could be done by the IFoA (and others) to help members in dealing with climate-related risk in their work. Some of these measures are already underway in some form.

Education and lifelong learning

We heard calls for an understanding of climate-related risk to be included in the education of actuaries. This ranged from it being included in various subjects in the pre-qualification syllabus to being a criterion for maintaining a Practising Certificate. There were also calls for a standalone post-fellowship qualification in climate-related risk, which would provide actuaries with the opportunity to evidence their knowledge in this area. (We note the recent *Actuary* magazine article[13] which shared the development of a new IFoA course on sustainability and climate-related risk.)

Organisations also told us that there is no shortage of events on climate-related risk. However, a number of them commented that the content of such events could evolve to provide more examples of work being carried out in practice and how it affects long-term liabilities. Suggested topics included how longevity might evolve under different scenarios, and ways to engage pension scheme trustees to take action. These may also be potential research topics.

Developments in these areas will help to address current skills gaps for actuaries and increase their confidence to provide appropriate advice to senior management, clients and customers.

Reading materials

The weekly update[14] from the IFoA Sustainable Finance Community was praised by a number of the organisations we met as being a succinct source of news on climate-related risk and other sustainability issues. We also heard that the IFoA website's sustainability and lifelong learning materials, in particular the practical guides[15] and the recently published climate change curated library,[16] provided a useful primer for actuaries in different practice areas.

Countering this was the observation we heard more than once that the extent of available reading material on climate change can make it a challenge in terms of where best to focus. The recently published RPD toolkit on Climate Change and Sustainability is intended to help members in this area.

Preventing greenwashing

Organisations told us that actuaries have a role to play in preventing 'greenwashing', by speaking out where products and services do not stand up to claims made about climate-related risk. This is in line with the 'Speaking up' communications provisions of the Actuaries' Code, and consistent with wider regulatory focus, both in the UK and globally.

Modelling and metrics

There could be a role for the IFoA to drive some consistency around metrics – there are many examples at present. We were told it can be challenging for organisations to land on the right ones to be consistent with the market, and to be most useful to potential users.

There was also a comment about setting reasonable expectations around what actuaries can and should do on climate-related risk modelling to add value. This may particularly be the case for very long-term modelling which, like modelling for some other purposes, might convey spurious accuracy without appropriate communications.

Global reach of the IFoA

The IFoA has an important role to play as a global thought-leader in this field, recognising the international nature of our membership and the potential wide range of different climate issues faced in different territories.

13 | **A starting point for change** *The Actuary* August 2021

14 | **Weekly update** from the IFoA Sustainable Finance Community

15 | **IFoA practical guides to climate change**

16 | **IFoA Climate change curated library**

Appendix 1 – Our scope and methodology

This information-gathering exercise was announced in December 2020 with the following scope

Climate-related risk

Treatment of climate related risk in actuarial work, or wider actuarial influence in approach taken by firms to recognise and mitigate this risk.

Climate-related risks are systemic long-term risks that impact the work of actuaries in many areas. The 2017 IFoA Risk Alert called on actuaries to consider how these risks affect the advice they are providing. As a signatory to the Green Finance Education Charter, the IFoA is committed to report on progress in mainstreaming the principles and practice of green and sustainable finance.

This information-gathering exercise will look at current practices adopted by actuaries across all practice areas in the treatment and assessment of climate related risk.

The purpose of this exercise was to gather information across the profession to produce a 'heat map' of recent and planned activities in relation to climate-related risk. This (a) shows the extent of actuarial involvement in each type of work, and (b) highlights case-study examples of high-impact work being carried out.

The IFoA website[17] provides more information on the work of the Actuarial Monitoring Scheme.

Methodology

We invited[18] all IFoA members and organisations employing IFoA members to take part in the review. The submission window ran from March to July 2021.

We asked organisations and individual members to provide case studies describing their most impactful activities involving climate-related risk. We also asked consultancies and insurers to complete questionnaires to show how climate-related risk impacts specific areas of their work. More details of the questionnaires are set out below.

We considered the completed questionnaires as part of our review, along with the follow-up conversations with a sub-set of those taking part.

Participation

We received over 50 substantive responses to this exercise. This included:

- 11 insurers
- 13 consultancies
- 30 responses from individuals working in a range of organisations

We held follow-up discussions with actuaries from 12 organisations who had submitted questionnaires.

A list of the participants is set out in **Appendix 2.** Although we invited responses from anywhere in the world, the vast majority were submitted by UK organisations or in relation to their UK businesses. Unless stated otherwise, this report therefore refers to UK practice. Overall, the organisations taking part employ around a third of IFoA members in the UK. The responses were also primarily prepared by consultants and insurers, being significant employers of actuaries. The comments in this report therefore apply particularly to those types of organisation and the finances of pension funds and insurance companies.

17 | **Actuarial Monitoring Scheme** webpages

18 | **News article** launching information-gathering exercise

Questionnaires

We asked those taking part in this information-gathering exercise to complete one of four different questionnaires:

- Insurer
- Consultancy
- Other type of organisation
- Individual response.

In all questionnaires, case studies were requested in the following terms:

> *Please provide case studies describing the most impactful activities involving climate-related risk by IFoA members, or members of other actuarial associations (approx. 150 words max). In each case study, consider including details of the activity, any challenges faced, and how the activity may change over the coming years.*

For insurers and consultancies, we also asked the organisation to provide a qualitative rating in five or six areas for a number of specific activities:

For each question (other than resource) a qualitative description was provided to help determine whether the response should be High, Medium or Low. For those questions marked * the descriptions were quantified as follows:

- High: over 50%
- Medium: 25% to 50%
- Low: under 25%

The business activities and functions that we asked about are shown in the summary tables on pages **10**, **14** and **16**.

Area	Insurer questions	Consultancy questions
Resource	Estimated number of individuals involved from time to time with this type of activity or function or project, regardless of consideration of climate-related risk	
Actuarial involvement *	Proportion of team who are IFoA members (or members of other actuarial associations)	
Climate status *	N/A	**Current:** proportion of this type of project where climate-related risk is currently considered **Future:** proportion of this type of project where climate-related risk is likely to be considered over next 3 years
Climate impact	**Current:** impact of climate-related risk on activity or function at current time **Future:** overall impact of climate-related risk on activity or function expected in next 3 years	Overall impact of climate-related risk on this type of project
Climate influence	Level of influence of IFoA members (or members of other actuarial associations) with respect to climate-related risk in relation to each type of activity or function or project	

Appendix 2 – List of participants

List of organisations and individuals taking part

26 organisations took part in this exercise:

Aegon UK
Allianz Holdings plc
Aon
Ario Advisory
Aviva plc
Barnett Waddingham LLP
BDO LLP UK
Buck
Deloitte (Actuarial Insurance and Banking)
Direct Line Group
First Actuarial LLP
Government Actuary's Department
Hymans Robertson LLP
Isio Group Ltd
JUST Group plc
Lane Clark and Peacock LLP
LBG
Mercer Ltd
Prudential plc
River & Mercantile Investments Ltd
Royal London
St. James's Place plc
Towers Watson Ltd
Wesleyan Assurance Society

Two organisations took part anonymously.

33 individual IFoA members also took part:

Doug Baird
Patrick Bloomfield
Russ Bowdrey
Barry Butler
Matthew Byrne
John Campbell
Elizabeth Chong
Roelof Coertze
Calum Cooper
Ben Farmer
Nicky Holtzhausen
Leon Jones
Alice Kaye
Kruti Malde
Paul Meins
Grant Mitchell
Azim Mithani
Mathew Nyagwoka
David M Ruiz
Charles Ward
Heting Yang

12 individuals took part anonymously.

The IFoA Review Team wishes to thank all the individuals and organisations that contributed to this exercise.

Appendix 3 – Current legal and regulatory requirements

This information-gathering exercise was carried out in 2021 at a time when actuaries' involvement in climate-related activities has been increasing and is expected to accelerate

Between March and July 2021 we gathered information from organisations and individual actuaries about activities in the previous 18 months, and expectations for activities over the next two to three years.

Over that time period, a number of regulatory changes have been proposed or introduced, which potentially have an impact on the work of actuaries. A non-exhaustive list of these (principally UK) changes are summarised here to provide context around the activities described elsewhere in this report.

General

- **From 2006** – institutions, asset owners and service providers have adopted the voluntary Principles for Responsible Investment (PRI)[19] setting out actions for incorporating ESG issues into investment practice
- **12 May 2017** – the IFoA Risk Alert called for actuaries to ensure that they understand, and are clear in communicating, the extent to which they have taken into account climate-related risks in any relevant decisions, calculations or advice.
- **June 2017** – the above risk alert referred to the 'Recommendations of the Task Force on Climate-related Financial Disclosures' published the following month setting out how companies and other entities should disclose their climate-related activities.
- **July 2019** – UK government Green Finance Strategy[20] sets out expectation for listed companies and large asset owners to produce TCFD disclosures by 2022.

UK pensions

- **1 October 2019** – statement of investment principles (SIP) to include policies in relation to financially material considerations, including climate-related risk, over the appropriate time horizon of the investment.[21]
- **1 October 2020 / 2021** – implementation statements explaining various matters, including climate-change policies, to be included in scheme accounts produced[22] from 1 October 2020, and published online by 1 October 2021, for schemes with more than 100 members either providing pure DC benefits, or providing both DB and DC benefits.
- **March 2021** – Consultation on Pensions Regulator's new combined code of practice[23] including expectation that trustees of all pension schemes should be integrating climate-related risks and opportunities into their risk management and governance arrangements.
- **From 1 October 2021** – TCFD-aligned activities for largest (£5bn+) pension schemes and authorised master trusts to commence[24] from 1 October 2021 (with £1bn+ schemes following a year later). In each case the trustees must commission scenario analysis and establish a number of metrics in relation to climate-related risk and produce TCFD disclosures as part of their subsequent annual reports, and make these disclosures publicly available.

19 | **Principles for Responsible Investment** (PRI)

20 | **UK government Green Finance Strategy**

21 | **The Pension Protection Fund (Pensionable Service) and Occupational Pension Schemes (Investment and Disclosure) (Amendment and Modification) Regulations 2018**

22 | **The Occupational Pension Schemes (Investment and Disclosure) (Amendment) Regulations 2019**

23 | **Consultation on new combined code of practice**

24 | **The Occupational Pension Schemes (Climate Change Governance and Reporting) Regulations 2021**

UK financial regulation and supervision (banks and insurers)

- **March 2019** – The PRA, along with the Financial Conduct Authority (FCA), established the Climate Financial Risk Forum[25] to build capacity and share best practice across industry and financial regulators to advance the sector's responses to the financial risks from climate change. It brings together senior representatives from across the financial sector, including banks, insurers and asset managers. The forum has set up four working groups to produce practical guidance on four specific areas: risk management, scenario analysis, disclosure and innovation.
- **April 2019** – building on previous regulatory activity, the PRA set supervisory expectations (Supervisory Statement 3/19) for banks and insurers on the management of climate-related financial risks, covering governance, risk management, scenario analysis and disclosure. This set out expectations that firms take a strategic approach to managing climate risk, and appropriate actions to mitigate those risks. SS3/19 was published alongside Policy Statement 11/19,[26] addressing the responses from the consultation exercise.
- **July 2020** – SS3/19 followed this up with a 'Dear CEO letter'[27] to firms. This set out more detailed guidance on how firms should embed their approaches to managing climate-related financial risks by the end of 2021. The letter built on the expectations set out in SS3/19 and provided observations on good practice, as well as setting out next steps for implementation.
- **June 2021** – the PRA published the Key Elements document outlining the 2021 Biennial Exploratory Scenario on financial risks from climate change. The 2021 Climate Biennial Exploratory Scenario (CBES)[28] will explore the resilience of the UK financial system to the physical and transition risks associated with three scenarios of early, late and no additional action, which build on a subset of the scenarios published by the Network for Greening the Financial System (NGFS).[29] The 2021 CBES built on the Insurance Stress Test for 2019, which included an exploratory exercise in relation to climate change. The set of climate scenarios explored the impacts to both firms' liabilities and investments stemming from physical and transition risks. The PRA expects to publish the CBES results in May 2022.

25 | The **Climate Financial Risk Forum** is an industry forum jointly convened by the PRA and FCA

26 | **Enhancing banks' and insurers' approaches to managing the financial risks from climate change**

27 | **Thematic feedback from the PRA's review of firms' SS3/19 plans and clarifications of expectations**

28 | **Key elements of the 2021 Biennial Exploratory Scenario: Financial risks from climate change**

29 | **Central Banks and Supervisors – Network for Greening the Financial System**

Appendix 4 – Glossary

Terminology used in this report

- **Scenario testing** shows the impact over an appropriate projection period (say 10 years) of a number of economic scenarios on the entity's assets and liabilities. These scenarios are described qualitatively and given descriptive titles to describe different outcomes. Examples in the context of climate-related risk include 'orderly transition', 'disorderly scenario' and 'no climate action taken'.
- **Stress or shock testing** shows the impact on the entity's current, or one-year, balance sheet (that is its assets and liabilities) of a number of economic and demographic shocks which may be plausible, but relatively extreme, outcomes of climate-related risks. Examples might include equity markets falling 20%, or life expectancy increasing by one year.
- **Stochastic modelling** takes several thousand projections (simulations) over a number of years based on statistical distributions of economic variables to show the likelihood of different outcomes. Climate-related risk may be taken into account by identifying and illustrating individual projections that represent one or more climate scenarios.
- **Physical risks** are risks from climate change relating to facilities and infrastructure, impact on operations, water and raw material availability and supply chain disruptions. These may have direct financial consequences for organisations where those risks are realised, as well as up-front insurance and investment-related costs.
- **Transition risks** are risks associated with transition to a low-carbon economy. If realised, such risks can result in stranded assets, loss of markets, reduced returns on investment and financial penalties.
- **Liability risks** are risks that come from people or businesses seeking compensation for losses they may have suffered from the physical or transition risks from climate change outlined above.

Appendix 5 – References

Documents referenced in this report

Report footnote	Title	Author
1	Consultation: Proposals for changes to the Regulatory Framework on Climate Change and Sustainability	IFoA
2	IFoA climate change statement	IFoA
3	IFoA Risk Alert – climate-related risk	IFoA
4	UN Climate Change Conference 2021, COP26	UN
5	IFoA Sustainability and Lifelong Learning	IFoA
6	RPD Toolkit: Climate Change and Sustainability	IFoA
7	Actuaries' Code	IFoA
8	Standard Setting at the IFoA	IFoA
9	Climate Change Scenarios – Implications for Strategic Asset Allocation	Mercer
10	Responsible Investment report	Aegon
11	Recommendations of the Task Force on Climate-related Financial Disclosures	TCFD
12	Enhancing banks' and insurers' approaches to managing the financial risks from climate change	PRA
13	A starting point for a new IFoA course on sustainability and climate risk	IFoA
14	Weekly update from the IFoA Sustainable Finance Community	IFoA
15	IFoA practical guides to climate change	IFoA
16	IFoA Climate change curated library	IFoA
17	Actuarial Monitoring Scheme webpages	IFoA
18	News article launching information-gathering exercise	IFoA
19	Principles for Responsible Investment	PRI Association / UN

Report footnote	Title	Author
20	UK Government Green Finance Strategy	UK government
21	The Pension Protection Fund (Pensionable Service) and Occupational Pension Schemes (Investment and Disclosure) (Amendment and Modification) Regulations 2018	UK government
22	The Occupational Pension Schemes (Investment and Disclosure) (Amendment) Regulations 2019	UK government
23	Consultation on new combined code of practice	The Pensions Regulator
24	The Occupational Pension Schemes (Climate Change Governance and Reporting) Regulations 2021	UK government
25	Climate Financial Risk Forum	PRA / FCA
26	Enhancing banks' and insurers' approaches to managing the financial risks from climate change	PRA
27	Thematic feedback from the PRA's review of firms' SS3/19 plans and clarifications of expectations	PRA
28	Key elements of the 2021 Biennial Exploratory Scenario: Financial risks from climate change	PRA
29	Central Banks and Supervisors – Network for Greening the Financial System	NGFS

All links correct as of October 2021.

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