



Government Actuary's
Department

Teachers' Pension Scheme (England and Wales)

2024 Actuarial Valuation

Climate risk

1 July 2026

Fiona Dunsire FIA C.Act, Government Actuary
Neil Crombie FIA C.Act

Navigating risk | Cutting through complexity

The Government Actuary's Department is proud to be accredited under the Institute and Faculty of Actuaries' [Quality Assurance Scheme](#). Our website describes [the standards we apply](#).

Contents

- Introduction 1
- Background..... 2
- Our approach 4
- Strategic Sustainability scenario..... 6
- Turbulent Transition scenario..... 8
- Climate Crisis scenario 10
- Summary 12
- Uncertainty 15
- Compliance and limitations 16

Introduction

This Climate report sets out the climate scenario analysis undertaken alongside the actuarial valuation of the Teachers' Pension Scheme (England and Wales) (TPS) (the Scheme) as at 31 March 2024. This report was prepared by Fiona Dunsire FIA C.Act, Government Actuary and Neil Crombie FIA C.Act, and was published on 1 July 2026.

Important

This report is a subset of the valuation reporting provided for the Scheme; the other reports cover the Overview, Approach, Data, Assumptions, Results and Glossary. The full set of valuation reporting information can be found in the [Summary](#) report.

The purpose of this report is to highlight the possible future impact that climate-related risks may have on the cost of the Scheme.

There is significant uncertainty involved when assessing climate risks. More information on this uncertainty is set out in the Uncertainty section of this report. Care has been taken to ensure that, where material, this work has taken into consideration the latest climate change research and appropriate climate data.

Over time, as the actual [global emissions pathway](#) is further defined and there are advances in science and technology, the view of future climate risks will evolve. Future developments may have a material impact on the results and conclusions contained in this work and care should be taken when referring back to this analysis after the date of issue. Climate-related risks should be reviewed regularly, particularly if there are significant or material changes in climate policy, global emissions pathways, or other relevant factors that may lead to different outcomes or decisions being made.

Nature-related risks have been incorporated into the scenario narratives and analysis; however, there remains significant uncertainty around how and when these risks will materialise.

Background

Climate change is one of the most significant long-term global challenges we face. Public service pension scheme valuations also have long-term horizons, so climate change could significantly impact the outcomes of future valuations. For example, climate change could impact the actual experience of the Scheme and the assumptions adopted for future valuations.

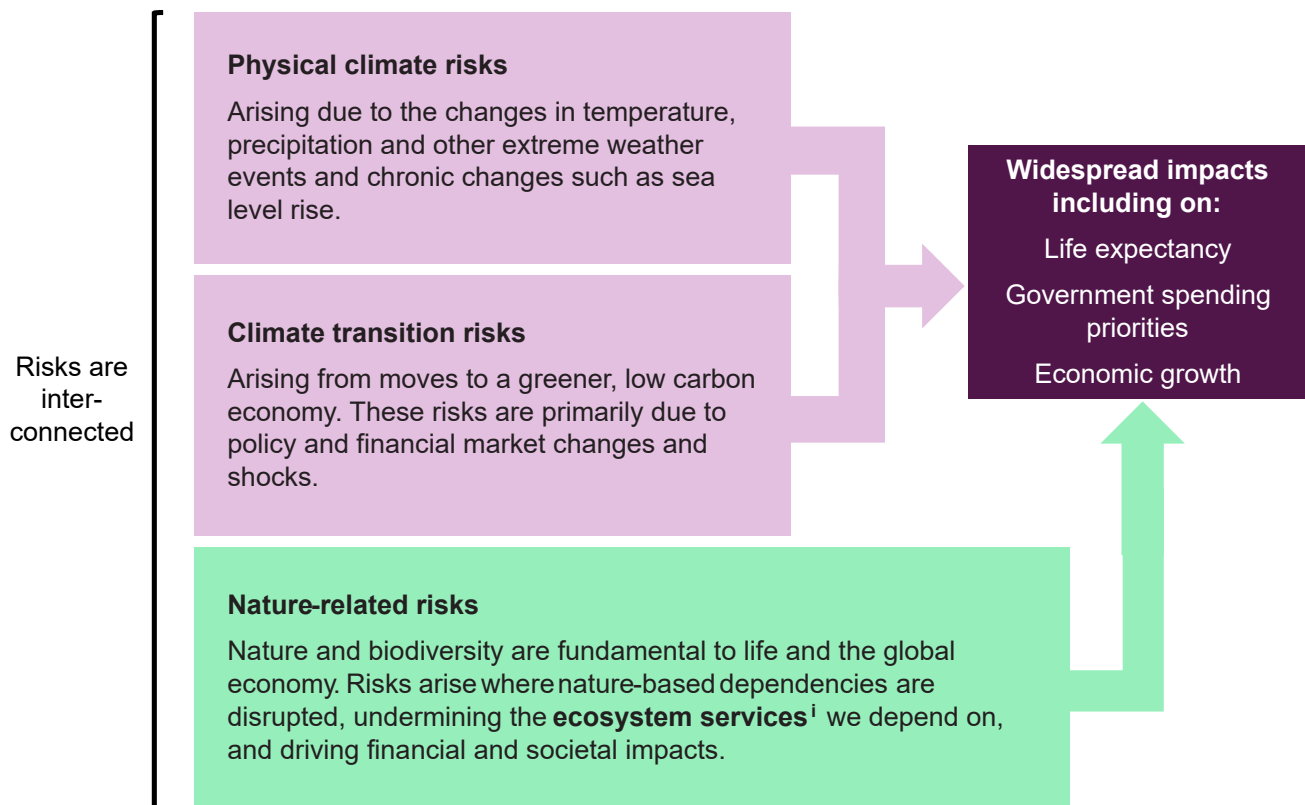
Note

Climate-related risks have not explicitly impacted the outcomes of the 2024 valuation shown in the [Results](#) report. For example, no explicit adjustment is made to the employer contribution rate to reflect future potential climate-related costs.

Climate-related risks will have implicitly impacted the outcomes of the 2024 valuation to the extent they are allowed for in the assumptions used. For example, the discount rate assumption directed by HM Treasury is based on the Office for Budget Responsibility's forecast of long-term GDP growth, which includes an implicit allowance for the future impact of climate risks, alongside other long-term risks.

Climate change and nature loss are interlinked, each exacerbating the other, and creating substantial risks. In this report we group these together under the term 'climate risks'.

The diagram below summarises the key types of climate risk. If these risks materialise there could be widespread impacts on the prevailing economic and societal landscape, both in the UK and globally.



i. ecosystem services

Our approach

The impacts of climate risks are highly uncertain. To reflect the wide range of possible impacts we have designed and considered three bespoke climate scenarios: Strategic Sustainability; Turbulent Transition; and Climate Crisis.

In the following sections we consider each scenario in turn to:

1. provide context for the scenario, both globally and within the UK
2. consider the likely implications for key valuation assumptions that will be adopted in 2040
3. estimate the impact on future Scheme costs at each valuation from 2028 to 2040, relative to a baseline cost of 25.2%, using the 2024 assumptions.

We use the 2040 valuation as the end point of our scenario analysis as we assume the implications of each scenario will become clear by that time. For the 2028 to 2036 valuations, we assume that future costs lie part way along the pathway from 2024 to 2040, based on our best estimate of the pathway under each scenario. More information on this approach is set out in the [Summary: Assumptions](#) section of this report.

Caution

Scenario analysis is a powerful tool to explore the potential impacts of climate change. The scenarios we have chosen cover a range of pathways to plausible outcomes at the time of issuing this report. This view may change over time as greater clarity emerges about future global emissions and the actual impacts of climate change.

Our scenarios do not represent forecasts, and we do not assign any probability to the likelihood of each scenario. Other plausible scenarios exist that have not been considered in this report.

In the scenarios that follow we calculate the cost of future benefits using the Projected Unit methodology, which is the same methodology used for the 2024 valuation.

Our results only cover the future service cost of the Scheme. This means we only consider the cost of new benefits being accrued over the next year and not the change in the cost of benefits accrued in the past. Because [employer contribution rates](#) are assessed over a different time period and cover both past and future service costs, the impacts shown in this report should not be interpreted as direct additions or deductions to the 2024 employer contribution rate. They should instead be considered as indications of the likely direction of any change, and used to compare the size of changes between different scenarios.

 Note

To conduct this scenario analysis, we have considered the wider societal implications that may stem from climate change and nature loss and reflected these within the narrative descriptions below. Our quantitative analysis then focuses specifically on how these narratives may translate into impacts on the future cost of the Scheme. The analysis makes no allowance for other policy changes.

Strategic Sustainability scenario



Context

There is a planned and proactive global response to climate change, underpinned by early, coordinated action. Countries collaborate effectively to set and meet ambitious [Nationally Determined Contributions](#) and by 2050, [net zero](#) has been achieved. By 2100 the global temperature has increased by less than 2°C, compared to [pre-industrial](#) levels.

The transition to a low carbon world is methodical and well-communicated, minimising short-term disruption from policy shifts and market adjustments. Supported by rapid technological developments, early risk mitigation efforts significantly reduce exposure to severe physical climate risks later in the century.

Increased active travel (e.g. walking or cycling) reduces urban air pollution and new regulations across a range of areas support the protection and restoration of nature, leading to nature-positive outcomes and improved environmental quality from the 2030s onwards. Positive nature-climate [feedback loops](#) become well established, supporting improved population health. Nature-related risks are largely mitigated, supporting sustainable economic growth over the longer-term.

In the UK, stable and inclusive economic growth supports [fiscal resilience](#).

Assumptions in 2040

By 2040, discount rate and salary growth expectations increase very slightly due to marginally improved long-term growth enabled by a coordinated transition. Inflation expectations reduce slightly, down 0.05% per year.

Health outcomes improve due to significant reductions in air pollution, better diet reducing the risk of certain chronic diseases and positive economic outlook, increasing average life

expectancies by one year compared to current rates of improvement. There are fewer cold-related deaths in the UK.

Impact on Scheme costs

Higher transition costs are recognised and priced into the economic outlook in the short-term. This leads to weaker short-term economic expectations, increasing the cost of future benefits relative to the baseline. During this period, anticipated improvements in life expectancy and reductions in physical climate impacts start to emerge. At the 2028 valuation future service costs are 0.2 percentage points higher than the 2024 baseline of 25.2%.

Over the medium term, the additional improvements in future life expectancy gradually materialise, increasing the cost of benefits. At the same time, physical climate risks are lower than initially anticipated, supporting stronger than expected economic performance. This improved economic outlook helps moderate, though not eliminate, the cost pressures arising from higher life expectancy.

As 2040 nears, economic growth expectations exceed those underlying the current valuation and are assumed to remain stable at this higher level. Despite these favourable economic conditions, the sustained expectation of continued improvements in life expectancy at a faster rate than currently anticipated more than offsets the benefits of higher economic growth. As a result, the cost of future benefits continues to rise modestly over time. By the 2040 valuation future service costs are 0.4 percentage points higher than the baseline.

Turbulent Transition scenario



Context

A fragmented future where weak international cooperation leads to an uncoordinated and reactive global transition. Despite the lack of coordination, ad-hoc mitigation efforts and rushed action around mid-century mean global temperatures stabilise around 2°C above [pre-industrial](#) by 2100. This helps avoid the most extreme physical climate risks in the long-term, but there are still more frequent and intense extreme events.

In the short-term, inconsistent nature-related policies and a lack of strategic direction lead to mixed environmental outcomes. As we reach mid-century, environmental protection starts to be prioritised and public attention shifts in support of nature. As a result, nature-related risks are managed more proactively, with coordinated policy action, investment in protection and restoration, and greater integration of nature considerations into economic decision making. This helps to mitigate the risk of potential systemic and economywide impacts from nature depletion by the end of the century.

In the UK, the initial absence of disruptive policy change provides short-term stability. However, by the 2030s, mounting pressure to meet future [Nationally Determined Contributions](#) and climate targets triggers abrupt and frequent policy shifts. These disorderly measures damage market confidence and constrain economic growth until mid-century.

Assumptions in 2040

By 2040, discount rate and salary growth expectations both decrease by 0.15% per year due to the high costs of mitigating climate risks and disorderly nature of the transition. Inflation expectations rise by 0.05% per year.

Health outcomes suffer and life expectancies reduce by one year compared to current projections as a result of reduced economic growth, despite fewer cold-related deaths. By

limiting warming to +2°C, longer-term health outcomes are somewhat moderated, although the nature of the transition leads to increased inequality of health outcomes relative to today.

Impact on Scheme costs

Limited action in the short term means there is no material impact on Scheme costs. At the 2028 valuation future service costs are unchanged from the 2024 baseline cost of 25.2%.

During the early 2030s, a significant sentiment shock emerges as intermediate climate-related targets are missed and the scale of transition required becomes clear. This deterioration in the economic outlook leads to a sharp increase in the projected cost of future benefits. At the 2032 valuation future service costs are 0.8 percentage points higher than the baseline.

As 2040 approaches, markets start to adjust to the new climate and policy landscape. Despite this, expectations of economic growth remain below present-day levels, increasing projected costs. This is partially mitigated by a reduction in projected future life expectancy, caused by the period of weaker economic conditions, impacting public spending on health and increasing inequalities. By the 2040 valuation future service costs are 0.5 percentage points higher than the baseline.

Climate Crisis scenario



Context

Global climate action stalls by the 2030s. No new policies or targets are agreed, and international cooperation breaks down. Environmental protection and sustainability are neglected, leading to all meaningful global mitigation efforts ceasing. As a result, global temperatures rise rapidly reaching 2°C higher than pre-industrial levels by mid-century, and over 4°C higher by 2100. Earth system tipping points are crossed, triggering irreversible global changes to societies and ecosystems.

Some adaptation measures are undertaken, largely by corporations looking to protect profits; however, these efforts are insufficient compared with the scale and severity of physical risks. The global economy suffers repeated shocks from extreme weather events, resource scarcity, and supply chain disruption.

In the UK, extreme weather events become the norm and environmental degradation is widespread. There is a lack of nature-positive systemic action, and nature-related financial and societal risks continue to build, driven by the degradation of natural resources, disruption to food and agricultural systems, increased water scarcity, and greater volatility in commodity prices. Effects ripple through supply chains and financial markets, amplifying impacts both globally and within the UK.

Assumptions in 2040

By 2040, the discount rate and salary growth expectations both decrease significantly, down 0.85% per year. Inflation expectations are 0.3% higher per year.

Despite a significant reduction in cold-related deaths in the UK, health outcomes decline and life expectancy worsens dramatically, reducing by six years due to the secondary impacts of a long-term worsening economic outlook. Productivity is severely impacted.

Impact on Scheme costs

It becomes evident by 2028 that the global pathway is not aligned with achieving net zero by 2050. Expectations of future economic growth have already weakened materially, driven predominantly by the escalating impact of acute physical climate risks. This places upward pressure on the projected cost of future benefits. Although expectations of life expectancy begin to decline, the effect is relatively modest compared with the scale of the economic pressures. At the 2028 valuation future service costs are 1.2 percentage points higher than the 2024 baseline of 25.2%.

By 2032, expectations of economic growth deteriorate further as physical and transition climate impacts intensify. At the same time, the growing realisation of significant climate-related health and societal impacts leads to a reduction in expected future life expectancy. This helps to partially offset, though not reverse, the upward pressure on costs arising from the weaker economic outlook.

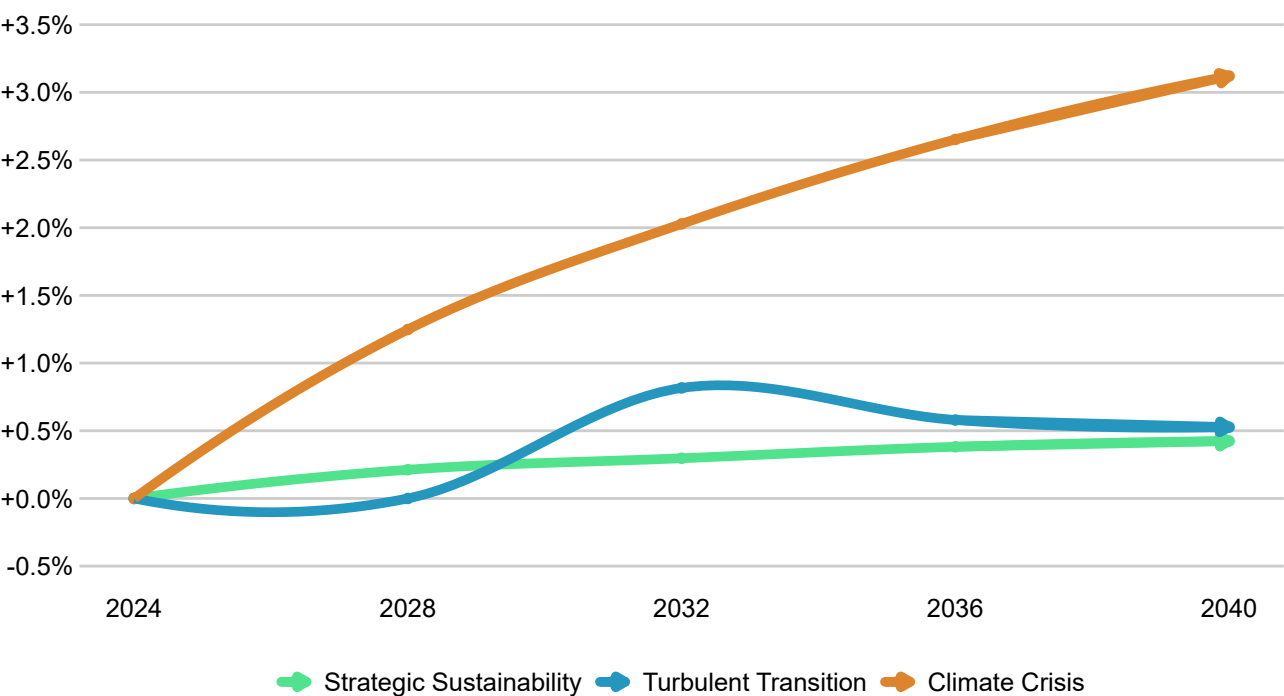
At the 2036 and 2040 valuations these trends continue; deterioration in the expectations of future economic growth lead to upward pressure on the cost of future benefits, that are only partially mitigated by worsening health outcomes. By the 2040 valuation future service costs are 3.1 percentage points higher than the 2024 baseline.

Summary

Outcomes

The chart below summarises the change in future Scheme costs under the three scenarios, relative to the baseline cost of 25.2%. Across all scenarios, the overall effect is an increase in the cost of future benefits. This reflects the combined influence of economic expectations and changes in life expectancy. There may be other plausible scenarios that result in a decrease in the cost of future benefits (for example, a scenario where economic performance is significantly improved but there aren't the same increases in life expectancy).

Change in the cost of future benefits under three climate scenarios



While the longer-term outcome for the Scheme is broadly similar under the Strategic Sustainability and Turbulent Transition scenarios, there may be broader societal benefits associated with a more orderly transition similar to the Strategic Sustainability scenario. Under the Climate Crisis scenario, the projected increase in future costs is significantly higher.

Assumptions

The table below sets out the assumptions for the 2040 valuation that we have used for each scenario. Assumptions are shown as changes from the assumptions adopted for the 2024 valuation, and are rounded to the nearest 0.05% per annum, or nearest whole year. While some of the changes are relatively small, over a long time horizon they can have a

significant impact. More information on the assumptions adopted for the 2024 valuation can be found in the [Assumptions](#) report.

Financial assumptions have been informed by data from a third party provider and the work of the Office for Budget Responsibility. Demographic assumptions have been informed by academic research and the work of the Office for National Statistics. Judgements have been applied in both cases to arrive at the final assumptions used.

2040 valuation assumption	Strategic Sustainability	Turbulent Transition	Climate Crisis
	-0.05%	+0.05%	+0.30%
Inflation rate	Decreases slightly due to well-planned adaptation and mitigation.	Increases slightly as a result of the disorderly transition.	Increases as a result of the worsening, widespread impacts of physical climate risks.
	~0.00%*	-0.15%	-0.85%
SCAPE discount rate	A very slight increase due to higher long-term growth enabled by an orderly transition.	Decreases due to the higher costs associated with the disorderly transition.	Decreases significantly due to the economic implications of severe physical climate risks.
	~0.00%*	-0.15%	-0.85%
Salary increases	A very slight increase due to higher long-term growth.	Decreases due to disorderly nature of transition.	Decreases significantly due to worse economic outlook.
	+1 year	-1 year	-6 years
Life expectancy	Improves due to significant reduction in air pollution, better diet and positive economic outlook.	Worsens overall, as improvements due to reduction in air pollution are more than offset by the worse economic outlook.	Worsens due to the secondary impacts of a long-term worsening economic outlook.
Other demographic assumptions	Unchanged. The potential changes in member behaviour are highly uncertain and are expected to have less impact on scheme costs when compared to the assumptions listed above.		
Membership profile	Unchanged. We assume that leavers are replaced by joiners such that the scheme’s membership profile remains constant over time.		
* When rounded to the nearest 0.05% per annum this value rounds to 0.00%.			

The SCAPE discount rate impact is based on a discount rate change net of CPI inflation.

Proportion of 2024 to 2040 change in future costs used at each valuation

For intermediate valuation years between 2024 and 2040 we estimate the change in cost of future benefits. We do this by applying a proportion of the total 2024 to 2040 change in cost, chosen to be consistent with the narratives set out in the scenario sections earlier in the report.

Note

There is considerable uncertainty involved in setting the assumptions to be used in climate scenarios. More information on this uncertainty is set out in the [Uncertainty](#) section of this report.

Uncertainty

The climate change outcomes shown in this report and the assumptions used to generate those outcomes are highly uncertain. This comes in part from the uncertainty in existing climate models. In particular, a number of known limitations are listed below:

- **Tipping points:** These are thresholds that once crossed may cause irreversible changes in the Earth's system. Anticipating the moment at which a tipping point would be reached and its consequences is challenging. As a result, tipping points in the Earth's system are often excluded from climate change analysis and financial modelling. We have sought to address this through our choice of third-party model, which includes allowance for tipping points in the highest physical risk scenario.
- **Speed of realising climate impacts:** Because the Earth's climate is influenced by many different factors – such as atmosphere, oceans, and human activities – that interact in complex ways and over varying timescales, the timing of the emergence of different climate change impacts is uncertain.
- **Geographical spread of impacts:** Whilst the physical climate change impacts under any scenario are generally expected to be less severe on the UK relative to the world average, the geographical spread is still uncertain. Ultimately the climate outcome will be determined by overall global emissions (of which the UK contributes a small part).
- **Earth system model uncertainty:** There are several uncertainties associated with the outputs of climate models due to incomplete understanding of the Earth's system, natural variability of the climate and the limitations of climate models. Climate models generally have considerable skill in the simulation of average climate and some extreme events (such as annual extremes in temperature) at global and regional scales. However, projections of rare extremes or compounding events at precise geolocations are very difficult due to deep uncertainty.
- **Impact on mortality:** The impact of climate change on mortality (and morbidity) is highly uncertain and there are limited data and information available to inform suitable assumptions.

This work also makes no allowance for:

- **Potential future climate policies:** Due to their subjective nature, these are very difficult to model and therefore our analysis does not assume the implementation of any specific policies at any point.
- **Specific future adaptation measures:** It is very uncertain what action might be taken in the future to prevent or minimise damage from the effects of climate change, so our analysis does not include any specific measures other than those set out in the scenario narratives.

Compliance and limitations

The [Overview](#) report should be referred to and contains compliance and limitation information covering this and other component parts of the valuation reports.