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Institute event overviews

Growth in a changing climate: workshop report

2025

Contents

Summary

This report summarises discussions held at two events exploring “Growth in a Changing Climate” held in June 2025.

Economic growth is the Government’s number one mission. This will only be achieved if we think about growth in the context of a changing climate and take account of the physical impacts of climate change that are now locked in because of historic and ongoing emissions.

Businesses need to be able to deal with our new and evolving climate reality. This means fully appreciating the physical risks that climate change will bring and taking action to build resilience.

- Climate adaptation and resilience is still a new topic for most organisations and it might be difficult for many to intuitively see climate change as a significant risk.
- Climate disclosure requirements can help to ensure that more organisations are carrying out risk assessments, but it remains to be seen whether this will lead to significant action on building resilience.
- Challenges for conducting effective risk assessments include a tendency to focus on median projections rather than imagining the ‘worst case scenario’, and taking a system-wide approach rather than focusing on individual assets.
- A major barrier to taking action is the difficulty of making the business case for action. Quantifying risks and benefits is a key part of this processes. Methods – such as PCRAM for infrastructure investment – are starting to be developed to help address this problem.
- Policy levers that could help drive action include increasing the scope of mandatory reporting and adopting an outcome-based approach to regulation.

The need to adapt to climate change means that we will need also need innovation and new ways of thinking so that we can build resilience and protect people, property and societies as our climate continues to change.

- The UK already has many strengths that could provide a foundation for developing adaptation-related goods and services. These include strengths in digital technologies and data processing (which might be utilised in providing risk assessment and monitoring services), financial services (which could provide a home for new insurance and financial products), and engineering consultancy services.
- A lack of climate literacy among investors and lenders combined with an unfamiliarity with the adaptation and resilience sector is a barrier to startups seeking to secure finance for projects.
- Nature-based Solutions face additional challenges in seeking to develop bankable projects. Aggregating multiple projects at the ‘landscape scale’ is one potential solution.

- Policymakers can help to promote innovation by providing the enabling conditions for investment, including, for example, through the provision of a stable policy environment and through risk sharing (such as providing guarantees and underwriting for loans).

Introduction

The need to adapt to climate change is now unavoidable. Historic and ongoing emissions of greenhouse gases have locked in climate impacts that will affect every country in the world. While it remains essential to reduce emissions to net zero as quickly as possible to minimise the level of additional damage, we also need to accelerate climate adaptation, to safeguard existing businesses and to develop the new goods and services that will help to protect people, property and societies in our new climate reality.

The Government's stated "number one mission" is to "kickstart economic growth"[i], but we need to change the way we think about growth to factor in the realities of our changing climate. The businesses that will thrive in the future are those that are able to deal with our new climate reality – those that have built resilience to the physical risks of climate change into their business plans. There is also an opportunity for new businesses to emerge – those providing the goods and services that will help others to adapt to and endure our new climate reality.

This report is based on discussions at two workshops held in June 2025 that brought together academics and the wider policy community to consider how climate change impacts might affect economic growth in the UK. We hope that the ideas presented here will spark further discussions and help to contribute to the emerging discourse on adaptation and growth.

Part I: Building resilience to physical climate risks

Although the UK is still a long way from being 'well adapted', the Government is beginning to acknowledge the potential economic risks posed by climate change. For example, the recently published Climate Adaptation Research and Innovation Framework (CARIF) says:

> "successful and cost-effective adaptation will avoid future costs to individuals, businesses and UK government that will otherwise be a drag on growth".[ii]

Similarly, the Industrial Strategy (published after we had held our workshops) states:

> "As the world navigates a period of upheaval – driven by great power competition, *climate instability*, migration, and demographic transitions – the Industrial Strategy must not only stimulate economic output, it must help the UK *adapt*, compete, and endure." (emphasis added).[iii]

However, there was a general sense in our workshops that there is still a long way to go before these ideas are fully integrated into economic thinking by both government and businesses themselves. This chimes with the conclusions of the CCC, who found insufficient delivery and implementation of most adaptation outcomes in the business sector, including:

- public and private adaptation measures are implemented to minimise risks to business sites,
- productivity losses due to physical climate risks are minimised, and
- supply chain risks are identified and managed.[iv]

Below we share some of the ideas that were expressed by workshop participants about why this might be and what could help.

Understanding, assessing and appreciating risk

Box 1: Physical climate risks

Climate change poses two types of risk to businesses: *transition risks* (which relate to the transition to a low-carbon economy and the need for businesses to decarbonise their activities) and *physical risks* (which relate to the impacts of increased exposure to climate hazards like extreme weather and sea level rise). Physical risks can affect businesses both directly and indirectly:

- Assets may be damaged, for example by storms or flooding.
- Productivity and labour supply might be affected, for example when extreme heat affects workers' health or disrupts transport systems.
- Production capacity may be reduced, for example because of supply chain interruptions.
- Operating costs may increase, for example because of increasing water scarcity, or increased insurance premiums.
- Capital costs may increase, for example where there has been damage to facilities.

In this report, we are focusing solely on physical risks.

Climate adaptation and resilience is still a very new topic for most organisations and there is a widespread lack of understanding - from boards to auditors and everyone in between. Many business leaders do not intuitively see climate change as a significant risk for their companies, especially where they are focused on the short-term (with many thinking it will only become relevant in the future).[v]

Anecdotally, it appears that one reason for this may be that it is hard for many leaders to imagine how first order impacts – such as extreme weather events, changes in precipitation patterns and rising sea levels – might affect their business. This is especially true when most haven't yet experienced any major losses that were clearly attributable to climate change. Only by walking boards through the implications – *is your supply chain at risk of disruption from floods, storms or droughts? How susceptible is your workforce to health issues during a heatwave? How insurable is that factory that sits on a floodplain? Could a drought restrict the availability of cooling water for your datacentre?* – does it become possible to start to grasp the realities.

In recent years, the Taskforce on Climate-related Financial Disclosure[vi] has helped to raise awareness about physical climate risks through its reporting framework, which is now being incorporated into the International Sustainability Standards Board's standards.[vii] In the UK, large firms and financial institutions are required to report against this framework.

These are relatively new requirements on businesses and it will take time to see whether they translate into substantive action, or whether they are merely perceived as a 'tick box' exercise.

Moving to a risk mindset requires imagination

While many businesses are now conducting risk assessments, there are often shortcomings in the process that can lead to an underestimation or downplaying of physical climate risk. Perhaps the most fundamental reason is the need to fully appreciate the limitations in models and to account for uncertainty in an appropriate way.

There are several limitations to current climate and economic modelling approaches that mean models are likely to underestimate the risks associated with physical climate impacts.[viii] These include a tendency to focus on average outcomes rather than the 'worst case scenario' and a failure to include tipping points and feedback loops.[ix,x]

We need to move from a 'science' mindset that focuses on central scenarios and only those impacts that we can project with *confidence*, to a 'risk management' mindset, where we use imagination to consider what *could* go wrong in the worst-case scenario, even if we *uncertain* about the likelihood of these outcomes.

Systems thinking

Another shortcoming of many current risk management practices is a tendency to focus on individual assets but to fail to consider wider interdependencies. These might include exposure to failures in critical infrastructure, or value-chain exposures.[xi]

There is good reason for this – it is hard to do! – and addressing these types of risks requires collaboration, so cannot be done by a single organisation in isolation. Shared assessment methods and frameworks can be a step towards starting to make more systematic assessments possible.

Taking action to reduce risk and increase resilience

If conducting a risk assessment is the first step, the key question is whether this will then lead to action to minimise risks. As the CCC has found, this does not yet seem to be happening.[xii]

As described above, one reason for the lack of action might be that risk assessments are underestimating the level of risk, leading leaders to believe that action is not necessary at this point in time. Further reasons put forward by workshop attendees included challenges in making the business case and an over-reliance on insurance.

The business case for adaptation action

A major barrier to taking action is difficulty in making the business case for investment in resilience measures. Quantification of risk is an important first step to be able to do this, but many businesses are not yet quantifying risks in their assessments. A survey of private-sector organisations carried out by insurance and risk management firm Marsh McLennan found that while most (83%) respondents had carried out an assessment of physical climate risks, only half (52%) had done this in a quantitative way.[xiii]

Quantifying physical climate risks is notoriously difficult and it may require the development of new assessment methods for businesses to be able to fully incorporate them into cost benefit analyses. The resilience benefit score developed by S&P for the Green Evaluation Second Party Opinion is one example. The Physical Climate Risk Appraisal Method (PCRAM) is another such attempt. It was developed to help quantify the costs and benefits of resilience measures in infrastructure investments so that physical risks could be incorporated into an investment model.[xiv] The intention was to allow resilience to be considered at the moment at which investment decisions are made, rather than after the fact, when it may be too late to change course. In this way, the impact on future revenues and return on investment can be properly understood. Collaboration was a key part of this process – bringing together climate scientists, engineers, investors, ratings agencies and governments (among others) to create a shared understanding.

Participants also welcomed the supplementary Green Book guidance on accounting for the effects of climate change that was published in April by Defra. This should help to make it easier to build the business case for adaptation into Government spending decisions.[xv]

Over-reliance on insurance

Insurance is a necessary and important part of risk management, but it will not on its own be sufficient to deal with the level of physical climate risk that we must now anticipate. Companies might be over-relying on insurance rather than taking active steps to adapt and improve their resilience.

However, insurance providers might also provide the solution in that they could be well-placed to incentivise the take-up of adaptation and resilience measures, for example through offering lower premiums to businesses that can demonstrate greater resilience or making coverage conditional on putting adaptation measures in place.

Participants highlighted Flood Re's development of 'Flood Performance Certificates' as an example of a tool that could help insurers in this regard.[xvi]

The role for policy in building business resilience

The discussions at our event generated some ideas for areas in which policy interventions could be explored further.

Risk assessment and disclosure

TCFD-aligned reporting is mandatory for large companies and financial institutions but not for smaller business. Reporting against the equivalent framework for nature-related risks (created by the Taskforce for Nature-related Financial Disclosure or TNFD) remains voluntary for all. Making these types of disclosure mandatory for more organisations could help to boost action to increase resilience.

Outcome-based approaches for regulation

Workshop participants noted that there is a particular challenge for regulation to keep pace with a changing climate. Since we can expect climate impacts to continue to worsen as long as we continue emitting greenhouse gases, minimum resilience standards would need to be continually revised to keep pace as extreme weather events become more frequent and intense.

One solution to this problem is to set service delivery requirements instead of minimum resilience standards. This then allows companies themselves to determine the best way to achieve them and permits flexibility and innovation as circumstances change.

Ofwat's outcomes-based regulation was given as an example of this approach, which includes service performance measures such as customer satisfaction, leakage and pollution incidents. (However, it should be noted that Ofwat has identified some shortcomings with this approach, in particular, where standards focus on performance at a point in time, they may not provide sufficient insight into a company's approach to managing future risk.[xvii])

Participants welcomed the Climate Change Committee's forthcoming 'Well-Adapted UK' report, which will help to provide a better understanding of what outcomes businesses should be aiming to achieve.

Part II: Innovation and growth in adaptation and resilience

Although many of the physical impacts of climate change are well-known and have long been forecast by climate scientists, business and investment interest in the resilience and adaptation sector has lagged far behind that in the climate mitigation sector.

But the picture is starting to change. According to a survey of 30 Forbes 2000 businesses by the World Economic Forum, nearly half (47%) of respondents said they were exploring opportunities in adaptation-related products and services.[xviii] And analysis by PwC found a growing interest among venture investors in the sector.[xix]

The Government also acknowledges these new opportunities in the CARIF:

> "Providing adaptation goods and services (construction, engineering, software and advice) presents a business opportunity, especially to first-movers, both domestically and internationally."[xx]

This is a new and emerging sector that is not yet as well explored as the mitigation sector. The World Economic Forum has reported that "there are no good global estimates of the size of markets for adaptation-related goods and services".[xxi]

In this section we share some of the ideas discussed at our workshop on potential opportunities for innovation and growth in the adaptation and resilience sector and look at ways in which it might be supported.

Box 2: Adaptation-related goods and services

Areas for growth can be considered in three broad categories:

1. **Understanding and assessing risks**. For example, using Earth observation systems to collect data on hazards, exposure and vulnerability; weather modelling; risk analytics; business services.
2. **Building resilience against physical impacts**. For example, early warning systems, new insurance products, storm-proofing technologies, cooling technologies, flood resilience, health protection.
3. **Responding to physical impacts**. For example, data collection and processing to support disaster response, decision-making tools, restoration and recovery technologies.

In this report we use "technologies" to refer to both nature-based solutions as well as infrastructure, engineering or data-based solutions.

Where might the UK be able to contribute?

To the best of our knowledge there has not yet been any systematic analysis to identify in which areas of adaptation-related goods and services the UK might have a particular strength. However, the Industrial Strategy (which was published after our workshops) does mention a few examples, including:

- insurance and reinsurance,
- management consultancy, and
- agri-tech.[xxii]

Workshop participants suggested areas of strength for the UK that might provide the foundations for successful adaptation-related innovation. These included:

- Cutting-edge science and engineering research taking place at UK universities.
- A pipeline of highly-skilled graduates.
- A strong climate tech ecosystem.
- A strong start-up ecosystem in London.
- World-leading public scientific institutions such as the Met Office.
- Being global leader in financial services.
- Being a global leader in digital technologies.
- Being a world leader in the use of nature markets (for example Biodiversity Net Gain).
- A potentially large domestic market (because UK consumers are interested in environmental issues).

Ideas for more specific adaptation-related goods and services included:

- **Data collection and simulation**, for example from Earth system observation, meteorological monitoring, or the use of AI to create synthetic data.
- **Data assimilation, analysis and interpretation** (including through the use of AI) to help provide actionable insights, for example providing more granular risk data or real-time hazard warnings.
- **Data infrastructure,** to make insights from climate and meteorological data more accessible and affordable, for example allowing smaller businesses to access risk information where previously this was only available via expensive consultancies (a "QuickBooks" for climate data).
- **Financial services,** including innovative insurance products and new financial products such as green bonds.
- **Engineering services and consultancy** to manage risk and support resilience activities.

Barriers to innovation and growth in the adaptation and resilience sector

Securing investment

A key question for entrepreneurs (or existing businesses looking to expand into adaptation-related goods and services) is whether they will be able to secure investment. Participants identified a number of barriers.

Lack of climate literacy among investors

There was a sense from participants that thinking about physical climate risk was not yet mainstreamed in the finance sector, making it harder to finance adaptation innovation (and, on the flip-side, leading lenders to potentially underestimate the risk of loan failures in traditional sectors). There was a perceived lack of private capital that understands the adaptation space.

Unfamiliar goods and services attract a higher cost of capital

Relating to the lack of climate literacy, where investors are unfamiliar with the adaptation and resilience sector, they can see investments as higher risk, leading to a higher cost of capital.

The (mis)perception that the public sector will provide

Another misperception can be that adaptation and resilience are public goods and therefore will be provided by the public sector. This frames thinking about the way that it should be financed.

Nature-based solutions

Nature-based solutions (NbS) (actions that address adaptation and resilience through the protection, management and restoration of natural ecosystems) can be more challenging to finance than traditional engineering or data-based solutions. Reasons for this include:

- Projects are typically smaller in size that investors want.
- The need for long-term thinking (which may go beyond investors' ideal timescales)
- Difficulties in identifying revenue streams.
- The need for multi stakeholder engagement and planning.
- Lack of familiarity with NbS

A solution that addresses at least some of these challenges is to work at the landscape scale, with the aim of creating a patchwork of bankable projects that mutually reduce risks to each other. This type of package of projects can make for a more attractive proposition for investors.

The introduction of nature markets – such as Biodiversity Net Gain and Nutrient Neutrality – can provide a revenue stream for some NbS projects.

WWF's NbS accelerator aims to deliver a portfolio of projects that can help build understanding of what works, so that effective, investable projects can be delivered at scale.[xxiii]

The role for policy in promoting adaptation and resilience innovation

We explored some ideas for ways in which policymakers can help to support and promote innovation in adaptation and resilience. Suggestions included:

Providing access to data. For many start-ups, accessing public data can be extremely important. Providing open data can help to drive innovation.

Enabling demonstrators. Demonstrators can help to increase familiarity with this emerging sector and provide evidence on 'what works'.

Reducing risk for investors. Government-backed guarantees and underwriting loans can help to reduce risk for investors and therefore bring down the cost of capital until the sector has matured. Public sector actors may also in some cases represent a 'credit-worthy offtaker' (that is, be a reliable

ultimate customer), providing confidence about future revenue streams and therefore making for a more attractive investment proposition.

Reducing friction in the procurement process. Excessive bureaucracy in dealing with public sector customers can be a significant challenge for start-ups.

Acting as an enabler by creating stable, long-term policies. Long-term policy stability helps to create confidence for investors.

About our workshops

We held two expert workshops in June 2025: 'Building business resilience in a changing climate' and 'Economic opportunities in climate resilience'.

The workshops brought together around 20-30 experts from across the academic, policy, business and civil society communities. An initial panel discussion was followed by break-out discussions to examine key questions in greater depth.

We are very grateful to the speakers who took part in our events:

Building business resilience in a changing climate

- Baroness Sheehan, Chair, Lords Environment and Climate Change Committee; Director, Peers for the Planet
- Prof Swenja Surminski, Managing Director Climate and Sustainability, Marsh McLennan; Professor in Climate Risk Management, LSE
- Sandy Trust, Institute and Faculty of Actuaries Council Member, lead author Planetary Solvency report
- Madeleine Rawlins, Global Practice Leader – Climate Change, Mott MacDonald
- Prof Michael Wilkins, Executive Director, Centre for Climate Finance and Investment, Imperial College Business School (Chair)

Economic opportunities in climate resilience

- John Robinson, Technology Investor, Mazarine Climate
- Claire Cockett, WWF Nature Based Solutions Accelerator
- Alexis Kruse, Climate Entrepreneur, Imperial College London
- Alyssa Gilbert, Director, Undaunted (Chair)

We would also like to extend our sincere gratitude to all participants for their invaluable contributions and collaborative spirit.

Please contact Jenny Bird (j.bird@imperial.ac.uk) if you have any queries about this report or our work in this area.

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