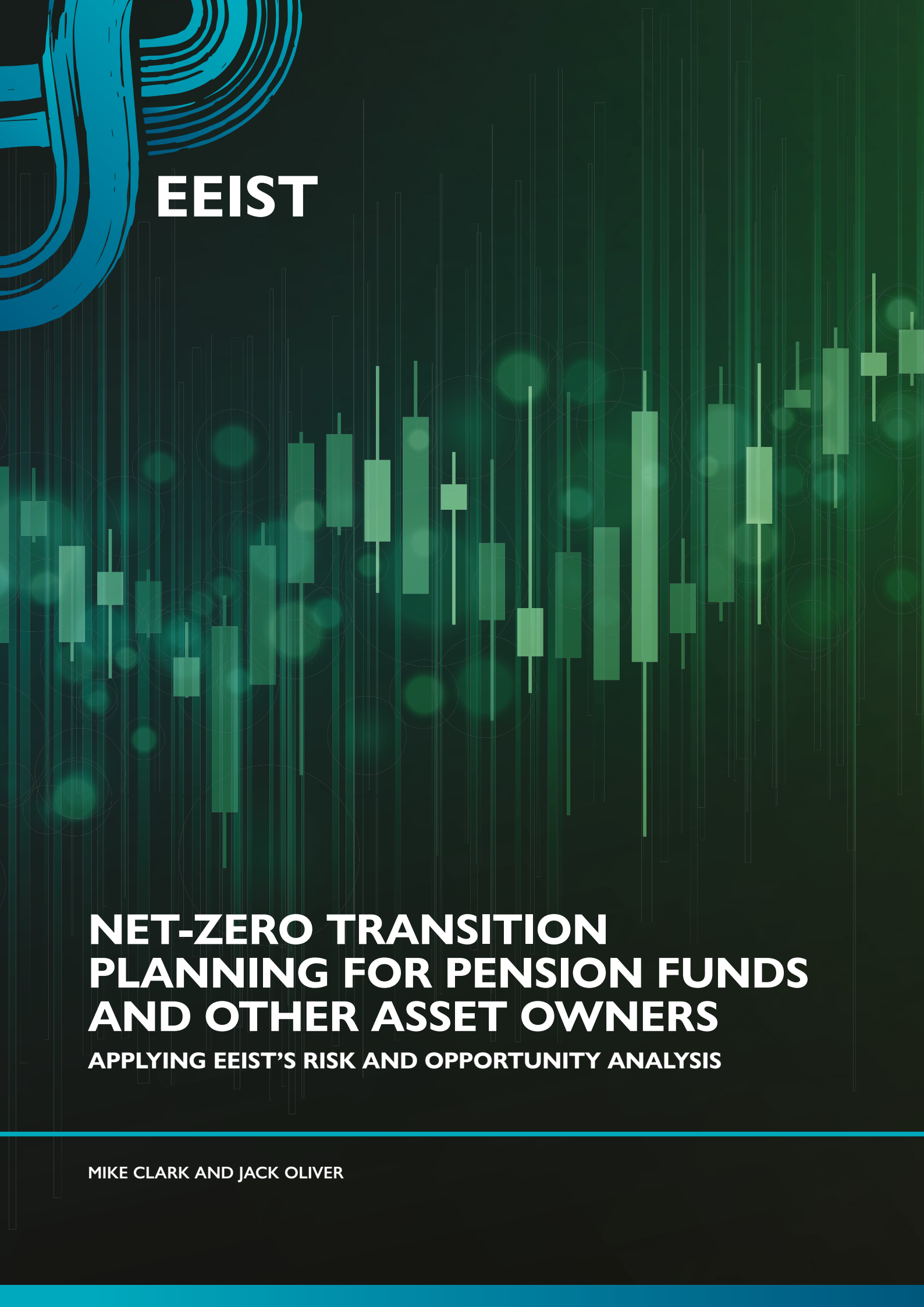


EEIST

NET-ZERO TRANSITION PLANNING FOR PENSION FUNDS AND OTHER ASSET OWNERS

APPLYING EEIST'S RISK AND OPPORTUNITY ANALYSIS

MIKE CLARK AND JACK OLIVER

Contents

Mike Clark and Mark Cliffe are Visiting Fellows from the University of Exeter

Jack Oliver is Research Impact Fellow, Global Systems Institute at the University of Exeter

About

The Economics of Energy Innovation and System Transition (EEIST) project develops cutting-edge analysis to support government decision making around low-carbon innovation and technological change. By engaging with policymakers and stakeholders in Brazil, China, India, the UK and the EU, the project aims to contribute to the economic development of emerging nations and support sustainable development globally. Led by the University of Exeter, EEIST brings together an international team of world-leading research institutions across Brazil, China, India, the UK and the EU. The consortium of institutions are UK: University of Exeter, University of Oxford, University of Cambridge, University College London, Anglia Ruskin University, Cambridge Econometrics, Climate Strategies, India: The Energy and Resources Institute, World Resources Institute, China: Beijing Normal University, Tsinghua University, Energy Research Institute, Brazil: Federal University of Rio de Janeiro, University of Brasilia, Universidade Estadual de Campinas (UNICAMP) EU: Scuola Superiore di Studi Universitari e di Perfezionamento Sant'Anna. For full institutional affiliations see **eeist.co.uk.**

Funders

EEIST is jointly funded through UK Aid by the UK Government Department for Energy Security & Net Zero, and the Children's Investment Fund Foundation (CIFF). The contents of this document represent the views of the EEIST team, and should not be taken to represent the views of the UK government, CIFF or the organisations to which the authors are affiliated, or of any of the sponsoring organisations.

EEIST

Executive summary

We have left it too late to tackle climate change incrementally. We now require a dramatic acceleration of progress through transformational change across society and the global economy. The pensions industry has an undeniably important role to play in supporting the journey to net zero, not least through investing for a world that its beneficiaries would want to live in. While this paper focuses on the UK, it is relevant for pension funds globally.

Acting on behalf of their beneficiaries, pension funds must rise to the challenge of 'greening' their investment strategy and portfolio assets. To do so requires fundamental change to the way investment decision making is framed.

We argue that the current net-zero strategies guiding pension funds and other asset owners (we shall simply refer to 'pension funds' here) are too strongly influenced by modern portfolio theory. At the same time, official climate scenarios are increasingly regarded as not being 'decision-useful'.

This practitioner-focused paper sets out how the Economics of Energy Innovation and System Transition (EEIST) programme – initially targeted at net-zero policymakers – can be applied to catalyse a paradigm shift in transition planning in the investment industry.

With net-zero commitments made, credible transition plans will increasingly be expected by beneficiaries, plan sponsors (for defined benefit funds), NGOs and regulators. These plans will need short-term bespoke scenario analysis in order to set interim targets against which reporting will be required.

Drawing on EEIST's 'Risks and Opportunities' methodology, rooted in complexity economics, we recommend that pension funds adopt 'Decision-Useful Climate Scenarios'. This approach delivers analysis of future investment risks and opportunities through the application of plausible 'real-world' narratives.

Inspired by EEIST's 'Ten Principles for Policy Making in the Energy Transition', we propose 'Ten Transition Planning Principles for Pension Funds'. These principles provide a framework for transformational net-zero decision making and embedding the associated change in risk culture.

The final section provides readers with an overview of the leading transition planning work currently being carried out by the Universities Superannuation Scheme (USS), in which the application of 'EEIST Thinking' is clearly visible.

With thanks to Mark Cliffe

An Introduction to EEIST

The Economics of Energy Innovation and System Transition is a three-year research programme funded by the Department for Energy Security and Net Zero and the Children's Investment Fund Foundation and led by the University of Exeter. Established in 2020, EEIST's mission is to support governments in China, Brazil, India, the UK and EU to develop transformative low-carbon transition policies. These policy initiatives are developed by a team of world-leading experts in complex economics systems modelling, and climate and environmental policy.

'EEIST Thinking'

In this paper we define 'EEIST Thinking' as the underpinning academic foundations of the first two flagship EEIST reports: 'The New Economics of Innovation and Transition: Risks and Opportunities Analysis', and 'Ten Principles for Policy Making in the Energy Transition'.

The 'Risks and Opportunities Analysis' (ROA) paper highlights some of the greatest successes in the clean energy transition so far (such as dramatic cost reductions in wind and solar power and LED lighting) which have come from policies to shape markets that were not generally those recommended by conventional economic analysis. To replicate these successes, the report calls on policymakers to learn the resulting lessons and think differently about the dynamics of change in our economies. For example:

- Consider all the potential effects of a policy that might be important, even if a financial value cannot be applied to it,
- Incorporate feedback loops (relationships that reinforce or oppose change) and how they can be strengthened or weakened,
- Instead of converting different kinds of outcomes into one metric, assess each outcome in its own right; carefully weigh up different interests.

The 'Ten Principles for Policy Making' paper offers governments new methods to encourage the kind of transformational change required to tackle the climate emergency. These new principles are contrasted with 'traditional principles' often used to guide policymaking in situations where only marginal change is being considered.

EEIST Thinking aims to catalyse transformational change when incremental change is inadequate. And with climate, it is too late for incremental change.

Climate Scenarios

The role of scenario analysis

Scenario analysis is an established tool used to support strategic development and decision-making. Benefits of scenario analysis include:

- Deepening understanding of the wider range of outcomes that stem from radical uncertainty,
- Providing a process to manage, communicate and advise around complex issues to decision makers,
- Developing more adaptive plans that deal with the risk and opportunities arising from disruptive change.

The UK pensions market is one of the largest pensions markets in the world.

Bespoke, 'decision-useful', scenario analysis is a vital transition planning tool for responsible pension funds who seek to intensify their response to climate change.

Official climate scenarios

In 2017, the Network for Greening the Financial System (NGFS) was established. This global collaboration between central banks and financial supervisors subsequently partnered with an expert group of climate scientists and economists to design a set of hypothetical low-carbon transition scenarios out to 2050 (each with different physical and transition risk profiles).

This work has stimulated good progress in the finance sector and, following adoption by several financial regulators including the Bank of England/PRA for their Climate Biennial Exploratory Scenarios (CBES) initiative, these scenarios are often referred to as the 'official' climate scenarios. However, official climate scenarios are increasingly seen as not 'decision-useful'; time horizons are considered too long and they overlook key risks and opportunities the transition will bring.

Examples of the risks largely excluded are:

- **Physical risks:** Weather (acute physical risk), non-linear shifts or tipping points and feedback loops.
- **Transition risks:** Wars and geo-political shocks, policy disruptions, finance (private or public), financial market volatility, stranded assets or labour, the impacts of disruptive technologies, and large-scale migration.

The importance of challenging typical assumptions

The EEIST Risks and Opportunities Analysis (ROA) paper highlights three widely used assumptions in the context of policy formulation: certainty, marginality and homogeneity.

Certainty means that parameters and possible outcomes are sufficiently well known to be described accurately with quantified probabilities. **Marginality** refers to a situation where a policy intervention seeks to create only marginal change - the intervention is neither expected nor intended to cause structural change. **Homogeneity** in policymaking arises when it is assumed that the interests of affected actors, together with the intended and unintended outcomes of policy, are not sufficiently different to be a significant factor in the choice of policy.

As the authors of the EEIST ROA paper highlight, these are all weak assumptions in the context of net-zero transition policymaking, where structural change is the goal. To better reflect the complexity and uncertainty of 'real-world' dynamics and provide a 'decision-useful' output, the assumptions should also be avoided by pension funds conducting scenario analysis.

In situations of non-marginal change – as with the low-carbon transition – 'equilibrium' (in modelling terms) cannot be assumed. Without equilibrium, an optimal allocation of resources cannot be specified – hence the deep uncertainty. Investors cannot specify climate risk in a fully probabilistic sense.

Climate-related risks will crystalise, compound with other risks and cascade. Investment opportunities will play out in a similar way. They will need to be evaluated against a background where, in both the real economy and the financial system, risk and opportunity are going through a continuous systemic process of reassessment. The mantra that 'past investment returns are no guide to the future' is more relevant than ever before.

Developing 'decision-useful' climate scenarios

As a practical application of 'EEIST Thinking', pension funds should include bespoke qualitative scenario analysis in their transition planning toolbox.

Qualitative climate scenarios are based on plausible narratives that incorporate non-marginal change and address a fuller range of physical and transition risks – and opportunities – not seen in official scenarios. This recognition inspired the RWCS (Real World Climate Scenarios) initiative in early 2022.

The RWCS approach focuses on two key risk and uncertainty drivers: policy and markets (see Fig 1). Considering high and low combinations of each of the two drivers results in four scenarios to explore the range of plausible outcomes (from which the evidence for broad quantification of key macroeconomic and market variables can be derived). For example, will policy interventions be high and fast or low and slow? And will markets demonstrate high dynamism, with rapid knowledge transfer, speedy product development and flourishing innovation, or will they prove sluggish, showing low dynamism and retaining multiple barriers to progress?

Along with the RWCS initiative, Ortec Finance have provided much of the early thought leadership regarding the benefits of more realistic scenario analysis. Ortec was founded by leading experts in the fields of econometrics and technology, and helps clients manage uncertainty and improve investment decision making.

Its managing director (climate & ESG solutions), Willemijn Verdegaal, has said: "To mitigate the risk of falling into the 'model says it's OK' trap, investors must build a deep understanding of assumptions and limitations of these standard-setting scenarios. In turn, they need to develop a range of plausible scenarios, recognising that one-size-fits-all regulatory scenarios may not capture complex non-linear dynamics of the transition on the one hand, and physical risks associated with a warming world on the other hand".

Figure 1: Climate Scenarios 2x2 Matrix

3. Carbon Bubble **policy steps up after Fossil fuel surge bursts**	**1. Roaring '20s** **policy and markets align**
Politics: Global co-operation is reinforced after the carbon bubble bursts **Growth:** Policy tightening to squeeze inflation hits growth, followed by a 'green' recovery stimulus (carbon dividend) and support for sustainable finance **Investment:** green investment is initially driven by cost advantages, then by recovery packages once the carbon bubble bursts **Energy and asset prices:** fossil fuel price surge is followed by a renewed collapse, accelerating asset stranding (cushioned by state support)	**Politics:** Concerted global co-operation, US bipartisanship, COP breakthroughs, aggressive Net Zero implementation **Growth:** Robust and sustained, "Keynesian" world, active fiscal policy, with carbon pricing/ dividends, productivity boosted by tech investment **Investment:** strong, driven by public and private sectors, fast roll-out of green infrastructure and technology, accelerated innovation **Energy and asset prices:** carbon pricing drives wedge between fossil/renewables, accelerating asset stranding (cushioned by state support), markets and consumers reward green companies
4. Meltdown **policy failures compound weak growth**	**2. Green Phoenix** **market-driven, while policy logs**
Politics: Nationalism and division, return of Trump(ism), geopolitical conflict **Growth:** L shaped (also because of climate physical shocks), pandemic recurs, (energy) trade war **Investment:** weak. Nationalist governments support home fossil fuel industries and (in consuming nations) renewables to achieve 'energy security' **Energy and asset prices:** energy trade war keeps fossil fuel prices volatile. Asset stranding hurts financial system	**Politics:** Co-operation stymied by downturn-fuelled nationalism **Growth:** V shaped, a renewed dip in the initial 2 years, "creative destruction" scenario, governments fall behind on climate commitments, leaving businesses to take the lead **Investment:** driven by business, not government, capitalising on new (cheapening) technologies and consumer pressure for 'greening' and digitalisation **Energy and asset prices:** fossil fuel prices and asset prices slump. Activist ESG investors and consumer pressures drive 'greening", leading to leading to further 'stranding'

High policy intervention

Policy Intervention

Low policy intervention

Low market dynamism — **Market Dynamism** — High market dynamism

Fig 1. Real World Climate Scenarios to 2030. Source RWCS/Mark Cliffe

Guiding Principles

Shifting the paradigm for decision making

Business decision-making processes are often underpinned by guiding principles; a pension fund transitioning to a net-zero-aligned strategy is no different. At present, the investment industry – like much of the wider financial services industry – makes decisions influenced by the principles of modern portfolio theory. This governs the exercise of strategic asset allocation where target allocations are set for various asset classes (equities, bonds, cash, etc) driven by risk appetite and expected returns. Underpinning this process is the application of the Capital Asset Pricing Model (CAPM).

Codified several decades ago, CAPM uses historic market returns to calculate expected future returns and so fails to reflect the unprecedented risks and opportunities of a changing climate. Although the shortcomings of CAPM have long been known, pension fund advisers typically embrace these principles – it has simply become 'the way we take decisions around here'. Addressing climate change requires this approach to be adapted.

Transition planning principles

EEIST's 'Ten Principles for Policy Making' paper provided guidance to policymakers on how to accelerate clean technology transitions and create the transformational change required to tackle the climate emergency. Here we draw inspiration from 'EEIST Thinking' to propose the following Ten Transition Planning Principles for Pension Funds.

For this paper we have narrowly defined transition planning as the development of net zero-aligned investment strategy through a process of qualitative climate scenario development. That said, we note that for defined benefit pension schemes, climate risk management needs to address both funding strategy and covenant strength.

These 'transition principles' sit alongside 'traditional principles' for decision making – stylised versions of principles used in situations of marginal change, greater certainty and homogeneity.

TRADITIONAL PRINCIPLES	TRANSITION PRINCIPLES
Backward-looking	**Forward-looking**
Modern portfolio theory, with the Capital Asset Pricing Model, alpha, beta, tracking error and related theory and metrics, is based on a view of financial markets that rests heavily on past investment returns. Climate risk is a forward-looking concept and must be treated as such.	
Official scenarios	**Bespoke scenarios**
The current official climate scenarios are of limited use for financial decision making by individual organisations, including net-zero transition planning for pension funds. Individual, bespoke scenarios enable pension funds to address numerous gaps, including the outlook for asset prices. There is also the opportunity to include a pension fund's own views in the actual decision making. Scenarios lead to a decision; they are not the decision itself.	
Risk	**VUCA**
Volatility, uncertainty, complexity and ambiguity (VUCA) characterise the unprecedented, unpredictable and often unquantifiable developments stemming from climate change. VUCA requires that pension funds, and other financial decision makers, embrace new and innovative approaches to the management of risk and opportunity. Complexity economics provides an academic frame.	
Climate in isolation	**Climate 'systems thinking'**
Climate change, together with biodiversity loss, sits in a wider system of other macro risk drivers (including wars and geo-political shocks, policy disruptions, finance and financial market volatility, stranded assets or labour, or impacts of disruptive technologies). Climate risks should not be viewed in isolation.	
Linear	**Non-linear**
Finance theory tends to adopt a linear approach when discounting the future. Non-linear change, featuring tipping points, is pervasive in many systems: earth, societal, finance. Climate tipping points are dangerous and need to be avoided. Progress towards positive tipping points (e.g. mass adoption of a low-carbon alternative product) needs to be accelerated. Pension funds should become more familiar with the dynamics of these events, which will have significant portfolio effects.	
Trends	**Shocks**
Economic shocks can have widespread and lasting effects on the magnitude of investment returns, and on the timing of those returns. Unfortunately, these shocks are missing from conventional equilibrium models underpinning official scenarios, which produce smooth trends.	
Optimisation	**Adaptive**
Financial modelling which seeks optimisation will be hindered by the multiple real-world effects that are not captured by the models. Rather, pension funds should aspire to a decision-making process that is adaptive. This will be supported by a governance structure characterised by learning, flexibility and recognition of VUCA. Outcomes will then better accommodate evolving experience, both in the performance of investment assets and in the world in which the assets are invested.	
Numbers	**Narratives**
It is said that 'not everything that can be counted counts and not everything that counts can be counted'. Narratives should address the right questions. Numbers can be a useful way of identifying and answering these questions, but sometimes they are simply not available. This is where the ability of scenarios to deal with uncertainty is critical.	
Caution	**Opportunity**
It is often easier to see the risks of climate change than the opportunities it presents. The net-zero transition will require immense investment, give birth to new products and lead to new behaviours. A strategic openness to investment opportunity is likely to reward risk takers, even though some endeavours undoubtedly will fail. Official climate scenarios have systematically underestimated the exponential progress in green technologies such as solar energy.[1]	
Market	**Peers**
Decisions need to consider the behaviours of other organisations. 'Going green' too slowly is a risk for a company or other entity in which a pension fund is invested, but so is going too fast. While moving too slowly is a risk to a pension fund, the perception that it might be going too fast could also become a risk.	

[1] Way et al. (2022). Empirically grounded technology forecasts and the energy transition. https://www.cell.com/joule/fulltext/S2542-4351(22)00410-X

In Progress Case Study: USS

The Universities Superannuation Scheme (USS) and the University of Exeter are collaborating on the development of 'Decision-Useful Climate Scenarios' which will support USS's plans to incorporate a richer and systemic view of climate and transition considerations in their investment strategy and risk processes.

Extract from USS TCFD submission 2023:

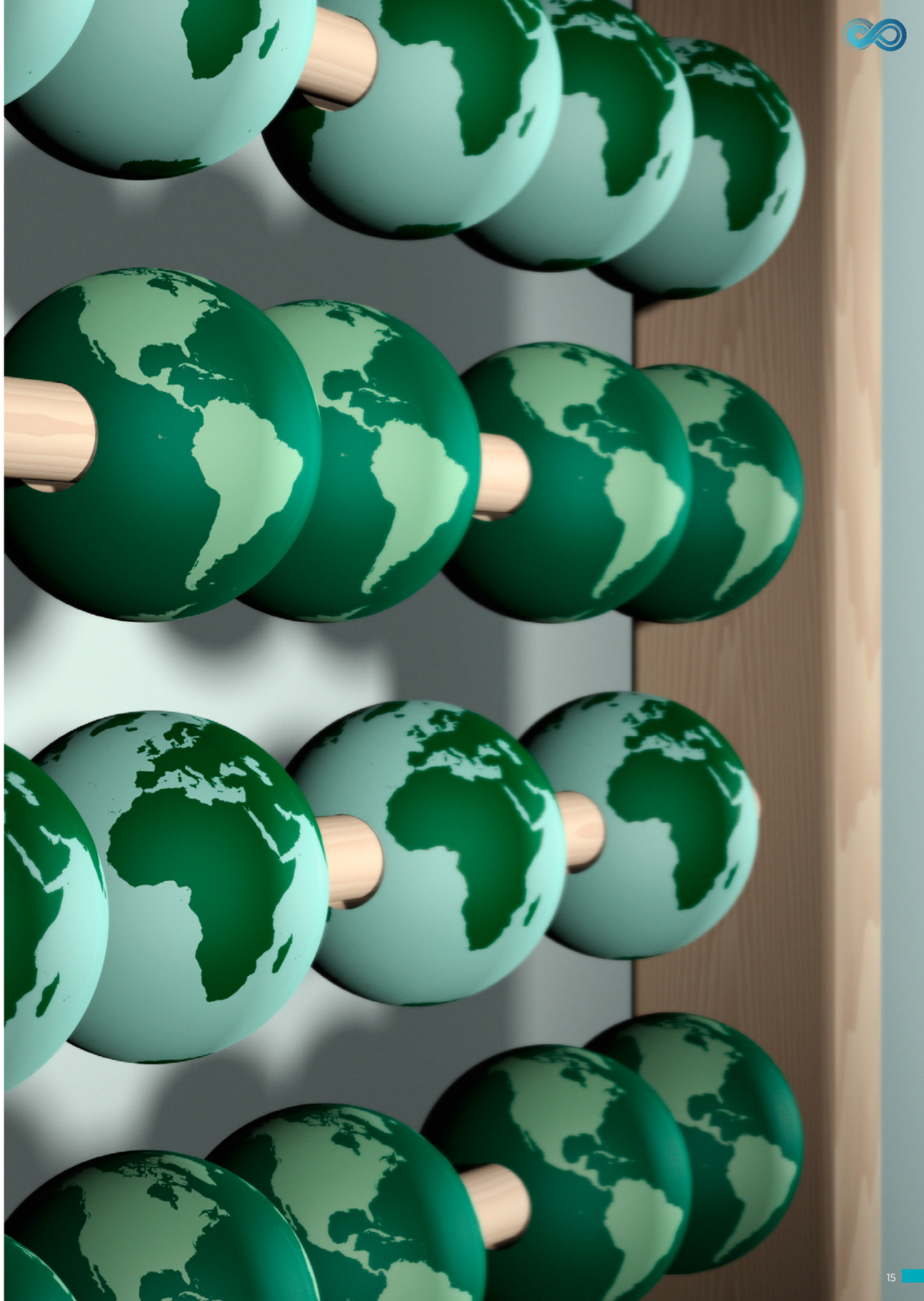
USS believes that climate scenario analysis has the potential to become an important input to the asset allocation process. It could provide guidance to help USS navigate an uncertain world and understand structural changes arising from climate transition or other factors that may fundamentally alter the macroeconomic and investment environment relative to what we have experienced in recent history.

However, institutional investors like USS face the challenge of evolving their investment process to capture additional uncertainties from the changing climate, in which long-established views of correlation and diversification may no longer hold. In such a world, the analysis of plausible scenarios becomes a powerful tool.

We believe that through collaboration we can develop an approach to climate scenario analysis which integrates a deep understanding of climate science with its interaction with macroeconomic and financial markets outcomes over different time horizons. This is particularly important because the climate challenge and policy response are likely to represent one of the key drivers of the macro and investment environment over the next 20-30 years.

From our perspective the key objective of this collaboration is to develop an approach to scenario analysis that brings together climate and other macro drivers (rather than looking at climate risks in isolation) and developing a framework to integrate scenario analysis into our investment processes. More specifically, we will be looking for:

- Deeper understanding of physical and transition risks and how tipping points may affect these,
- A framework to build scenarios across different time horizons integrating climate and other macro drivers such as demographics and geopolitics,
- A framework to assess resilience of assets and portfolios to alternative scenarios on climate and other drivers,
- Decision-useful inputs to our investment processes.



EEIST

Economics of Energy Innovation and System Transition

The Economics of Energy Innovation and System Transition (EEIST) project develops cutting-edge energy innovation analysis to support government decision making around low-carbon innovation and technological change. By engaging with policymakers and stakeholders in Brazil, China, India, the UK and the EU, the project aims to contribute to the economic development of emerging nations and support sustainable development globally.

Find out more at:
eeist.co.uk

University of Exeter

All documents can be found online here: eeist.co.uk/downloads

Funded by UK Government
Department for Energy Security & Net Zero

2023IIB041