Institute and Faculty of Actuaries

Resource & environment issues

A practical guide for pensions actuaries

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Introduction

Resource & environment (R&E) issues are an important part of the economic and social landscape in which pension schemes operate.

R&E issues are less visible, less tractable and, arguably, less well understood, than issues that actuaries typically consider when advising their clients. As such, they present risks and opportunities that may not be reflected fully in current market prices.

This guide explains where R&E issues are relevant to pension schemes and the work of pensions actuaries. It is a first attempt at helping pensions actuaries to assist their clients in navigating the uncertainties associated with R&E issues, in collaboration with covenant and investment advisers. Supplementary reports will be published which provide more technical detail on how R&E issues might impact on covenant assessments, funding advice and mortality. This guide is intended to raise awareness of the topic, encourage discussion and prompt further research. It is aimed at actuaries advising UK trust-based defined benefit pension schemes, although some of the material is also relevant for actuaries advising other types of pension schemes and in other jurisdictions.

Only rarely would R&E issues be the top priority for a scheme. However, they are illustrative of more general challenges facing pensions actuaries: a tendency for covenant assessments to focus on short-term, quantifiable aspects; a heavy reliance on current market pricing when setting financial assumptions; and the use of extrapolative mortality models that cannot readily incorporate changes in the underlying causes of death.

Pensions actuaries will want to consider what a proportionate approach to R&E issues would be for each of their clients. In practice, the weight given to R&E issues will depend on the scheme's circumstances, including the time horizon of its journey plan, its investment strategy and its sponsor's industry sector. For some schemes, the most relevant consideration may be the extent and speed at which insurers factor R&E impacts into annuity pricing.

Regulatory context

The Technical Actuarial Standards require that actuaries use assumptions and models that are fit for purpose and communicate material risks and uncertainties to clients[1].

In addition, the Pension Regulator's "Code of Practice No. 3: Funding defined benefits" requires trustees to understand the risks to their funding plans, be they related to funding, investment or the employer covenant. The Regulator's more recent guidance on integrated risk management goes further. It encourages trustees to "identify, prioritise and ideally, where proportionate, quantify the material risks" and suggests trustees "put plans in place to monitor and manage the material scheme risks".

This guide outlines how R&E issues can represent material risks to pension scheme funding, the implications for actuarial advice, and practical suggestions to help actuaries meet professional requirements in this area. It may help pensions actuaries and their clients to avoid criticism for not treating climate change as a material risk, thus reducing potential reputational damage[2].

1 | For example, paragraphs 3, 4, 4.5 and 5.5 of TAS 100 (Version 1.0) and paragraphs 12 and 13 of TAS 300 (Version 1.0).

2 | See, for example, Pension Funds Must Confront Climate Risk
http://www.clientearth.org/pension-funds-must-confront-climate-risk/

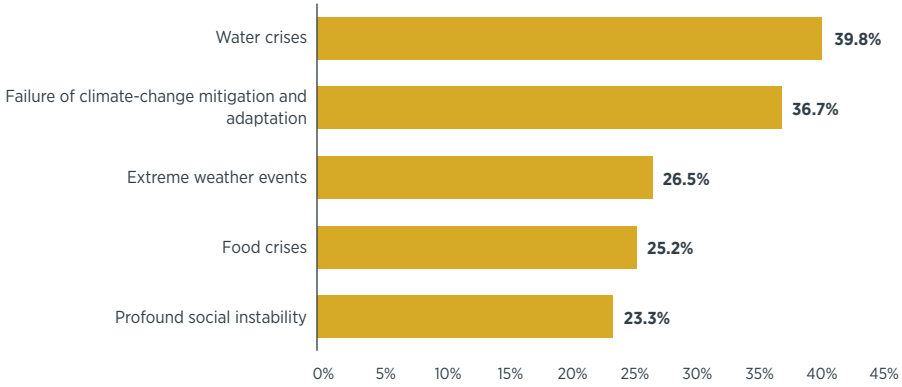
Introduction to R&E issues

All economic activity is fundamentally reliant on the natural environment for energy and raw materials[3].

Moreover, our economic, social and environmental systems are highly interconnected. Environmental damage, natural resource shortages and the decarbonisation of energy production therefore have social and economic repercussions.

In 2016, the World Economic Forum identified the global risks[4] of highest concern over the next ten years using a survey of almost 750 experts and decision-makers drawn from business, academia, civil society and the public sector. R&E risks, and associated social problems, featured prominently in the top five, as shown in Figure 1.

Figure 1. Global risks of highest concern over the next ten years[5]



3 | Natural Capital **http://naturalcapitalcoalition.org/natural-capital/**

4 | They defined a global risk as "an uncertain event or condition that, if it occurs, can cause significant negative impact for several countries or industries within the next 10 years".

5 | World Economic Forum Global Risks Report 2016 **http://www3.weforum.org/docs/GRR/WEF_GRR16.pdf.** Risks are ordered by the percentage of survey participants who mentioned them when asked to select up to five risks of major concern over the next ten years, from a list of 29 global risks.

The most extensively researched area of R&E risks is climate change. The Task Force on Climate-related Financial Disclosures (TCFD), set up by the Financial Stability Board in 2016, identifies two main categories of climate risk: "physical" risks relating to damage caused by the climate itself; and "transition" risks arising from efforts to mitigate climate change by reducing greenhouse gas emissions[6].

There is scientific consensus that warming of the climate is "unequivocal"[7]. In December 2015, at the COP21 conference in Paris, global leaders made their strongest commitment yet to tackle climate change and limit the increase in the global average temperature to well below 2°C above pre-industrial levels. Analysis from climate scientists shows that achieving this aim requires profound and urgent changes to the ways we consume and produce energy[8], implying a fundamental transformation of our economy. The COP21 pledges that governments have already made will have a substantial economic impact, particularly on transport and energy production. However, these pledges are unlikely to be sufficient to meet the 2°C target[9] and periodic strengthening of the pledges is expected. Where will we end up on the spectrum between rapid transformation of our energy system (with associated transition risks) and massive climate change (with associated physical risks)? It is currently very unclear, but all scenarios pose major risks for the financial system and the work of actuaries. For more information about climate risks and opportunities for businesses, see Section B of the TCFD's recommendations report[10].

6 | The TCFD, chaired by Michael Bloomberg, was established by the Financial Stability Board to develop recommended disclosures to help financial market participants to assess and price climate-related risks and opportunities. See, for example, the recommendations of the Task Force on Climate-related Financial Disclosures **https://www.fsb-tcfd.org/publications/recommendations-report/**

7 | IPCC Climate Change 2014 Synthesis Report **https://www.ipcc.ch/news_and_events/docs/ar5/ar5_syr_headlines_en.pdf**

8 | For example, commentary in Nature Geoscience by Prof Kevin Anderson **http://www.tyndall.ac.uk/sites/default/files/duality_in_climate_science.pdf**

9 | United Nations Environment Programme: Emissions Gap Report **http://web.unep.org/emissionsgap/**

10 | Recommendations of the Task Force on Climate-related Financial Disclosures **https://www.fsb-tcfd.org/publications/recommendations-report/**

Examples of R&E risks

R&E issues pose risks and opportunities to the companies that sponsor pension schemes, to investment portfolios and to the wider economy (with implications for funding assumptions). They are often inter-related. For example, water shortages due to excess demand may be exacerbated by changing rainfall patterns due to climate change. R&E risks include:

- Rising and/or volatile energy prices (eg effect of carbon pricing)
- Changes to energy supply (eg leading to stranded fossil fuel reserves)
- Changes to transport patterns (eg distance, mode)
- Resource shortages (eg water, base metals, rare earth metals)
- Crop yields (eg land quality, climate change)
- Property damage (eg flooding, storms)
- Air, water and land pollution (eg clean-up costs, health effects, reputational damage)
- Large scale migration of people (eg to escape the worst effects of climate change).

An earlier IFoA report[11] examined wider R&E risks and how constraints on key resources represent a significant risk to future economic growth. These wider R&E impacts may be particularly relevant to individual sponsors and thus covenant risk.

11 | Resource Constraints: Sharing a Finite World **https://www.actuaries.org.uk/documents/resource-constraints-sharing-finite-world-evidence-and-scenarios-future**

Incorporating R&E in covenant assessments

R&E issues are major sources of risk for businesses, but their importance may be underestimated when assessing covenant strength.

Covenant strength is one of the key considerations for trustees in setting their funding strategy. However, covenant assessments may not adequately reflect R&E risks because they are often hard to quantify, have uncertain timeframes or lie outside the core expertise of most trustees, actuaries and covenant advisers.

Covenant advice already takes account of R&E issues to some extent, for example for companies in the oil, gas and commodity sectors where they are obviously of immediate relevance. However, R&E risks may be overlooked where they are longer-term in nature or primarily arise through indirect routes such as supply chain exposure. Actuaries can encourage trustees to raise R&E issues in their discussions with their covenant adviser and the employer, to ensure that these risks are given sufficient consideration.

Possible questions for the sponsoring employer

- What are the main R&E risks faced by the business over the short-term (within two years), medium-term (two to five years), long-term (five to ten years) and very long-term (beyond ten years)?
- How does the company identify, assess and mitigate these risks?
- What might affect business viability over the term of the recovery plan?
- How does the company seek to achieve a business model which is robust under a wide range of possible futures?

12 | See, for example, Five Megatrends and Possible Implications **http://www.pwc.com/us/en/governance-insights-center/publications/assets/pwc-corporate-goverance-directors-megatrends.pdf**

A comprehensive covenant assessment may require a longer-term perspective, placing greater emphasis on qualitative information and considering business resilience in the face of future uncertainties. This would facilitate inclusion of R&E risks and opportunities, as well as wider social, political and economic trends[12]. It might involve exploring the employer's risk management processes, including how it identifies emerging risks and factors them into long-term business planning.

R&E issues can be incorporated at each stage of the covenant assessment and could lead to explicit monitoring of R&E risks, development of contingency plans, a different level of prudence in the valuation basis, or a change in the recovery plan length. A case study later in this guide illustrates how R&E issues can be included in an integrated approach to pension scheme risk management.

R&E implications for financial assumptions

Pensions actuaries may want to work with their clients' investment consultants to consider how R&E issues could affect the financial assumptions used to value pension liabilities.

R&E experts often comment that markets are not pricing R&E risks correctly and are underestimating the downside risks[13]. As UK pensions actuaries use market yields when setting financial assumptions, and compare the resulting value of liabilities with a market value of assets, the resulting funding positions may not fully reflect R&E risks.

It is increasingly common for mainstream investment approaches to take account of R&E issues, typically alongside social and corporate governance issues[14]. Some research has been carried out to model the potential impact of R&E issues on the future returns from pension scheme investments. However, almost all of it has considered investment returns in isolation, rather than in relation to the financial assumptions that might be used to value pension liabilities. For this reason, the IFoA is commissioning some scenario analysis to help actuaries, trustees and companies to understand the potential impact of R&E issues on investment returns, market yields and inflation expectations, and hence on pension scheme funding.

When might R&E issues affect financial variables?

The direct economic consequences of R&E issues may be limited over the next twenty years, or at least not distinguishable from "noise" in the data. Many UK defined benefit pension schemes will hope to have secured their liabilities by then and therefore may think R&E issues are not important to them. However, indirect consequences are likely

13 | For example, The Value of Responsible Investment **http://www.cisl.cam.ac.uk/publications/publication-pdfs/ilg-the-value-of-responsible-investment.pdf**

14 | Environmental, Social and Corporate Governance (ESG) Made Simple **http://www.plsa.co.uk/PolicyandResearch/DocumentLibrary/0585-Environmental-Social-and-Corporate-Governance-ESG-Made-Simple.aspx**

to be felt sooner as markets anticipate and reprice future expectations. This could easily happen within the next ten years, which is a relevant time horizon for almost all pension schemes. For example, most schemes have investments in the oil and gas sector which are vulnerable to the repricing of stranded assets.

How might pensions actuaries reflect R&E issues in financial assumptions?

One way to think through the funding implications in the context of the specific circumstances of a particular pension scheme is to use scenario analysis. Recent research on the implications for pension scheme investments indicates a range of possible outcomes. A CISL study[15] illustrates an "extreme yet plausible" no mitigation scenario in which equity prices fall by around 50% in the first year after a shock to market sentiment. The CISL study assumes that nominal gilt yields would rise whereas a study by Mercer[16] assumes that the impact would be dominated by other macro-economic factors. However, there are also plausible scenarios in which nominal yields would fall. Further research is therefore needed. In the meantime, the uncertainty arising from R&E issues may be a reason to review the level of prudence in the basis or consider the scheme's potential funding position under a wider variety of scenarios.

As for any area of risk, the funding implications of R&E issues are affected by the covenant and investment implications and vice versa. For example, a scheme that is actively managing R&E risks to its investments and has a sponsor with relatively low exposure to R&E risks, may conclude that no adjustments are needed to the current financial assumptions. Conversely, scheme actuaries may want to suggest a more prudent funding approach in schemes where mitigation of R&E risks is not explicitly addressed in trustees' investment strategy or where R&E is a major source of covenant risk.

15 | Unhedgeable Risk **http://www.cisl.cam.ac.uk/publications/sustainable-finance-publications/unhedgeable-risk**

16 | Investing in a Time of Climate Change **http://www.mercer.com/content/dam/mercer/attachments/global/investments/mercer-climate-change-report-2015.pdf**

R&E implications for mortality assumptions

Current and future mortality rates are the most important demographic factors for funded UK defined benefit pension schemes and the most obviously affected by R&E issues.

How might R&E issues affect UK mortality rates?

Potential R&E effects on death rates over the next few decades include[17]:

- Direct effects of rising temperatures – these are generally expected to reduce UK mortality rates (reduction in cold-related deaths more than offsetting an increase in heat-related deaths).
- Other direct effects of climate change – more extreme weather events (eg flooding) and more insect-borne disease are both expected to increase deaths in the UK, but only by a small amount.
- Beneficial health effects of R&E mitigation – efforts to reduce air pollution and greenhouse gas emissions may improve health by improving air quality, reducing meat consumption and increasing walking and cycling.
- Harmful health effects of R&E mitigation – energy prices could rise (eg due to carbon taxes), making it more expensive to heat homes and import fruit and vegetables.
- Macroeconomic impacts of R&E issues – could increase deaths by reducing economic growth and increasing food prices, resulting in lower healthcare spending and poorer nutrition.

17 | UK Climate Change Risk Assessment 2017 **https://www.theccc.org.uk/uk-climate-change-risk-assessment-2017/**

All of these effects are difficult to quantify. Most quantitative studies to date have focused on air pollution and temperature-related deaths[18]. The mortality supplement to this guide will outline these studies' findings and comment on how the impacts may vary by age and location. In summary, changes in air pollution-related and temperature-related deaths may increase UK life expectancy over the next few decades, with larger changes from pollution than temperature. However, the combined impact of other R&E effects could be more material than either of them and work in the opposite direction. For example, the PLSA has illustrated two "low trend" mortality improvement scenarios which incorporate R&E constraints in their narrative description and indicate reductions in pension scheme liabilities[19].

How might pensions actuaries reflect this in their work?

Current death rates are affected by environmental factors such as cold winters and poor air quality, and these effects are reflected in the data used to construct base tables and initial rates of mortality improvement. The key question for pensions actuaries is how UK death rates may change due to R&E issues, something which is most relevant when setting future improvement assumptions.

Some factors, such as the potential for fewer cold-related deaths and beneficial effects of R&E mitigation, could increase life expectancy. Other factors, such as the potential negative health effects of R&E mitigation efforts and a resource-constrained economy, could reduce life expectancy. Given the uncertainty surrounding these effects, actuaries may wish to consider illustrating a larger range of possible mortality improvements in their advice, including lower life expectancies.

18 | See, for example, Every Breath We Take: The Lifelong Impact of Air Pollution h**ttps://www.rcplondon.ac.uk/projects/outputs/every-breath-we-take-lifelong-impact-air-pollution** and Climate Change Effects on Human Health: Projections of Temperature-related Mortality for the UK during the 2020s, 2050s and 2080s **http://jech.bmj.com/content/68/7/641.abstract**

19 | The NAPF Longevity Model, November 2014 **http://www.plsa.co.uk/longevity-model**

Integrated risk management case study

This case study illustrates how R&E risks to pension scheme funding can be managed by extending a scheme's existing integrated risk management approach.

It uses an idealised, fictional example of a UK defined benefit scheme sponsored by a large supermarket chain where the trustees and sponsor are engaged with R&E issues.

Covenant

When assessing the financial strength of the sponsor, the trustees asked their covenant adviser to consider R&E issues as part of standard considerations such as affordability of contributions and balance sheet strength. Based on a combination of published information, management information and discussions with the employer, the covenant adviser concluded that:

1. The company was managing R&E issues well in the short to medium term (less than five years):
   - It had a market-leading initiative to reduce food waste and packaging.
   - It was building new stores to excellent environmental standards and trialling new approaches to reduce energy use in stores.
   - Its supply chain seemed well diversified, reducing the risk of disruption due to extreme weather events and crop failures.
   - Consumers perceived its environmental credentials to be better than most of its competitors.
2. The company's approach to managing R&E issues in the longer term (more than five years) was weaker:
   - Its environmental initiatives were largely consumer/brand focused and were not well integrated into business planning and risk management.

- Many of its environmental initiatives were isolated exemplars, with limited plans to extend these to the rest of the business (eg retrofit of existing stores).
- Its long-term business plans lacked flexibility, eg they were vulnerable to changing transport patterns due to reliance on out-of-town stores and a centralised distribution network.
- It did not have a long-term vision tp be a sustainable business that was aligned with international targets to keep global average temperature rises below 2°C.

Funding

At the latest triennial valuation, the trustees and employer agreed a five year recovery plan to eliminate the deficit on a technical provisions basis. In other words, the trustees expected the scheme to be fully funded, on a reasonably prudent basis, before R&E issues became a greater concern to the covenant. However, the trustees questioned whether R&E issues were fully reflected in the assumptions used.

The trustees therefore asked the scheme actuary to illustrate the funding position under two R&E scenarios: a "2 degree" scenario in which there is rapid transformation to a low carbon energy system; and a "4 degree" scenario in which little effort is made to mitigate climate change or other R&E issues[20]. The scheme actuary worked with the investment consultant and covenant adviser to consider how investment returns and affordability of contributions respectively might be affected in these scenarios. The worse scenario showed a doubling of the deficit and a tripling of the recovery plan length.

Investment

Historically, the trustees had relied on their investment managers to manage R&E risks to their investments as appropriate. However, they had little insight into what this meant in practice and how effective the managers were being. They worked with their investment consultant to ask their investment managers probing questions on how they managed R&E risks. As a result of these discussions and the scenario analysis outlined above, the trustees:

- Decided to continue their existing plans to de-risk the scheme's investments.
- Informed their investment managers that they expected them to integrate R&E issues into investment processes where they had the potential to be financially material[21], and that insufficient attention to R&E could result in the retendering of their mandate.

20 | The IFoA is commissioning some scenario analysis that will assist actuaries in carrying out this type of analysis.

21 | Law Commission guidance for trustees **http://www.lawcom.gov.uk/wp-content/uploads/2015/03/lc350_fiduciary_duties_guidance.pdf**

- Requested an annual report from their investment managers summarising how they address R&E issues, with particular attention to the R&E risks identified through the covenant assessment.
- Introduced a small allocation to a "sustainable opportunities" equity fund to hedge some of the risks elsewhere in their investment portfolio and offer upside potential.
- Asked their scheme actuary to consider how the actions they had taken to reduce R&E risks to their investment portfolio might feed through into the discount rates used for funding purposes.
- Updated their Statement of Investment Principles to reflect the actions taken.

Ongoing monitoring

The trustees added R&E to their regular monitoring processes:

- Environmental key performance indicators are now included in their quarterly covenant monitoring dashboard (eg energy use and food waste).
- There is ongoing dialogue with the company to understand its inclusion of R&E issues in risk management and long-term business planning.
- The R&E funding scenarios are refreshed annually.
- The investment subcommittee review R&E risks and developing industry practice annually.

They also started to include R&E issues within annual member communications, to keep members informed of the actions being taken.

Summary of possible actions for pensions actuaries

Here are some actions for pensions actuaries to consider taking, to the extent that they are relevant to their clients and it is proportionate to do so.

- Learn more about R&E risks to be equipped to discuss them with clients. See the footnotes to this guide for suggested reading and look out for the forthcoming supplementary reports.
- Encourage trustees to raise R&E issues in discussions with their covenant adviser and the employer.
- Find out how your clients are addressing R&E risks in their investment processes and consider whether your funding advice is consistent with these risks.
- Review whether your models adequately incorporate R&E risks and whether the documentation is adequate.
- Use scenario analysis to explore uncertainty in financial and demographic factors arising from R&E issues.

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