Weathering the storm: stability in a changing climate - speech by Sarah Breeden

Based on remarks given at the Chapman-Barrigan lecture

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Sarah Breeden, Deputy Governor for Financial Stability, shares some real world examples of how risks to price and financial stability from climate change are emerging now, and how they might grow going forward. She emphasises the importance of work at the Bank and in the wider financial sector to build awareness of and resilience to these risks.

Speech

Introduction

I wanted to start by saying what an honour it is to speak this evening at the annual Chapman Barrigan lecture. It is always special to come together to celebrate trailblazing women. And this series is a wonderful tribute to and legacy for Honor Chapman and Trish Barrigan, two outstanding, inspirational, pioneering leaders in property.

The lectures provide space for reflection and discussion on the forces shaping our economies and financial systems and I'm delighted to contribute to that tradition tonight. It's a time of profound change – technological, geopolitical, environmental. I plan tonight to explore the theme of our changing climate and the role of the Bank of England in delivering stability through that.

I am also greatly honoured to speak to such a distinguished crowd from the commercial property sector. The commercial property sector is undoubtedly a hugely important sector of the United Kingdom's economy. It provides the physical space for businesses to operate, innovate and generate jobs. It attracts significant amounts of foreign capital as it does so. And it directly employs over 1 million people.

But it is also a sector that has over the years seen significant cycles of boom and bust and contributed to many financial stability challenges, both in the United Kingdom and overseas (including in the US even very recently). Understanding the challenges facing the sector is a critical part of our financial stability mission, and we are hugely grateful to the industry for the open and constructive engagement that you all provide.

Central to that engagement is the Bank's commercial property forum (CPF). Such engagement has been crucial as recent years have not been quiet. Just in the last five years, the CPF has helped us to navigate the financial stability risks from a global pandemic and the transition to a higher interest rate environment, all against a backdrop of rising global uncertainty.

Today, the sector continues to face headwinds. The latest Bayes UK CRE lending Report shows that almost 70% of all outstanding debt (around £100bn in total) is due for repayment by 2027. Around 10% of debt matured in 2024 with a small minority in default and the rest restructured or extended. Refinancing pressures will likely be felt more acutely in sectors such as office and retail given the post-pandemic shift to more remote working and the continuing shift from physical to online shopping. The transition to higher rates is far from over.

But reassuringly, compared to before the financial crisis, bank lending standards have been much more conservative, and our stress tests show that the UK banking system is resilient to very large falls in CRE prices. Other players matter too, of course. Non-bank participation in the UK CRE sector has grown rapidly since the global financial crisis, adding welcome diversification to the supply of funding. But here I am mindful of vulnerabilities in the non-bank sector – most notably liquidity mismatches, leverage and valuation opacity – and the potential for increased risks that they bring (**FSB, 2025**).

But I do not wish to focus on those vulnerabilities tonight. Instead, I want to focus on the challenges of a changing climate. That matters for the Bank of England given our statutory responsibilities for monetary and financial stability. And it matters for you too, as the commercial real estate sector has both a key role to play in helping navigate the climate transition and a set of risks to manage as we do so.

These risks from a changing climate are not hypothetical or somewhere far off in the distance.

Last year was the warmest year on record, with annual average global temperatures exceeding 1.5°C above pre-industrial levels. The IPCC estimates that average global temperatures are now more than one degree higher than pre-industrial levels. They are set to rise at 0.2°C per decade, given past and ongoing greenhouse gas emissions[1]. And as average temperatures rise, so too does the risk of passing through 'tipping points' as ice sheets collapse and weather patterns change, causing large, accelerating and potentially irreversible impacts[2].

The rise in temperatures has already increased the frequency and intensity of extreme weather events both abroad and at home. In the UK, intense storm rainfall, like that seen in 2023-24 is now expected to occur once in every five years (compared to once in every 50 under a pre-industrial climate). Under a 2°C pathway, that rises to once in every three years.

The risks posed by this changing climate matter for individual firms' safety and soundness, the resilience of the financial system as a whole and, through their impact on the macroeconomy, the outlook for inflation.

These are real risks that could materialise, and in some cases already are materialising, within the time horizons that the Monetary Policy Committee (MPC), Financial Policy Committee (FPC) and Prudential Regulation Committee (PRC) care about. Indeed, when I first started work on climate change at the Bank almost ten years ago, my challenge was to explain how it might be relevant to the core mandate of a central bank. I think the examples. I'll cover today demonstrate clearly how that case has now been made.

Price stability

Let me begin by looking at how the physical effects of climate change impact inflation, starting with food.

Severe weather events – droughts, floods and extreme temperatures – can significantly impact global agricultural prices. Those events have been occurring with increasing frequency and intensity in recent years.

Historical experience suggests that severe weather events can generate price increases of over 30% in global agricultural commodity prices (**de Winne and Peersman, 2021**). As an economy that imports a high proportion of its food – around 40% – UK inflation is highly susceptible to such changes. Another study by **Peersman (2022)** showed that for a 1% unanticipated increase in globally-traded food prices, euro-area headline inflation rose by 0.1%. Our own work at the Bank of England shows broadly comparable results for the UK.

UK food prices are also affected by extreme weather events that take place at home. As we saw in 2023, excessive rainfall can have significant impacts on the supply of domestic agricultural products[3]. Beyond food production, weather events, such as extreme heat, also disrupt infrastructure, such as transport, that are critical to food supply chains[4].

The impact of severe weather events on inflation extends beyond the food sector. A Bank of England study using county-level data for England over the years 1998-2021, shows that flooding impacts output and prices across sectors – including those that feed into core inflation (**Ficarra and Mari, 2025**). It finds that the impacts differ across sectors, with some presenting as a demand shock and some as a supply shock.

What matters for monetary policy is the impact of such events on aggregate inflation. While most studies find negative impacts on GDP from extreme physical events, the estimated impact on aggregate inflation is less clearcut.

As set out in work by the Network for Greening the Financial System (NGFS), severe weather events impact the economy through demand, supply, and financial channels, with the aggregate inflationary impact depending, in theory, on whether the demand or supply effects of the event dominate[5]. That is uncertain[6]. But as my colleague James Talbot has highlighted, there is a growing body of literature to suggest that supply effects dominate, meaning these events increasingly represent a trade-off inducing shock for monetary policy makers to deal with (**Talbot, 2025**).

These impacts are likely to increase over time as temperatures rise further and shocks become more frequent and severe. In a study for the ECB, **Kotz et al (2023)** show that without adaptation measures, global food price inflation might increase by 1-3pp by 2035, increasing pressures on headline inflation by between 0.3-1.2 pp. They provide evidence that upward pressure from warmer temperatures on inflation is larger in warmer months and warmer countries, suggesting that the effects associated with climate change may be more pronounced as average temperatures rise. More broadly, the emerging literature between climate change and inflation suggests a non-linear relationship (**NGFS, 2024**). The possible existence of “tipping points” adds to the importance of this work.

In addition to considering these impacts on inflation from the physical effects of climate change, we need also to consider transition effects.

The UK government has for some time been implementing policies to transition to a less carbon-intensive economy, consistent with its commitment to reach net zero emissions by 2050. By reducing the physical effects of climate change, these actions will likely reduce the trade-offs monetary policy makers face in the long term. But they can have an impact on inflation in the shorter term.

Indeed I first discussed the role of carbon pricing in explaining some of the large rise and fall in inflation over 2021-23 in **a speech** I gave in January.

At its peak in October 2022, headline inflation reached 11.1% (**ONS, 2022**), around 40% of which can be attributed directly to rising energy prices, especially gas and electricity. Russia’s invasion of Ukraine and the resulting disruptions to gas supply – a classic “gas supply shock” – forms the prevailing narrative for the initial rise in inflation (**Alessandri and Gazzani, 2025**).

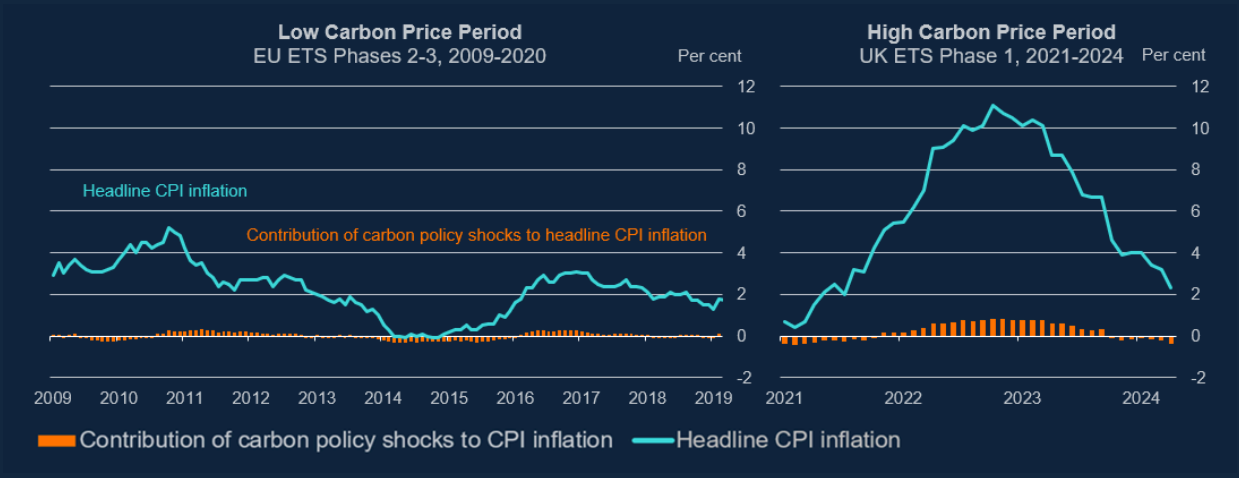
But while the invasion was undoubtedly the most significant single driver, carbon prices also rose rapidly during this period. By the summer of 2022, the UK Emissions Trading Scheme (ETS) carbon price had roughly doubled relative to the previous year (Chart 1), in part reflecting several policy announcements that effectively tightened the (future) supply of carbon allowances in both the UK and EU[7]. The rise in wholesale gas prices will have also contributed to the increase in carbon prices (**Shin and Mari, 2025**).

Chart 1: Carbon emissions allowance prices in the United Kingdom

Sources: Bank calculations. Data from LSEG and LSEG Commodities Research.Notes: The chart depicts the daily UK-relevant carbon price i.e. the EU ETS carbon price from 2005-2020, and the UK ETS carbon price from 2021-24. The EU ETS price has been converted from EUR to GBP. The London Stock Exchange Group (LSEG) UKA forecast (green dots) is in normal terms (adjusted for 2% inflation)

We estimate that around 1 percentage point of both the increase and subsequent fall in headline inflation over the 2021-23 period is likely to have originated from these changes to carbon policy (Chart 2, RHS). That reminds us that changes in carbon policies can have both inflationary and disinflationary impacts. Indeed looking over a longer horizon, changes in carbon policies have both pushed up and down on prices, albeit at much smaller magnitudes than in recent years (Chart 2, LHS).

Chart 2: Historical decomposition of past contribution of carbon policy shocks to developments in UK headline inflation



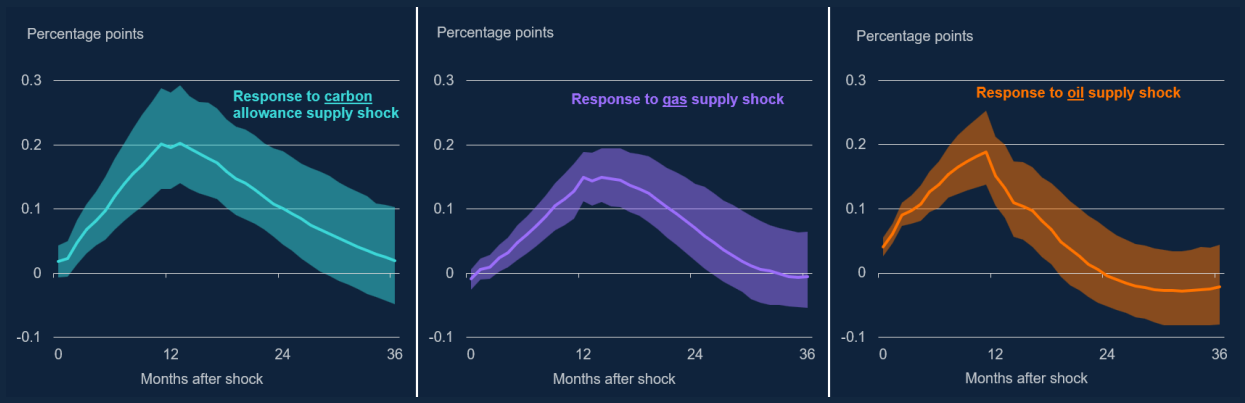
Source: Bank staff analysis based on **Copeland et al (2025)** Notes: The figure reports the historical contribution of the identified UK-relevant policy shock to UK headline inflation as estimated by the VAR model in **Copeland et al. (2025)**. To provide conservative estimates, the left-hand side chart is estimated using a "low carbon price" sample period (June 2008 to December 2020) whereas the right-hand side chart is estimated using the full sample, which includes the "higher carbon price", period (June 2008 to April 2024).

The energy sector plays an important role in the transmission of carbon policy shocks to inflation **(Copeland et al, 2025)**. Our estimates suggest that multiple energy-related commodity prices – including carbon allowances, crude oil, and natural gas prices – increase in response to a shock. These rising costs are passed on to the energy prices faced by households and firms. And, via supply chains, energy intensive firms also pass these through to non-energy prices.

The source of an energy price shock matters for monetary policy. We have estimated that a 1pp rise in energy price inflation originating from a shock in the carbon market has a roughly 25% larger impact on headline inflation relative to an equivalent shock arising in the gas market. It is also several months more persistent than if it had originated in the oil market (Chart 3).

Oil and gas prices have historically been, and are likely to remain, the primary drivers of energy prices: it takes an unusually large carbon supply shock to generate a 1pp rise in energy price inflation[8]. But carbon shocks are likely to grow in frequency and size over coming years, as carbon pricing schemes become more stringent, sectoral coverage widens, and as carbon prices are expected to rise (diamonds on Chart 1). It is however also likely that the drive to decarbonise, particularly in the power sector, will reduce the aggregate impact of carbon price shocks over the longer term.

Chart 3: Impulse response functions of UK headline inflation to carbon allowances, gas and oil supply shocks scaled to increase energy inflation by 1 percentage point at peak



Source: Copeland et al (2025) Notes: Impulse responses to the identified UK-relevant carbon policy shock, and the natural gas and oil supply shocks identified by Alessandri and Gazzani (2025) and Känzig (2021). Responses are normalised to increase energy CPI inflation by 1 percentage point at peak. Estimation sample: June 2008 to April 2024 for the carbon and oil shocks, and to December 2023 for gas shock (owing to the shock series length). Note: our UK-specific reconstruction of Alessandri and Gazzani's gas shocks (which takes the UK NBP natural gas price change around event days) enables estimation over the full sample, and yields similar results. The solid line represents the median draw. The shaded areas are the 80 percent credible intervals. For comparability across shocks, these are standardised to increase energy price inflation by 1 percentage point (at peak), which is a common scaling choice in the literature for ease of interpretation (see, for example, Känzig (2025) and Ortubai et al (2025)). It is worth noting, however, that this scaling choice means we are considering a particularly large shock in the carbon market: roughly 15 times bigger than a "typical" (1 standard deviation) shock over the sample period.

Understanding how these physical and transition risks transmit to inflation will be especially important for monetary policy makers.

That's because, as these examples show, climate shocks have a significant effect on energy and food prices. These items are bought regularly and have particular salience for households, meaning they have outsized effects on inflation expectations (**Bonciani et al, 2024**) and so potentially wage and price setting behaviour. In addition, in a world where these shocks become larger, more frequent and more persistent, the risks of these second-round effects become even greater.

Indeed, as my colleague James Talbot recently set out (**Talbot, 2025**), these shocks sound rather similar to the shocks monetary policy makers have faced in recent years – large, unpredictable, but persistent supply shocks in areas of salience for households. So monetary policymakers will need to understand the economic impact of these climate shocks and be ready to react as needed, if we are to keep inflation expectations anchored and inflation low.

With climate change already influencing the economy, a better understanding of how monetary policy might need to respond to climate shocks matters for investors too, including those in CRE. Building our collective understanding of what is happening and the appropriate policy response is not an easy task. But it is one we must rise to.

Financial stability

Climate change also matters for financial stability.

Back in 2022 our **Climate Exploratory Scenario** explored the financial risks posed by climate change for the largest UK banks and insurers.

The exercise concluded that climate change creates risks to households and businesses globally, and so for the financial system. It showed that if banks and insurers did not respond effectively, climate risks could cause a persistent, material drag on their profitability. Loss projections varied across participant type and climate scenario, but amounted to hundreds of billions of pounds. And losses would be significantly higher in a scenario with a late or disorderly transition and higher still in a scenario with no further policy action and so higher, and still rising, physical risks. Individual firms, and the financial system overall, would be much less resilient.

In that context, I'd like to hone in on two specific examples where climate risks becoming more proximate could directly impact financial stability.

The first relates to a question that I – and other Bank colleagues – have raised of a possible "climate Minsky moment", where the crystallisation of climate risk triggers broad asset repricing, perhaps similar to the impacts on asset prices we saw during Covid 19 or the start of the war in Ukraine.[9]

The impact on repricing of any 'trigger climate event' would of course depend on the source of the shock, how well climate risks are priced before it, the speed of any repricing, and if vulnerabilities in market-based finance further amplify it.

Analysis of these risks has to be global. The UK has already made much progress in its transition to net zero. It has also experienced fewer extreme weather events than other parts of the world. But as a small, open economy with a large financial centre, the UK is exposed to cross-border spillovers in global financial markets, and the global operations of large UK companies and UK-based Non-Bank Financial Institutions (NBFIs) mean they are of course vulnerable to climate developments overseas.

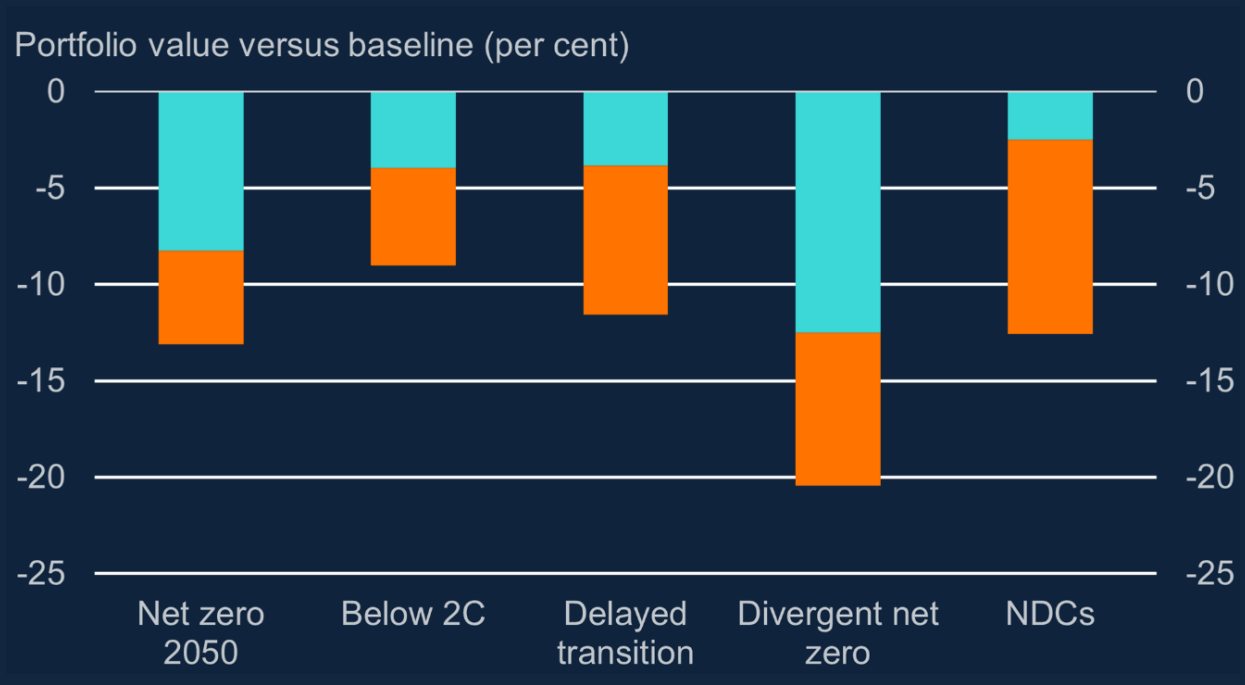
On pricing, there is evidence that climate risk is starting to be priced in assets such as corporate and sovereign bonds. But our analysis suggests that current prices neither fully account for the transition risks we could see as part of the transition, nor the physical risks we

could see in its absence.[10] In this context, markets over time or in response to a significant climate event begin to place more weight on scenarios where climate risks result in a broad-based macro shock, characterised by inflationary shocks, sharp changes in interest rates, and increased risk premia. And that would of course mean that they re-evaluate upwards their pricing of climate risk today.

The speed of repricing is crucial for understanding financial stability impacts. Rapid repricing could occur if markets start pricing in severe physical climate risks or a disorderly transition, perhaps following acute physical disasters. Even gradual repricing could result in short bouts of rapid price movements.

This repricing could affect a wide range of assets. Scenario analysis undertaken by Bank staff suggests that a portfolio of long-duration G7 sovereign bonds could lose 10-20% of its value given interest rate risk and increasing risk premia (depending on the scenario).[11] Corporate credit spreads could widen, making the repricing of corporate asset classes even more significant.

Chart 4: Climate re-pricing of a long-duration G7 sovereign bond portfolio



Source: **Measuring climate-related financial risks using scenario analysis (Holden et al, 2024)**

Large UK NBFIs, which are more exposed to market risks like these than banks, might not be resilient to such a shock. The first-order repricing shock is of a similar size to the shock in last year's SWES.[12] Larger declines in sovereign bond prices could lead to uncertain behavioural responses by NBFIs, such as forced selling in excess of that observed in that exercise.

These risks, and the tools to assess them, are evolving rapidly. It's important to take them seriously and fully understand the broader impacts, including potential behavioural responses. Following this work, we have a better understanding of how climate risks might impact financial markets. But there is more for us and for market participants to do. And to that end, we are further clarifying our expectations for banks and insurers through our recently published **consultation paper**.

Let me pause briefly on commercial property since assets here might also be vulnerable to sudden repricing. We are already seeing evidence of a “green premium” being paid for more sustainable office space[13]. That suggests that some climate risks are already priced in. However, a sharp reassessment of physical risks or the likelihood of a sharp and disorderly transition, may lead properties that are more exposed to severe weather events or that do not live up to sustainability standards to face a heavier discount. So there is work to do here too.

Climate risks becoming more proximate can also impact financial stability through the withdrawal or a higher cost of insurance. As flood risks intensify, insurers may withdraw coverage or increase price. This is already happening in the US, where policy non-renewals correlate with regional climate risks.[14]

Prospective homebuyers in flood prone areas might anticipate reduced insurance availability and higher premia, demanding discounts to house prices to compensate. Our **November 2024 Financial Stability Report** found that in the most pessimistic climate scenarios, the 1% of properties most exposed to increases in flood risk could lose around 20% of their value. And the potential fall in house prices for the 10% most exposed areas would be, on average, 6.5 times larger than in areas with a median level of risk.[15]

Mortgage lenders’ exposures are sensitive to house prices. A price fall would increase the loss given default on a property. If more properties were uninsured, potential losses faced by lenders in the event of flooding would also increase. We could see mortgage prisoners, where existing mortgage holders are unable to refinance their homes. Our CBES analysis found that in our late and no action scenarios mortgage losses faced by banks are around four times larger than in our early action scenario.

Changing insurance availability can also impact commercial real estate. It is estimated that 10% of commercial properties are in flood plains and the impact of flooding on affected businesses can be severe (**Crampton et al, 2025**). The need for businesses to self-insure could also put downward pressure on their investment expenditure.

In the UK we have Flood Re for residential properties – a joint reinsurance initiative between the Government and the insurance industry. This limits the short-term financial impact of flooding on households, as around 90% of residential properties are insured. But commercial properties are not covered. And as physical climate-related risks increase over the long term, and the Flood Re scheme ends, financial stability risks could develop. What happens as we approach the end of Flood Re matters a lot.

These examples highlight how some of the risks to the financial system are becoming more proximate. Since the Bank first started its thinking on how climate change matters for the financial system we are in a much better place – managing climate risks is becoming increasingly embedded in our analysis and our actions, and our increased understanding of a host of risks has led us to feel better prepared. However, there is much more for us and market participants to do to minimise both the likelihood of climate risks materialising and their impact if they do.

Conclusion

So where does this leave us? In 2019 I gave a speech titled “Avoiding the storm”. As I have hopefully highlighted for you this evening, the storm, or at least the beginnings of it, is already upon us. And so it is vital for us now to work out how to “weather it”.

What does that mean for the real estate sector? Climate risks are real and tangible, and as they become more imminent, property valuations may change rapidly. Real estate owners and lenders could face significant risks, particularly if insurance protection becomes unavailable.

To manage these risks and support the transition to net zero, investment for adaptation and mitigation is crucial. Under current Government plans, all commercial property will need an EPC rating of B or above by 2030. 83% of commercial buildings in major cities currently fall below that standard[16]. The cost of transition will be substantial and require significant financing. Without the necessary funding, we risk stranded or “zombie” properties.

As the central bank, our role is to provide the right macroeconomic and financial environment for this investment. That means two things: ensuring price stability and maintaining a strong and resilient financial system. And we need to do that in the face of physical and transition shocks. These are the most important actions we can take to ensure a stable foundation for economic growth. Our doing that will support us all in weathering the storm.

I would like to thank Natalie Burr, Richard Button, Jennifer Clark, Hannah Copeland, Kemal Ercevik, Lennart Brandt, Lewis Holden, Caspar Siegert, Borro Wanengkirtyo, Rebecca Mari, Timothy Rawlings, Francine Robb and Nicola Shadbolt for their assistance in preparing these remarks. I would also like to thank Andrew Bailey, James Talbot and Huw Pill for their advice and comments.

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1. **IPCC — Intergovernmental Panel on Climate Change**
2. **Global Warming of 1.5°C, IPCC (2020).**
3. **Climate change: Supporting farmers and growers - House of Lords Library**
4. **Impact of Climate Change on the UK Food System | Published in FSA Research and Evidence**
5. **Acute physical impacts from climate change and monetary policy (2024), NGFS Technical Document**
6. In **Ficarra and Mari (2025)**, a one standard deviation increase in the number of UK floods was found to reduce regional output by 1% and raise regional inflation by 0.5% at the two-year horizon. However, the aggregate economy-wide impact can differ significantly depending on the sectoral composition and position in the supply chain of the area affected by flooding. **Li (2024)** applies the same identification approach across countries and finds that flooding has a much larger inflationary effect in developing economies relative to advanced ones, because of the larger supply shock it triggers.
7. In 2021, the EU transitioned from Phase 3 to Phase 4 of the EU ETS. The UK left and established the UK ETS, which started in Phase 1. Both ETSs have scheduled a reduction in the supply of carbon permits, a decreasing share of permits being given out for free, and an expansion of sectoral coverage over the period 2021 to 2030.
8. For comparability across shocks, our estimates in Chart 3 are standardised to increase energy price inflation by 1 percentage point (at peak), which is a common scaling choice in the literature for ease of interpretation (see, for example, **Känzig (2025)** and **Ortubai et al (2025)**. It is worth noting, however, that this scaling choice means we are considering a particularly large shock in the carbon market: roughly 15 times bigger than a “typical” (1 standard deviation) shock over the sample period. The oil and gas price shocks needed to increase energy price inflation by 1 percentage point (at peak) are 5 times and 3 times bigger than a “typical” (1 standard deviation) shock over the sample period, respectively.
9. **Avoiding the storm: Climate change and the financial system - speech by Sarah Breeden | Bank of England** and **From hot air to cold hard facts - speech by Andrew Hauser | Bank of England**
10. **Financial Stability Report - November 2024 | Bank of England**
11. **Measuring climate-related financial risks using scenario analysis | Bank of England**
12. **System-wide exploratory scenario | Bank of England**
13. **Sustainability and Value | Capital Markets: Central London Offices Research | 2023 | JLL Research**
14. **Chairman Press | Chairman's Newsroom | Chairman | U.S. Senate Committee on The Budget**
15. Evidence is emerging that higher insurance premia are already affecting home prices in parts of the US, see for example Eastman, Evan and Kim, Kyeonghee and Zhou, Tingyu, Homeowners Insurance and Housing Prices (June 03, 2024). Available at SSRN: **Homeowners Insurance and Housing Prices**.
16. **British Property Federation**

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