



**BARNETT
WADDINGHAM**
beyond the expected

Lincolnshire Pension Fund

Climate analysis report as at 31 March 2022

Barnett Waddingham LLP
17 October 2022



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Executive summary

There is clear scientific evidence that human activities are causing climate change. The Lincolnshire Pension Fund (the Fund) faces potential risks from both the physical effects of climate change and the transition to a low-carbon economy.

Climate risk may manifest itself through many of the risks which the Fund already faces such as inflation risk and investment risk, which can potentially cause a deterioration in the Fund's funding position.

The purpose of this paper is to consider climate risk in the context of the Fund's 2022 actuarial valuation. This paper sets out climate scenario analysis on the assets and liabilities of the Fund based on the data and information received for the 2022 actuarial valuation.

The key features of this report are:

Climate risks

- For our analysis we have grouped climate risks into:
 - Physical climate risks
 - Transition climate risks

Other risks

- Climate risk can manifest itself in several other risks that the Fund is already exposed to such as:
 - Employer covenant risk
 - Investment risk
 - Inflation risk
 - Mortality risk
 - Legislative risk
 - Operational risk

Key Principles

- Agreed between the four actuarial firms, the Government Actuary's Department (GAD) and the Department of Levelling Up Housing and Communities (DLUHC)
- Climate risk will feature as part of the Section 13 review of the 2022 valuations

Climate scenarios and key metrics

- The BW framework tests four scenarios (early action, late action, no additional action, far too little too late)
- **Based on the scenario testing, we are comfortable with the current level of prudence included in our proposed funding assumptions**

Introduction and background

This paper sets out climate scenario analysis on the assets and liabilities of the Lincolnshire Pension Fund (the Fund) in-line with the Key Principles agreed with the Government Actuary's Department (GAD) for the purpose of the 2022 LGPS valuations. In producing this analysis we have also considered the requirements under the Occupational Pension Schemes (Climate Change Governance and Reporting) Regulations 2021 however, these regulations do not apply to the LGPS. We anticipate that the equivalent regulations that will ultimately apply to the LGPS will contain similar requirements.

The purpose of this report is to present information to help Lincolnshire County Council, as the administering authority to the Fund, consider climate risk in the context of the Fund's 2022 actuarial valuation. This report also sets out measures the administering authority could take to manage climate risk.

The analysis focuses solely on climate related attributes and combines a mixture of qualitative and quantitative assessments, considering the Fund's investment strategy and other unique characteristics.

The results of the analysis can be used by the administering authority to consider the Fund's exposure to climate risks and opportunities. It may feed into the Fund's Task Force on Climate-related Financial Disclosures (TCFD) report, when required.

The analysis considers the projected funding level under various climate-related scenarios, alongside the (proposed) 2022 valuation basis for the Fund. The results thereby allow the administering authority to consider whether the 2022 valuation funding strategy is sufficiently robust in the context of this climate scenario analysis and any potential contribution impacts.

The climate scenarios used are set out in the body of this report and relate to specific targets and global temperature changes, although we recommend these are taken as illustrative only. Qualitative commentary is included throughout to help provide context to the analysis, covering the impact on the Fund's assets, liabilities, and employer covenant.

This advice complies with Technical Actuarial Standard 100: Principles for Technical Actuarial Work (TAS 100) and Technical Actuarial Standard 300: Pensions (TAS 300) as issued by the Financial Reporting Council (FRC).

Climate risks

For our analysis, we have grouped climate risks into the following two categories:

Physical climate risks

This is the direct risk associated with an increased global temperature. This may include acute physical risks (such as heatwaves, landslides, floods, wildfires and hurricanes) and chronic physical risks (such as rising sea levels, changes in precipitation and more volatile weather events). These risks may put an invested asset (or an asset of an underlying company) directly at risk of damage; may cause disruption throughout supply chains and the global economy and/or may lead to higher costs on invested assets or underlying companies (such as insurance and litigation costs).


Transition climate risks

This is the risk associated with the transition to a low carbon economy. The main risk is assumed to be the potential impact of the enforcement of carbon taxes and policies (it is assumed that this risk is higher for regions and sectors with a higher level of, and hard to abate, emissions). However, other risks may include wider policy and regulation risk, technological risk, market risk, litigation risk, and reputational risk.

Physical risks	Transition risks
<ul style="list-style-type: none"> • Droughts • Floods • Wildfires • Sea level rises • Loss of biodiversity • Heatwaves 	<ul style="list-style-type: none"> • Carbon tax • Constrains on consumption of natural resources • Policy changes in land use and farming practices • Impact on labour skills development • Reputational risk

Other risks

Climate risk can manifest itself in several other risks that the Fund is already exposed to such as:

Other risks	Current mitigation and potential actions
<p>Employer covenant risk:</p> <p>The impact on employer covenant is possibly the most immediate risk for most pension schemes, including the LGPS. The key risk being that if an employer is unable to meet their financial obligation the cost will fall to the other employers in the Fund. Different employers within the Fund are likely to be affected at different times and for different reasons due to their own individual characteristics.</p> <p>It may be appropriate for the Fund to factor in any concerns over particular employers as a result of climate change into the funding valuation. Inevitably, certain LGPS funds and employers are likely to be more at risk from these changes than others. For example, bus operators and logistics companies may have to evolve considerably to satisfy new net zero requirements. Other companies or employers, such as schools and leisure centres may be affected by supply chains if those are disrupted.</p>  <p>Some areas are at greater risk of flooding and extreme weather events than others, affecting funds as a whole. Or local authority budgets may be affected by non-pensions issues surrounding climate change. This will all have an impact on covenant: how able and willing employers are to pay contributions to the Fund.</p> <p>The Fund should monitor the strength of the covenant of the participating employers over time, so that any sudden changes in any employer's position can be mitigated. The Fund should consider how they could factor climate risk into any employer covenant review.</p> <p>At this stage, without the relevant data it is difficult to factor climate risk into employer covenant reviews, but if you are aware of individual employers who may pose an increased risk due to climate change, then we would recommend that this is also considered as part of any covenant review and, consequently, in the funding strategy.</p>	<p>The Fund regularly monitors the strength of the covenant of the participating employers as part of each actuarial valuation.</p> <p>Currently, any employer covenant assessment, in terms of the impact of climate change, is likely to be qualitative due to lack of robust and relevant data.</p> <p>The Fund could focus on physical climate risks which could lead to high costs for employers as a result of insurance and litigation costs.</p> <p>It may be easier for the Fund to consider these risks by sector rather than by individual employer.</p>

Investment risk:

For funding purposes, the discount rate used to value the Fund's liabilities reflects the expected return on the investments that the Fund holds (reduced by a margin for prudence). Funds generally invest in equities, bonds and property, along with other alternative assets. The price of these depends on the market outlook of how each company underlying the investments will perform in the future. To the extent that the market has anticipated the effect of climate risk on each company, it is already reflected within the discount rate.



However, climate risk is complex and whilst it is easy to imagine the various ways that climate change could impact an energy company, for example, it becomes less clear with other companies such as those in the service or healthcare sectors. If the market cannot anticipate or agree on the impact, then it is *unlikely* this will be priced into today's market value or return expectation – in particular where investors' timeframes vary.

Allowance is made in the funding assumptions for the expected long-term performance of risk-seeking asset classes such as equities, but an explicit allowance for climate risk has not yet been included. There is a risk that these returns will not be achieved in practice due to climate risk.

Some funds already have a net zero pledge in place and therefore both funding strategy and investment strategy need to be aligned in order to achieve this. The Fund should therefore regularly review the investment strategy specifically with regards to climate risk, to ensure the risks are understood and managed appropriately.

The Fund receives regular updates from their investment advisers and asset managers about how climate risks are allowed for in the Fund's investment strategy.

The Fund's policy on environmental, social and governance (ESG) considerations, including climate change, is included in the Fund's Investment Strategy Statement.

The Fund may wish to consider any opportunities as well as risks emerging from climate change in incorporate those into the investment strategy.

The Fund regularly monitors the funding position of the Fund using our online intervaluation funding monitoring system, Monitor.

Inflation risk:



Inflation is another of our key assumptions, with the majority of LGPS benefits increasing in line with the Consumer Prices Index (CPI) each year. No one knows how inflation will move over the long term. However, we look to the bond market to gauge the market's expectations of this to set our assumption for the valuation.

As is the case for the discount rate, however, if the inflationary impact of climate risk is not being priced into the bonds in the market, then this will have a knock-on effect on our inflation assumption – the impact of which is, again, unknown. We have not made any additional adjustments to our inflation assumption for the 2022 valuation with regards to climate risk. There is a risk that long-term inflation

The Fund periodically reviews the level of inflation risk inherent in the Fund's investment strategy with their investment advisers.

will be different to assumed for the valuation due to climate risk. If inflation is higher, this will increase the cost of providing the benefits.

The Fund should therefore consider the inflation risk present within the Fund when reviewing the investment strategy.

Mortality risk:

It is easy to see that climate change will have an effect on how long we will all live, but it's more difficult to gauge exactly how. The list of implications of how it will affect the world is long (and growing) and includes risks like zoonotic pandemics such as Covid-19. But how much of that will impact on the life expectancy for members of UK pension schemes? How quickly will an effect be seen? And will it vary by location?



For example, it is possible that in the UK, longevity might actually improve due to climate change. If winters are milder in future, then that could mean fewer deaths. On the other hand, if our summers get too hot then that might not count for much.

It is not possible to predict with certainty how long members of the Fund will live and, if members live longer than expected, additional contributions will be required to prevent a deterioration in the Fund's financial position. The Fund should therefore keep the mortality assumptions under review.

The Fund takes advice from their Fund Actuary on appropriate changes to the Fund's mortality assumptions.

Legislative risk:

Changes in legislation could change the approach that the Fund has taken to managing climate change.



Task Force on Climate-related Financial Disclosures (TCFD) is a framework that aims to help companies and investors measure, manage, and report their climate-related risk exposures and opportunities in a consistent manner. At the time of this report, we are still awaiting the consultation regarding the proposals for new requirements for assessing and reporting on climate risks in line with the recommendations of the TCFD and how they apply to the LGPS. Therefore, we have no new regulations or guidance to inform this analysis. However, we have agreed an approach with DLUHC and GAD for the 2022 actuarial valuations.

The Fund receives regular updates on legislative matters from their advisers.

Further to this, funds face additional risks through the secondary effects of policies introduced by governments. For example, The European Union's (EU's) expansion in 2021 of the Emission Trading Scheme (ETS) made companies pay for the cost of carbon, including the car industry and domestic heating and the carbon border adjustment mechanism requiring goods imported into the EU to be covered by equivalent carbon pricing applicable to production of the same goods within the EU, under the ETS.

These types of policies increase the cost of production, affecting businesses and consumers and may affect the investment returns received.

The Fund should therefore take professional advice to ensure that they are aware of any changes in legislation and the impact of these changes on the Fund's funding position.

Reputational risk:



LGPS funds are expected to take action to mitigate climate risk. They are under increasing pressure from the general public to invest sustainably and to communicate their net zero targets. It is easy for funds to be compared against each other in their progress and therefore those funds making the least progress will be highlighted.

As mentioned, funds are being asked to make an allowance for climate risk in the 2022 valuations. Any challenges to this requirement are likely to be highlighted and/or flagged in the next Section 13 report.

By engaging with this scenario analysis, the Fund has met the requirements of the Section 13 review and therefore should not be highlighted (for this reason) in the final report.

Operational risk:



Although many physical implications of climate change are expected to play out over decades-long timescales, in the UK we are already seeing increased short-term localised disruption due to flash floods and power cuts. Depending on the location of critical services, these have the potential to disrupt the day-to-day operations of the Fund, including the payment of pensions to members. It is likely that in future such events will increase both in frequency and duration.

Transition effects may also impact the running costs of the Fund (in the same way that the current spike in gas and petrol costs, although driven by non-climate-related factors, will be increasing expenses).

The Fund may already have procedures in place covering Business Continuity Planning for short-term disruption, but these may need to be reviewed to ensure that they are sufficiently robust in light of the expected increase in frequency and duration of such disruptions, particularly in the context of increased working-from-home.

Key Principles

Barnett Waddingham has worked with GAD and the other actuarial firms to agree a set of Key Principles for how LGPS funds would undertake climate change scenario analysis as part of the 2022 valuations.

The Key Principles behind the climate scenario analysis have been agreed in order to assist GAD in their 2022 Section 13 review of the LGPS funds. In their 2019 Section 13 [report](#) dated November 2021, GAD noted:

“DLUHC will be consulting on proposals for new requirements for assessing and reporting on climate risks in 2021 in line with the recommendations of the Taskforce on Climate-related Financial Risks (TCFD), and new regulations and guidance are expected to follow. Climate risk will be a focus in future section 13 reports. GAD will facilitate dialogue and engagement with DLUHC, actuarial advisors and the SAB prior to publication of the 2022 valuations to ensure a consistent approach is adopted.”

DLUHC’s consultation on governance and reporting of climate change risks was launched 1 September 2022 and closes on 24 November 2022. Barnett Waddingham are currently considering the consultation and will be submitting a response.

The Key Principles agreed with GAD for 2022 valuation reporting are split into four areas:

Key Principles	Fund/BW action
<p>1. Scope of the analysis</p> <p>The scope was deliberately kept wide to reflect the various levels of that progress that different funds will have made on their journey in managing climate risk. It was agreed that any analysis should be able to identify the impact of transition risk (shorter term) and physical risks (longer term) on the potential funding outcomes.</p> <p>The purpose of the analysis is to test whether the Fund’s funding strategy is sufficiently prudent in the context of the scenario analysis considered and therefore any potential contribution impacts.</p> <p>The analysis should be supported by qualitative commentary on what potential actions are being taken to improve resilience to climate change and the potential implications.</p>	<p>The scenario analysis within this report separates the impact into transition risks and physical risks.</p> <p>This report comments on the suitability of the funding strategy.</p> <p>Qualitative commentary is included in the “Other risks” section.</p>

Scenarios to be considered and "expected" funding level

As a minimum, each fund should select two scenarios to consider: "Paris-aligned" and higher temperature outcome, and compare these to the funding basis.

"Paris-aligned" is an optimistic basis which assumes that good progress is made towards the ambitions made in the 2015 Paris Agreement.

2.

A higher temperature outcome assumes that no new climate policies are introduced beyond those already agreed, resulting in a growing concentration of greenhouse gas emissions and a larger increase in global temperatures.

Funds should also consider the extent to which the scenarios will consider additional elements such as the potential impact on life expectancy changes and employer covenant.

The scenario analysis in this report looks at four scenarios. Our "early action" scenario aims to represent a "Paris-aligned" scenario, and our "no additional action" scenario represents a higher temperature outcome. We also consider a "late action" and a "far too little too late" scenario.

The impact on the funding position of each scenario is then considered in the "Projected funding level" section of this report.

Additional elements are described in the "Other risks" section.

Time horizon and output

3.

The output from the scenario analysis will include consideration of the results (which will include the funding level on each scenario modelled) over a period of at least 20 years to ensure there is sufficient recognition of the transition and physical risks of climate change.

The scenario analysis looks at the impact on funding over a period of more than 20 years.

Reporting

4.

A summary of the analysis should be included in the final valuation report. GAD will be looking to confirm that the two scenarios have been considered in a way that funds and other readers can understand. It may also need to be referenced in the Section 13 dashboard included in the final valuation report.

The Fund's approach to managing climate risk in the valuation, should also be set out in the Funding Strategy Statement (FSS).

BW will continue to engage with GAD on the 2022 reporting requirements in order to ensure consistency with the other LGPS funds. BW would also be happy to provide wording for inclusion in the FSS.

Climate scenarios and key metrics

The climate scenarios within Barnett Waddingham’s in-house climate scenario framework consist of four scenarios, which are broadly based on those used in the Bank of England’s Biennial Exploratory Scenario (further details of which can be found in Appendix 1). A brief description of these scenarios is set out below.

Scenario	Brief description	Assumed temperature rise* by 2100	Approx. carbon price** 2030/2050	Physical risk	Transition risk
Early action (Paris-aligned)	Transition to net zero begins in year one, alongside assuming carbon pricing and policy intensifies over time. The long-term average return under this scenario is equivalent to the best estimate return calculated for the 2022 valuation of the Fund, effectively assuming the market is pricing in early action on climate risks.	1.6°C	\$300/\$900	Limited	Medium
Late action	Policy implementation is more sudden and disorderly due to delay, resulting in disruption over the medium term.	1.6°C	\$30/\$1,000	Limited	High
No additional action	No new climate policies are introduced beyond those already agreed, resulting in a growing concentration of greenhouse gas emissions and a larger increase in global temperatures. This results in changes in precipitation and increases the frequency and severity of extreme weather events. A temperature rise of 2.3°C is assumed to happen over the short term.	4.1°C	\$30/\$20	High	Limited
Far too little too late	This scenario has been created by Barnett Waddingham and accumulates the impacts of a “late action” scenario and a “no additional action” scenario. The scenario considers what may happen if the implementation of policies is more sudden and disorderly due to delay and, despite action, a larger increase in global temperatures still occurs. (It should be noted however that even this scenario does not represent a “worst case”.)	4.1°C	\$30/\$1,000	High	High

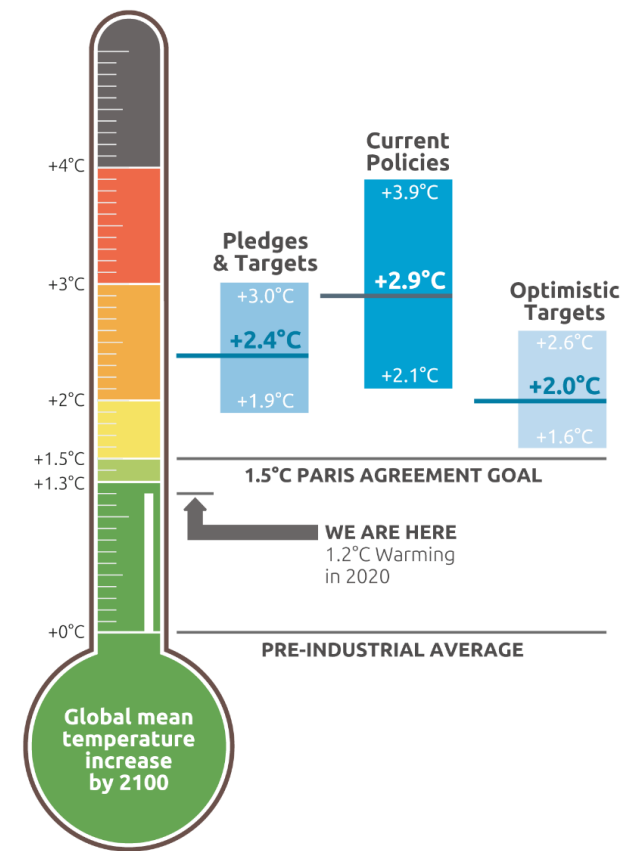
* Relative to pre-industrial levels

** Approximate assumed price in 2010 real terms to offset one ton of carbon dioxide in 2030 and 2050, respectively. Like other commodities, price increases with demand.

We do not expect any one of these scenarios to play out exactly in full and actual experience will differ from that projected within the scenarios. However, these illustrations can be used as a guide to consider climate risk within the Fund’s funding and investment strategy, thereby helping the Fund to monitor, manage and potentially mitigate specific risks.

The picture to the right shows how global temperature rises could change, based on national policies and pledges, giving context to the temperature rise considered under each scenario in this report.

The picture has been taken from the Climate Action Tracker (based on national policies and pledges end of December 2019) ourworldindata.org



Analysis of the Fund's assets

Using the Fund's long-term investment strategy, as provided to us for the 2022 valuation, we have assessed the climate risk impact under each of the scenarios set out above. The scenarios cover a range of outcomes, from global warming being limited to global warming increasing significantly. However, in reality, the risks may be significantly more material than implied within these scenarios.

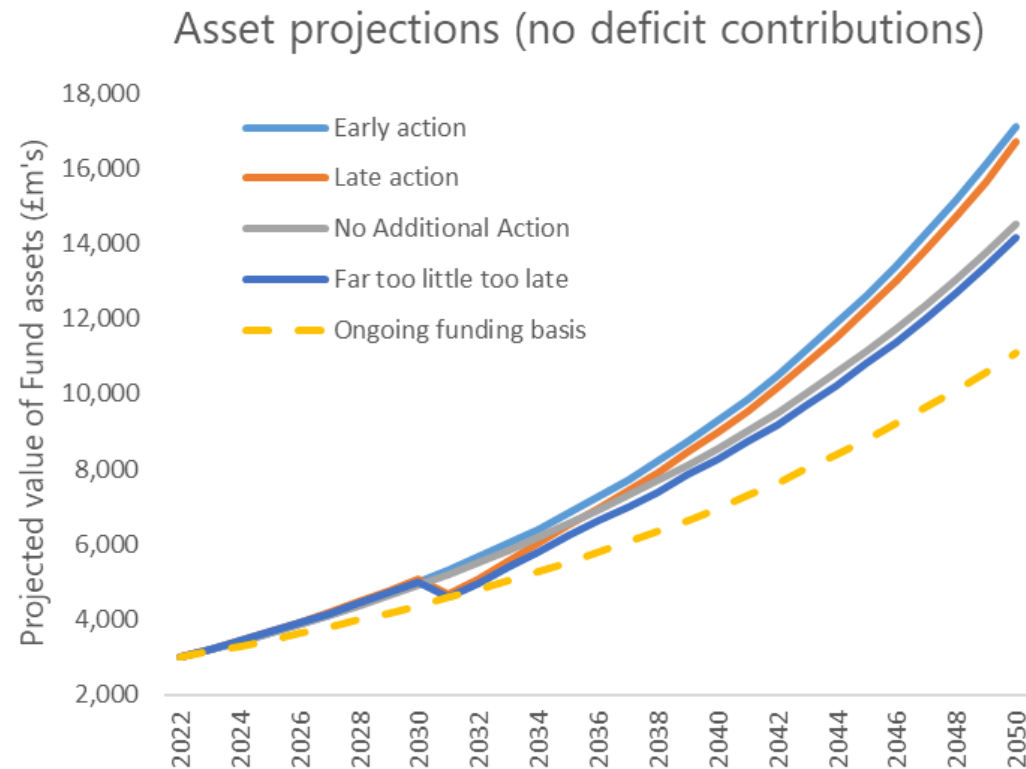
All scenarios effectively consider the current market mispricing of assets and future returns. This may be the case for a vast number of reasons, for example, due to lack of climate risk data for investors, stranded assets, impact on yields through issuance of greater bond supply, or currency risk if not all countries adapt equally.

The Bank of England Biennial Exploratory Scenario data used for our projections utilises a "top-down" approach (that is, at a macroeconomic level), rather than a "bottom-up" approach (at a company level). A bottom-up approach may provide for more granular results, however, given the quality and availability of data, the expectation that climate impacts will be systemic and the nature of UK pension scheme investments (that is, they are primarily invested in pooled funds with various underlying asset classes and numerous securities), a top-down approach was viewed as being more appropriate.

Barnett Waddingham's analysis looks at the impact of climate risk on each asset class at a given point in time. We have grouped the Fund's investment strategy into the same groupings used for the purpose of deriving the discount rate assumption used in the 2022 actuarial valuation and applied the Bank of England Biennial Exploratory Scenario data to each asset class. A breakdown of the asset projections by asset type under each scenario has been included in Appendix 2.

For the avoidance of doubt, our asset projection does not make any allowance for any steps that the Fund may have already taken to reduce emissions and manage climate risk. Further "bottom-up" analysis would be required to incorporate this. Nor does it allow for adjustments at future valuation dates.

The graph below illustrates the estimated pathway of the Fund's assets under each scenario. A projection on the ongoing funding basis is also included for comparison.



The "early action" scenario is used as the base case, and each of the other scenarios are considered relative to this scenario over the period to 2050. The difference between the projected assets under the "early action" scenario and the ongoing funding basis reflects the prudence allowance included for ongoing funding only.

The Fund's projected assets under each scenario differs and the assets under the ongoing funding basis sit below those on any other scenario in the long-term. This shows that in the long-term, the asset return assumed for the ongoing funding basis is sufficiently prudent to withstand the risk of these climate scenarios (albeit the prudence allowance is intended to act as a buffer against other non climate-related risks too).

However, in the medium-term, assets projected on the “late action” and “far too little too late” scenarios fall below those projected in line with the ongoing funding basis. These scenarios assume climate policy implementation is more sudden and disorderly, resulting in disruption and a sharp fall in returns while policies bed in (during the early 2030s).

In practice, we will continue to monitor the return on the Fund’s assets and any changes in our best-estimate outlook will be incorporated into the assumptions used for future valuations. If, for example, our best-estimate outlook shifts downwards towards the late action scenario then our funding projection would shift downwards too (maintaining the same level of prudence as we do currently).

Projected funding level

The Fund's liabilities are also subject to climate risks and opportunities. For example, inflation may increase due to resource constraints or decrease due to lower economic growth, life expectancies might be impacted by physical climate risks (e.g, drought, flooding), or operational costs might increase due to changes in the supply and demand of certain resources.

In this section we consider the impact of the different scenarios on the Fund's overall funding position.

Conditions of analysis

Due to the current lack of robust data, no assumption has been made for potential climate change impacts on mortality in our scenario analysis. We will keep this under review and consider any new information for future reviews of this analysis.

In our calculations we have used member data and asset data provided by the administering authority as part of the 2022 actuarial valuation. We checked the data for reasonableness as part of the valuation process and are happy that the data is sufficiently accurate for the purposes of this analysis.

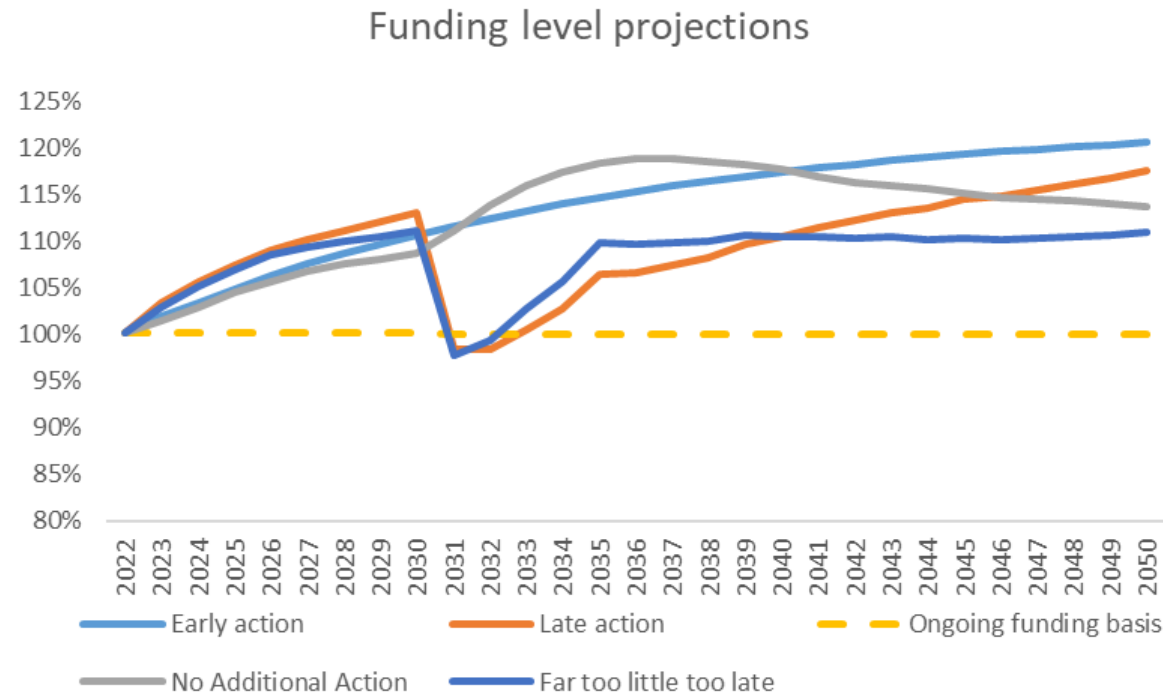
Results

The Fund's liabilities have been projected based on the data and assumptions used for the 2022 valuation. The ongoing funding basis projection assumes the (proposed) 2022 valuation assumptions play out in practice, with no adjustments made at future valuation dates. Whereas the early action scenario assumes that our 'best estimate' assumed return is achieved on the Fund's assets, that is the 2022 discount rate with the margin for prudence removed. The other climate scenario projections are then calculated with reference to the early action scenario using The Bank of England Biennial Exploratory Scenario data.

In our funding model, both the discount rate and benefit increases are linked to the assumed level of inflation. Because of this, the impact of changes in projected inflation on the liability value are minimal. Therefore, the projected values of liabilities are broadly similar across all climate scenarios.

In reality, it is unlikely that there would be this level of disparity between the scenarios over the long-term, as contributions and assumptions would be revisited every three years as part of the Fund's actuarial valuation. However, for the purposes of this analysis, we have calculated the projections in line with the (proposed) 2022 valuation assumptions.

Combining the liability projections with the asset projections, the graph below shows how the Fund’s funding level is expected to vary across the scenarios and time periods. This projection assumes that secondary (deficit) contributions are paid to restore the funding level to 100% over a rolling 16 year period on each scenario.



Over the [short-term \(up to 10 years\)](#), the funding level is influenced most by the impact on asset returns under a “late action” and a “far too little too late” scenario, driven by the assumption that physical risk is present from day 1.

Over the [medium-term \(10 – 20 years\)](#), the funding level is influenced most by the impact on asset returns under a “late action” and “far too little too late” scenario, driven by the introduction of sudden and disorderly policies. However, these impacts are somewhat recovered over time.

Over the [long-term \(20 years or more\)](#), the funding levels under all scenarios become less volatile but the outlook is most positive under the “early action” and “late action” scenarios under which the funding position continues to improve.

The Fund may be able to reduce the impact experienced on its funding level across each of the scenarios and time periods by considering the Fund’s investment strategy and using this report in discussions with their investment advisers. As part of any such review, the Fund should consider the other risks and opportunities to which the Fund is exposed (as detailed earlier in the report).

Employer contributions

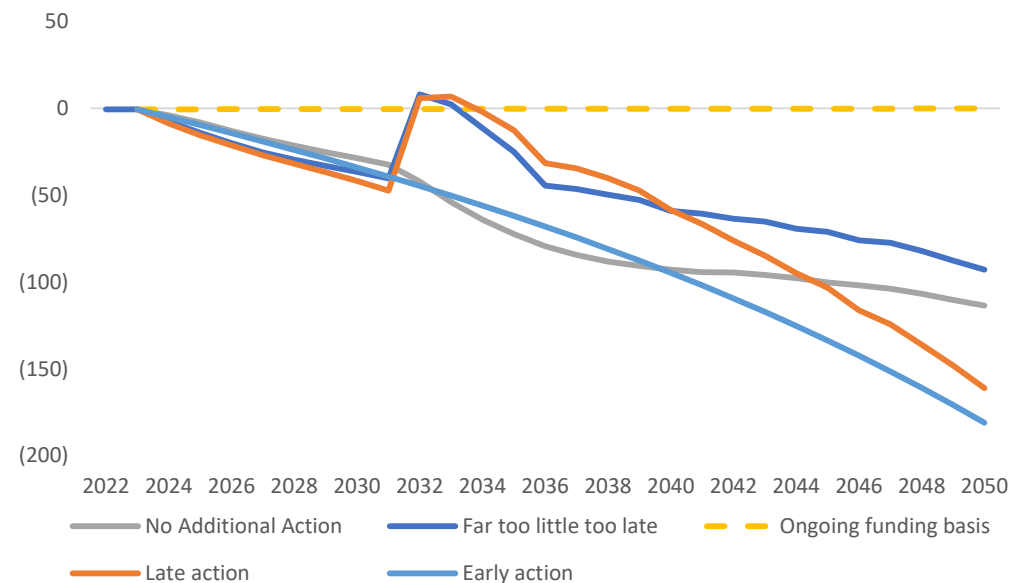
Our projection assumes that secondary (deficit) contributions are paid to restore the funding level to 100% over a rolling 16 year period on each scenario. This means that for the purpose of our projections, the recovery period never gets any shorter. This also means that different secondary contributions are assumed to be paid under each scenario.

The graph to the right shows the projected secondary (deficit) contributions required under each scenario, calculated assuming a rolling 16 year recovery period (please note that the recovery period is yet to be finalized by the Fund). As we are assuming a rolling recovery period, the secondary contributions on the ongoing funding basis never fully disappear in these projections. In practice, the contributions payable and associated recovery period would be reviewed at each funding valuation and adjusted as appropriate, i.e., the recovery period is unlikely to remain fixed.

The graph illustrates that, the ongoing secondary contributions are projected to be insufficient in the medium-term should the “late action” or “far too little too late” scenarios play out in practice and large injections of cash would be required.

We suggest the Fund monitors the situation over the next valuation period, carrying out further climate scenario analysis as and when new information become available. Monitoring of the funding position is currently done on a regular basis using our Monitor software which is our online intervaluation funding monitoring system.

Projected required deficit contributions (£m p.a.)



Final comments

The Fund has varying levels of climate risk across its assets and liabilities.

Our analysis considers the Fund's funding level under different climate scenarios and there are varying impacts. The largest impacts are experienced over the medium term, under a "late action" and "far too little too late" scenario (primarily driven by transition risks) and over the long-term under a "far too little too late" scenario (primarily driven by physical risks).

The ability to mitigate the climate risk impact on the Fund's liabilities is limited, although consideration should be given to the 2022 valuation basis used to calculate the contributions paid by employers to the Fund, to ensure the administering authority is comfortable with the level of risk being taken.

Climate risk is only one risk that the Fund faces. The prudence allowance included in the valuation assumptions is intended to act as a buffer against all downside risks, not just those relating to climate change.

Based on the scenario testing in this report, we are comfortable with the current level of prudence included in our proposed funding assumptions.

Over the short-term, our analysis shows there is some leeway to allow the Fund time to react to worsening conditions and put appropriate measures in place. We will of course keep this under review and, if at subsequent valuations it looks as though we are going down a "late action" type path, we will update our assumptions accordingly.

Next steps

Climate change and managing climate risk is becoming increasingly important. With draft regulations on the way, it is anticipated that it will become necessary for administering authorities to consider climate risk in relation to the Fund.

There are a number of actions set out in this paper, which the Fund could consider in managing climate risk including:

- Different employers are likely to be affected by climate change in different ways, and at different times. The administering authority should stay alert to this and continuously monitor employer covenant to ensure that any changes in covenant are revealed. Any changes should be dealt with as required and as soon as possible, in order to best protect the Fund and the other participating employers. Given the lack of robust data, the Fund may choose to consider climate risk by sector, rather than by individual employer.
- The Fund should regularly monitor the funding position of the Fund. This is currently done using our Monitor software.

- The administering authority may also wish to consider the climate risk and opportunities of the Fund's assets and investment strategy. This should be discussed with the Fund's investment advisers. Barnett Waddingham's Investment Consulting team would also be happy to carry out a more in-depth analysis of your investment strategy for you, if desired.
- The Fund should take advice from their Fund Actuary on appropriate changes to the Fund's mortality assumptions at future valuations.
- The Fund should ensure they are in receipt of regular updates on legislative matters from their advisers.

We look forward to discussing this paper with you in more detail.



Melanie Durrant FIA
Partner
Barnett Waddingham LLP

Appendix 1 Approach to climate scenario analysis

Overview

Barnett Waddingham's in-house climate scenario framework utilises the [Bank of England's Biennial Exploratory Scenario](#) to undertake climate scenario analysis. These scenarios build upon a subset of the [Network for Greening the Financial System \(NGFS\)](#) climate scenarios, which have been produced in partnership with leading climate scientists and make use of climate economic models.

The Bank of England Biennial Exploratory Scenario is not exhaustive concerning asset classes, regions, sectors, funds, macro-economic indicators and scenarios. Therefore, Barnett Waddingham's in-house climate scenario framework combines a mixture of qualitative and quantitative methods to assess climate impacts across all required areas.

The Bank of England Biennial Exploratory Scenario also utilises a "top-down" approach (that is, at a macroeconomic level), rather than a "bottom-up" approach (at a company level). A bottom-up approach may provide for more granular results, however, given the quality and availability of data, the expectation that climate impacts will be systemic and the nature of UK pension scheme investments (that is, they are primarily invested in pooled funds with various underlying asset classes and numerous securities), a top-down approach was viewed as being more appropriate.

Nevertheless, Barnett Waddingham's framework does allow for a bottom-up approach to be incorporated at Fund level, by breaking down the Fund's long-term investment strategy, although we have not done so for this analysis. If the Fund would like to receive more in-depth analysis of their investment strategy, we would be happy to liaise with our Investment Consulting team to prepare this for you. Detailed information on the breakdown of your asset strategy would be required.

Our analysis does not consider the impact of climate change on mortality due to the current lack of data in this area.

Climate scenario modelling is in its infancy and is expected to undergo significant development over time. Furthermore, climate scenario data quality is generally considered spurious and non-comprehensive. As a result, we intend to develop and build upon this analysis over time as data quality and availability improves.

In creating this framework, Barnett Waddingham has recognised these limitations and aims to address them by creating a solution that combines quantitative and qualitative analysis.

Key assumptions

Current market pricing

The Bank of England data includes projected returns and yields on several asset classes up to 2050, under three scenarios – “early action”, “late action”, and “no additional action”. Barnett Waddingham’s model examines the differences between these projections under each scenario and applies them to our own funding model, to allow for comparison with the Fund’s ongoing funding basis, rather than using the Bank of England data in isolation. To do this we need to make an assumption regarding what, in respect of climate change, is already priced into the markets.

We generally believe that the market is pricing in somewhere between the “early action” scenario and “late action” scenario.

We have spoken to several modelling providers who have provided a range of answers. Very few providers model a “base case” representative of the market’s assumed view. However, from what we have seen, modelling providers that do take into account a market “base case” scenario tend to show a positive relative impact under an “early action” scenario, implying that they agree that an “early action” scenario is more optimistic than what the market expects.

We also believe that, as time goes on without a global consensus on climate policy, it is likely that the market will increasingly price in a “late action” scenario.

Exactly how much the market is pricing in at any one time is difficult to predict. Therefore, for our analysis, we have taken a pragmatic approach and, instead of trying to second guess the market, we have used our “early action” scenario as our base case (i.e., equal to our best estimate of market assumptions for the 2022 valuation and excludes any prudence allowance). This means that our base scenario may be seen as somewhat ‘optimistic’, but results in our risk measures being conservative (as we consider downside risk relative to this scenario).

Projected employer contributions

Employer contributions comprise of primary contributions (covering the annual cost of accrual of benefits) and secondary contributions (as an adjustment to the primary rate as required i.e. payments towards any deficit that may exist). For our projections we have calculated the cost of accrual under each scenario and assumed that primary contributions will be paid in line with this in each case. Similarly to benefit increases, our discount rate is linked to CPI inflation, and therefore the primary contributions required under all scenarios is assumed to be broadly constant.

The secondary contributions allowed for under each scenario have been calculated to recover the deficit under each scenario over a rolling 16 year period (although this has not yet been agreed by the Fund). We have done this to better reflect the action the Fund may be required to take in adjusting contributions under each scenario if that scenario played out.

The funding projections shown are therefore not entirely indicative of what would happen in practice – in reality, three-yearly funding valuations would be carried out and the contributions payable would be recalibrated in line with the funding position and the Funding Strategy Statement, adjusting the recovery period appropriately. However, the projections do still highlight a wide range of outcomes that may be possible, depending on how climate matters progress.

Asset allocation

The Fund's assets are assumed to be invested in line with the strategic asset allocation used for the 2022 valuation, at all future dates. In practice, the strategic asset allocation should be reviewed on a regular basis, and it is unlikely this would remain constant over the next 30 years. Any changes to the asset allocation may affect the Fund's exposure to climate risk and therefore would alter our projections. Our analysis, therefore, only captures the risks projected under the current long-term investment strategy as used for the 2022 valuation and the derivation of the discount rate.

Timeframes

The Fund's investment strategy has been assessed under each scenario across a 30-year time horizon, which has been split into three segments of ten years (short-term, medium-term, and long-term). Ranges, rather than precise years, have been used due to the uncertainty of exact timings regarding climate events. The rationale for selecting these periods is set out below.

Short-term (0-10 years)

Over this period, we would expect significant improvements in modelling and data quality with regards to climate scenario analysis. Furthermore, under an "early action" scenario, we would expect significant progress by global governments and corporations, given the importance of significant changes being made by 2030 to limit global warming.

Medium-term (10-20 years)

Over this period, we may expect the impacts of a "late action" scenario to be at their highest. This is expressed as a ten-year range, as there is great uncertainty regarding the precise timing of any "late action".

Long-term (20-30 years)

Over this period, under an "early action" and "late action" scenario, we would expect global governments' and corporations' carbon emissions to be tending towards zero, in order to meet any net zero targets by 2050. Furthermore, under a "no additional action" and a "far too little too late" scenario, we would expect impacts to be at their greatest at the end of the scenario period (that is, by 2050).

Future reviews

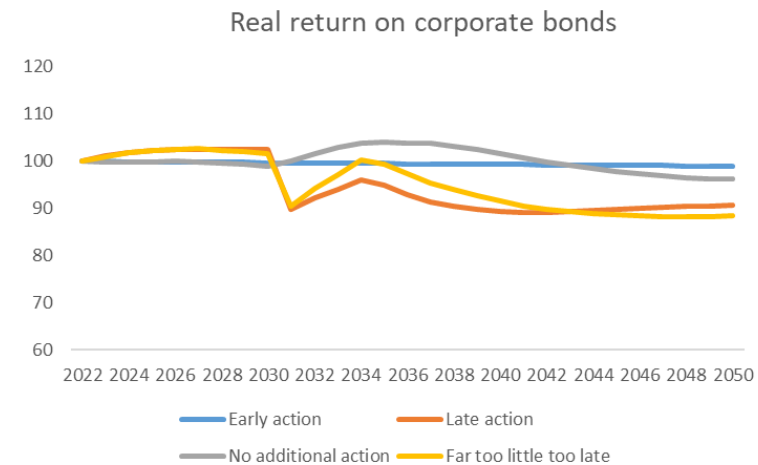
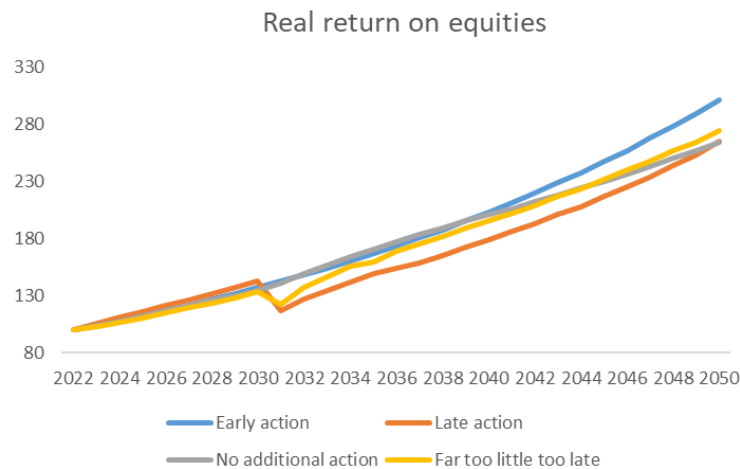
Barnett Waddingham will review and adapt our framework on an ongoing basis but expect to undertake a full-scale review during the next LGPS funding valuation, by which time we would expect a material increase in the quality and coverage of climate scenario analysis forecasts and climate data. If earlier support is required following the draft regulations from DLUHC, we would be happy to help and we will be in touch with more information.

In the meantime, Barnett Waddingham will continue to engage with modelling and data providers, as well as fund managers, regarding best practice and improvements to methodologies, data quality and coverage.

Appendix 2 Asset projections by asset class under each scenario

The graphs in this appendix, consider each asset class’s performance under each climate scenario *net* of inflation, over a 30-year time horizon. The early action projections are in line with our best estimate return on each asset class, as assumed for the 2022 valuation. The other scenarios are projected with reference to this using the Bank of England Biennial Exploratory Scenario data and assumed inflation relevant to that scenario. The scale used differs between each graph.

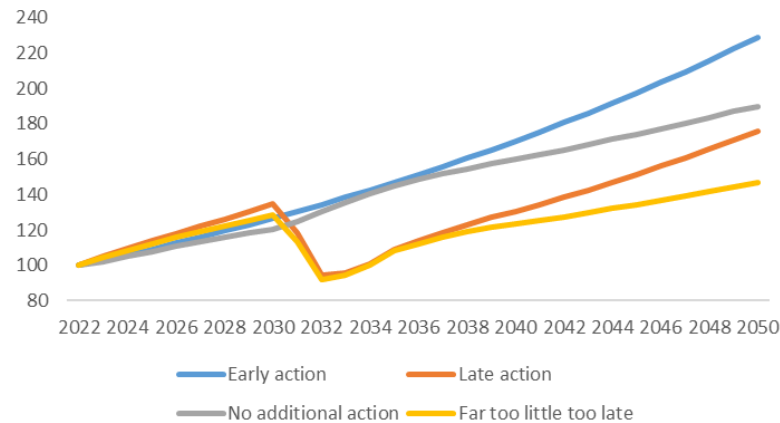
The kinks in the projected return under the “late action” and “far too little too late” scenarios for all asset classes are a result of the expected disruption that would be caused by last minute policy implementation.



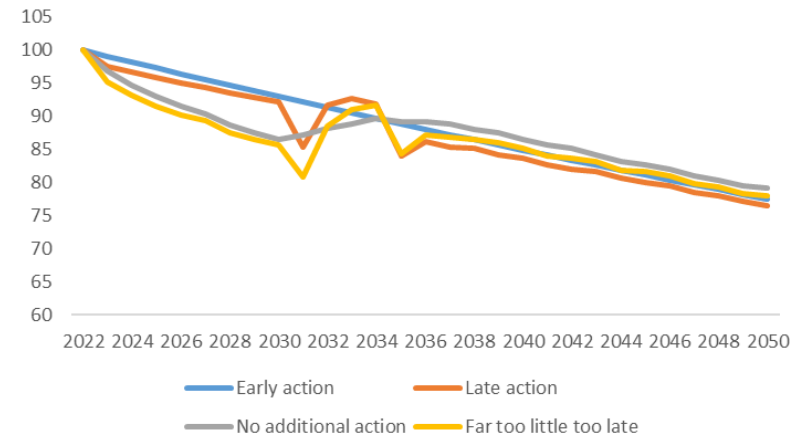
As the world enters uncharted territory with economies looking for ways to combat climate change, company shareholders face substantial risks that established business models may no longer be viable, and innovation may be necessary in order to survive, and thrive. The physical consequences of climate change have the potential to cause widespread damage and disruption to countries across the globe. This is likely to heighten market volatility and may trigger flights to safety from investors, which could result in a significant impact on returns.

Relative to equities, global corporate bond indices have a relatively high weighting to financials, which are expected to be less impacted by transition risk, but also to industrials, which are expected to experience higher impacts. Physical risks will vary, depending on where a company’s operations are based and how dependent their revenue is on their at risk assets or supply chains. Not only may these risks harm a company’s revenue, and increase the likelihood of them defaulting on the bonds, it may also result in companies having to issue more debt. Recovery rates on bonds may also be impacted, due to the risk of stranded assets.

Real return on property



Real return on gilts



Property will be a key contributor to the UK’s journey to a low carbon economy. It is anticipated that over the coming years, regulation will be created that requires commercial buildings to have at least an EPC rating of ‘B’ by 2030 as well as increased disclosures. This may result in large upgrade costs to property owners and may result in stranded assets (whereby the cost of upgrading the building is not feasible). As a physical asset, property has high exposure to physical climate risks. For example, a property near the coast may be at more risk of flooding due to rising sea levels, whereas a property in the financial hub of London may be better protected by government spending on sea defences.

The UK was the first major economy to make a net-zero commitment and currently their efforts are deemed to be ‘almost sufficient’ in meeting these objectives. We therefore believe that the UK will be in a relatively better position with regards to managing climate risk than many other developed and emerging nations. However, the UK is not immune to these risks. On the physical side in particular, large areas of the UK, including major cities, are expected to be below sea level in a scenario where temperatures increase significantly. These risks may impact businesses and result in lower tax revenues for the UK government.

As illustrated by the graphs, there is significant volatility of returns under the “late action” and “far too little too late” scenarios in the medium-term. This is primarily driven by the knee jerk action assumed to be taken in these scenarios. The real return on property is assumed to be affected by climate change to a greater extent than equities, bonds, and gilts for the reasons described above.

If the Fund wished to consider any alterations to their investment strategy, then advice should be taken from their investment advisers. The Fund’s objectives as a whole, along with the other risks and opportunities to which the Fund is exposed, should also be taken into account.

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