

From Carbon to Collateral: Five Years of Greening the Plumbing of Monetary Policy

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Abstract

Over the past five years, central banks have moved from debating whether to factor in climate-related considerations in their monetary policy operations to taking tangible actions. These actions are typically designed to manage climate-related financial risks on central banks balance sheets and/or to support the economy-wide transition to net zero (where central banks have a mandate to do so). This article reviews that evolution, drawing on experiences of the Bank of England and other central banks. It traces the expansion of climate-related measures from asset purchase programmes to collateral frameworks, lending operations and liability-side tools. We argue that clearly articulating a central bank's objectives is crucial for selecting appropriate instruments. These instruments must also reflect substantial differences in local market structures and operating frameworks. While improvements in climate data have removed some barriers, translating this data into decision-useful metrics remains challenging and is an area where the NGFS can provide valuable support.

Keywords: central banking, monetary policy operations, climate change, climate risk, physical risk, transition risk, sustainable finance.

The impact of climate change is intensifying. Rising temperatures have increased the frequency and intensity of extreme weather events and their economic impact is increasing. While the policies needed to mitigate climate change are for governments to decide, central banks need to understand the impact of climate change on the economy, the financial system and their own balance sheet. In 2021, an NGFS report titled 'Adapting central bank operations to a hotter world' (NGFS, 2021) discussed how central banks might need to factor in climate-related considerations in their monetary policy operations.

We can distinguish two distinct reasons why central banks might need to consider climate change as part of the financial operations that they use to implement monetary policy. First, all central banks will want to ensure that they are managing the climate-related financial risks on their own balance sheet, even if the materiality of these risks differs across countries. Second, some central banks may have a mandate to actively support the economy-wide transition to net zero. For example, they could use their monetary policy operations to try to reduce the relative cost of funding environmentally friendly vs polluting businesses. Traditionally, most central banks do not try to affect relative funding costs via their

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operations. But they may choose to do so to the extent their legal mandates ask them to in the context of climate change.

Central banks have several levers at their disposal to reflect climate considerations in their operations. For example, they might adjust asset purchase schemes to overweight certain types of issuers. They might also adjust the pricing of their lending operations or refine collateral requirements in relation to such lending. Or they might want to reflect climate considerations in the amount of central bank reserves that commercial banks are required to hold (where such requirements exist). Some of these levers will help manage financial risks to central banks' balance sheets. Other levers will help support a transition to net zero. And some will do both.

Below, we set out key areas in which central banks — including the Bank of England — have made progress in terms of turning these conceptual considerations into practice. Subsequently we will touch on some of the challenges that central banks had to overcome, before concluding with some overarching remarks.

1. PROGRESS CENTRAL BANKS HAVE MADE OVER THE PAST 5 YEARS

Since the NGFS report on monetary policy operations was published in March 2021, central banks have made a huge amount of progress to put these policy actions into practice. The measures that have successfully been implemented include tilting asset purchases towards greener issuers, adjusting “haircuts” on various types of collateral, as well as adjusting the terms of long-term refinancing operations to provide banks with incentives to lend to “green” activities.¹ Crucially, progress has been made both across a wide range of measures and a wide range of jurisdictions, including at the Bank of Japan, the Central Bank of the United Arab Emirates, the European Central Bank, the Magyar Nemzeti Bank and the People's Bank of China. A useful stocktake of these measures is included in the NGFS's 2024 publication “Adapting central bank operations to a hotter world: current progress and insights from practical examples” (NGFS, 2024).

Below, we step through the journey so far using the Bank of England as an example — while acknowledging the progress that has been made by other central banks, too.

Stage 1: greening asset purchase schemes

At the Bank of England our journey started with the greening of our Corporate Bond Purchase Program. The Corporate Bond Purchase Scheme (CBPS) was launched in August

¹ A collateral haircut determines how much a central bank will lend against an asset. For example, a 5% haircut means lending 95 cents against a bond worth \$1. This provides a buffer against losses: if the counterparty defaults, the bond's value can fall by up to 5% before the central bank incurs a loss.

2016 and expanded in 2020 in response to the Covid-19 pandemic. It purchased investment-grade sterling corporate bonds issued by non-financial corporates judged to make a material contribution to the UK's economic activity. The scheme was a monetary policy tool. Its size was therefore determined by the Monetary Policy Committee (MPC) as part of its monetary policy decision-making in order to achieve its inflation target. At its peak, the CBPS held GBP20bn of corporate bonds — estimated to be around 6.5% of the Sterling corporate bond market (UK Finance, 2021).

In November 2021, the Bank of England announced that it would ‘green’ this asset purchase portfolio. It decided to do so by regularly reinvesting the proceeds from maturing bonds into bonds issued by more climate-friendly issuers in each sector, and by making bonds by issuers that derive revenue from thermal coal mining ineligible altogether. The target was to achieve net zero in the portfolio by 2050 — something that could support an orderly transition to net zero (Bank of England, 2021). The announcement followed an update to the MPC's remit in which the Chancellor confirmed that the economic strategy of the Government which the MPC is expected to support as a “secondary objective” included supporting the “*transition to an environmentally sustainable and resilient net zero economy*” (HM Treasury, 2021). In addition to supporting the orderly transition to net zero, the changes to the asset purchase scheme also reduced the CBPS's exposure to transition risks (Monnin, 2018). The first reinvestments using this new approach were made in November 2021.

This change made the Bank of England the first major central bank in the world to “tilt” asset purchases towards greener assets. In July 2022, the European Central Bank announced that it would start “tilting” its corporate bond purchases under the corporate sector purchase programme (CSPP) and pandemic emergency purchase programme (PEPP) towards issuers with a better climate performance (ECB, 2022). This came at a time where, in light of the different monetary policy outlook, the ECB was still conducting net corporate bond purchases rather than simply reinvesting the proceeds from maturing bonds. The Magyar Nemzeti Bank announced in August 2021 that it would launch a dedicated Green Mortgage Bond Purchase Programme (Magyar Nemzeti Bank, 2021). Central banks have not yet adjusted their (often bigger) sovereign bond purchase schemes to reflect climate considerations given that there is significantly less scope to adjust the composition of these schemes.

Subsequent changes in the monetary policy environment made changes to asset purchase programs less relevant. As the post-Covid economic recovery began and interest rates moved away from the zero lower bound, central banks stopped expanding their asset purchase schemes, stopped reinvesting the proceeds of maturing bonds, and actively sold assets. This included the UK, where the MPC decided in February 2022 to reduce the size of the CBPS by a combination of ceasing to reinvest maturing assets and actively selling longer-dated bonds. The end of reinvestments meant that the previous approach to “tilting” was no longer applicable.

Instead, the Bank of England considered climate factors as part of the active sales process. This approach was designed to sell bonds issued by climate-friendly issuers less quickly than others. By June 2023 the active sales had concluded, with the last remaining bonds maturing shortly afterwards. This marked the end of the Bank of England's experience with "greening" its CBPS: portfolios that no longer exist cannot be greened.

The experiences with greening asset purchases still provide lasting lessons though. We developed important capabilities in terms of assessing the climate characteristics and associated transition risk for a broad range of non-financial corporates. And we learned how to tilt portfolios in a way that reflects this information without jeopardizing the primary purpose of these asset purchase programs. Some of the learnings from tilting the CBPS are also summarized in the Bank of England's 2025 Climate Disclosures, which show that our actions lead to a material change in the composition of the CBPS (Bank of England, 2025).²

The fact that asset purchases were wound down soon after we started to tilt our asset purchases is an example of the primacy of monetary policy objectives. The size of the CBPS was fully determined by the monetary stance required to achieve the UK's inflation target. The exact composition of the CBPS was not pinned down by monetary policy considerations — which allowed us to tilt the portfolio towards greener issuers as part of the Bank's "secondary objective". But as monetary policy required the portfolio to be wound down, that scope to make adjustments to meet the 'secondary objective' eventually disappeared, too.

Stage 2: greening collateral frameworks

Over the past three years, the Bank of England has turned its attention to greening the collateral underpinning our collateralized lending and "repo" operations.³ These operations are used to implement monetary policy. Central banks lend against suitable collateral, applying conservative haircuts (i.e. lending somewhat less than the market value of the collateral they take) in order to protect themselves against financial losses. These collateral policies will become increasingly important in the UK and elsewhere, as we transition away from asset purchase programs and towards a repo-led framework for monetary policy implementation (Saporta, 2024; Rodriguez et al, 2026). By accurately reflecting climate-related financial risks in our collateral eligibility and haircut methodologies, the Bank of England aims to ensure that its risk frameworks appropriately capture physical as well as transition risks connected to climate change — in the same way that they would do for any other risks.

² There are also lessons from the tilting of corporate bond purchase schemes for incorporating environmental factors into international reserve management frameworks (see e.g. BIS, 2022).

³ A repurchase agreement (repo) is a short-term agreement under which the central bank's counterparty agrees to sell securities and repurchase them later at a slightly higher price. This is economically equivalent to a secured lending operation where the price difference is equivalent to the interest rate the central bank would otherwise charge.

In 2024, the Bank of England started incorporating climate considerations into the haircuts and eligibility criteria for residential mortgage collateral. As of July 2026, raw (i.e. non-securitised) pools of residential mortgages accounted for over 60% of all collateral posted with the Bank. The value of these mortgages can be subject to both transition and physical risks. Transition risks include the risk that sharp increases in energy prices reduces the ability of households in difficult-to-heat properties to continue making their mortgage payments. Physical risks include the risk that more frequent flooding or subsidence could reduce the value of the property securing a mortgage. Climate change is expected to lead to more frequent and severe flooding in much of the UK. This can drive up the cost of insuring flood-prone properties or make the properties entirely uninsurable. This in turn can affect property values, for example because uninsurable properties cannot be mortgaged and can only be sold to a much smaller pool of cash-buyers. Similarly, climate change can increase the risk of subsidence. Subsidence occurs due to the expansion and contraction of the clay soil that many buildings in south-east England are built on. As climate change leads to more frequent periods of heavy rain as well as droughts, such contractions and expansions become more pronounced. This can damage properties, affect the cost of insurance, and ultimately reduce the value of a property. We amended data templates, worked with specialist analytics providers, and conducted detailed scenario analysis to quantify these risks and translate them into haircut adjustments. In addition, we also tightened eligibility criteria to ensure we only accept buy-to-let mortgages on properties that comply with the UK's minimum energy efficiency standards for rental properties.

In June 2026 we also announced changes to haircuts and eligibility criteria for corporate bonds. Issuers of the corporate bonds that we accept as collateral can be exposed to potential financial risks connected to the adjustment of the economy towards net zero. To reflect this, the Bank of England decided to apply haircut add-ons to bonds from issuers in relevant sectors to protect the Bank against financial risks. Consistent with the approach taken in the CBPS, it also announced that, from 31 October 2026, bonds issued by corporates that derive revenue from thermal coal mining and that are exposed to particularly material transition risks will not be eligible as collateral (Bank of England, 2026). While corporate bonds are not commonly used as collateral in the UK right now, these measures were announced alongside other changes that might change banks' incentives to use such collateral in the future. As such, they are important for future-proofing our risk management framework.

This shift of focus away from asset purchase schemes towards collateral measures is something we also see in other central banks. For example, the European Central Bank started applying similar haircut add-ons for corporate bond collateral in June 2026 (ECB, 2025). The Magyar Nemzeti Bank took a slightly different approach, and in September 2021 introduced lower haircuts for certain green securities rather than using add-ons for the least green assets.

Other central banks opted to adjust the pricing rather than the collateral policies of their lending schemes. For example, the People's Bank of China (PBOC, 2021) and the Bank of Japan (Bank of Japan, 2021) both rolled out programs that lend to banks at preferential prices, as long as that funding is used to support certain environmentally friendly activities. While the Bank of England's and European Central Bank's changes to collateral policies were motivated by the need to manage risks to central banks' balance sheets, such preferential pricing can support broader environmental objectives of the government.

Stage 3: liability-side tools

Work on the other side of central banks' balance sheet is more nascent. This includes measures such as central banks issuing green monetary bills or adjusting the amount of central bank reserves that commercial banks are required to hold in a way that reflects climate-related factors.

The NGFS's recent work demonstrates that such tools can be useful additions to central bank's toolkits, where central banks conduct these operations to meet their mandate (NGFS, 2026). Liability-side tools do not typically reduce direct financial risks that central banks are exposed to. But they can be effective in terms of supporting a broader, economy-wide transition to net zero. For example, commercial banks may be willing to lend to green projects at advantageous conditions if doing so reduces any reserve requirements they are subject to. And if central banks channel the proceeds of green monetary bill issuances into greener parts of the financial system, then this could support the development of a wider sustainable finance ecosystem.

How applicable such liability-side tools are depends on central banks' mandates as well as their broader operating frameworks. Liability-side tools are most relevant in markets where central banks regularly issue monetary bills, and/or impose reserve requirements that could be relaxed. While this is not the case for the Bank of England, some central banks — such as in the United Arab Emirates — have successfully launched work on schemes like this, demonstrating the diverse approaches taken to greening monetary operations across the NGFS's global membership (CBUAE, 2025).

2. OVERCOMING PRACTICAL CHALLENGES

There are now many successful examples of central banks having incorporated climate change-related considerations into their monetary policy operations. But it's important to acknowledge that central banks had to overcome a range of practical challenges to get there. We are not yet at the point where reflecting climate risks in monetary policy operations is as common and unremarkable as managing other risks. Nevertheless, knowledge sharing and dialogue in fora

like the NGFS are helping to broaden the range of central banks implementing these types of operations. There are three challenges in particular:

Challenge 1: articulating objectives

The first challenge is to clearly articulate what a central bank is trying to achieve by integrating climate considerations into its monetary operations. As mentioned above, some central banks integrate climate factors into their monetary policy operations to reduce risks to their own balance sheet, while others try to support an economy-wide transition that addresses the broader economic and societal risks linked to climate change. These differences reflect different central bank mandates, so there is no right or wrong answer. However, not distinguishing between these distinct objectives is a frequent source of confusion (Sachs et al., 2026).

This is because which objectives a central bank pursues determines which tools to prioritize. There are no “one size fits all” solutions. For example, increasing haircuts on assets exposed to climate risks can be important to protect central banks’ balance sheets. But recent analysis by Bank of England staff (Somaiya et al., 2025) has shown that it is unlikely to materially support the transition to net zero. Conversely, long-term refinancing operations that provide cheap funding for green projects could be helpful to support the transition. But providing cheap funding for certain activities will not typically reduce direct financial risks to a central bank. Instead, it could erode central bank income, thereby reducing a central bank’s financial resilience.⁴

The NGFS’s work acknowledges the importance of matching tools and objectives and provides helpful guidance in this area. For example, the NGFS’s 2021 report on monetary policy operations provides an indicative assessment of which tools may be most relevant in the context of reducing risks to central bank balance sheets vs. supporting the transition to net zero. And the NGFS’s 2024 report that took stock of progress so far demonstrated that this had been reflected in the tools that different central banks had chosen to deploy in practice. Specifically, changes to the pricing of lending operations always reflected an objective to support the transition, while changes to haircut policies and asset purchase programs would often (also) reflect an objective to manage risks to the central bank’s balance sheet.⁵ The fact that the NGFS’s work can support central banks irrespective of what they are trying to achieve is one of the great strengths of the network.

⁴ Such lending schemes may reduce risks indirectly by supporting a global transition to net zero and reducing physical risks a central bank is exposed to. However, it is not clear that an individual central bank can shape the global transition in a way that would lead to a measurable reduction in physical risks to its balance sheet.

⁵ According to the 2024 report overall, more measures had been motivated by an objective of supporting the transition rather than managing risks to central banks’ balance sheets. However, this could simply be a result of central banks being less likely to talk about their risk management practices in public.

Challenge 2: tailoring solutions to local frameworks

The second challenge is that monetary policy operations differ significantly across countries. Even when abstracting from differences in mandates with respect to climate change, there are big differences in the way different central banks go about their monetary policy operations. This is another reason why there are no one-size-fits all solutions.

At the most basic level this includes the fact that some central banks target inflation while others target exchange rates. Differences between inflation and exchange rate targeting do not only affect the formulation of monetary policy, but also the financial operations that are being used to implement monetary policy. For example, a central bank that targets exchange rates is more likely to intervene in foreign exchange markets or to issue monetary bills, while a central bank that targets inflation is more likely to adjust the terms of its collateralized lending programs or to buy and sell assets denominated in its own currency.

But even amongst inflation targeting central banks there is plenty of heterogeneity. For example, some central banks use reserve requirements while others don't. Some central banks have used large-scale asset purchase programs while others haven't. And some central banks have a history of providing various long-term refinancing operations while others don't. In addition, there is significant heterogeneity in the composition of the collateral that underpins central banks' secured lending operations. For example, some central banks primarily accept traded securities as collateral in their routine operations, while other central banks regularly accept credit claims such as residential mortgages or loans to non-financial corporates. And even where eligibility criteria are aligned in theory, commercial banks may deliver very different collateral mixes in practice. Often, this reflects the nature of different financial systems and the type of assets that commercial banks carry on their balance sheets. For example, in the UK, the biggest class of collateral that banks post with the central bank are residential mortgages, while in the Eurosystem covered bank bonds are the most frequently used type of collateral.

This means that it is not usually possible for central banks to simply copy approaches taken by their peers. Given the many dimensions along which central banks' operating frameworks and the financial systems that central banks operate in differ, it is unlikely that central banks find precedents in other countries that they can exactly replicate in their country without making adjustments.

The NGFS work on monetary policy operations helps address this challenge. Over the past years, the NGFS has organized numerous knowledge-sharing seminars and collated case studies that document measures implemented by a wide range of central banks. Crucially, it has focussed on those common building blocks that other central banks may be able to draw on, even if it does not make sense for them to follow the exact same approach. For example,

this includes sharing experiences on how to best assess transition risks that certain types of assets are exposed to. As usual, the NGFS doesn't try to come up with one-size-fits-all solutions but shares specific insights and experiences with its members. This allows central banks to learn about ways of addressing specific challenges that are relevant to them.

Challenge 3: data and metrics

For a long time, the lack of reliable asset-specific data was another factor that has held back some central banks. Depending on the assets they are trying to assess, central banks may have felt that they did not have the information that would be necessary to assess climate risks that specific assets are exposed to and/or the contribution to the transition to net zero that they could be making.

Fortunately, the availability of relevant information has increased materially over the past years. For example, the share of listed corporates worldwide that disclose Scope 1 and 2 carbon emissions increased from 28% in 2015 to 76% in 2023 (MSCI, 2025). Disclosure rates in developed markets and amongst large firms are even higher and often around 90% (Dalmas et al., 2025). While there continue to be challenges for some other types of assets, data availability has increased for many of these asset classes too.

In light of this progress, the focus has shifted from identifying raw data to developing simple, decision-useful metrics. In many cases, the challenge is not so much to identify raw information, but to make sense of it. For example, the greenhouse gas emissions of a company in isolation will not tell us much about the transition risks the company is exposed to. To understand these risks, we need to also consider the company's revenues, its ability to reduce emissions in a cost-effective way, its ability to pass higher regulatory costs on to its customers, etc. Decision-useful metrics consider all this information and express it in simple summary statistics such as "climate-adjusted probabilities of default", "climate value at risk", etc.

The Bank of England's work on integrating climate considerations into its monetary policy operations demonstrated that this is not always easy — but that central banks can draw on a range of useful tools to overcome these challenges. For example, the Bank of England has used extensive scenario analysis to quantify the physical risks to residential mortgage collateral. This draws on raw data such as a property's location, forward-looking climate projections at a post code level to assess physical hazards that the property might be exposed to across various climate scenarios, and financial modelling to translate this into potential impacts on the value of properties and mortgages. As part of its annual climate disclosures (Bank of England, 2026a), the Bank of England also publishes extensive scenario analysis for sovereign bonds that translates climate factors into potential mark-to-market losses. The NGFS's work

on scenarios, data and metrics can provide extremely useful tools in this context. But making sense of all this information in the context of specific monetary policy portfolios will always require a significant amount of analysis and judgement by individual central banks.

3. CONCLUDING REMARKS

Over the past five years, the debate about climate change and monetary policy operations has moved from theory to practice. What began as a largely conceptual discussion has evolved into a broad range of concrete policy measures that different central banks have implemented. Central banks have demonstrated how to reflect climate considerations in the context of asset purchases, collateral frameworks and lending operations. And we have seen the emergence of interesting work on reserve requirements and green monetary bills. We are moving towards a situation where managing climate-related risks is becoming part of business as usual for central banks.

At the Bank of England, we have moved from greening our Corporate Bond Purchase Scheme to integrating climate risks into the treatment of residential mortgages and corporate bonds used as collateral. These measures have been rooted in our statutory objectives and have been informed by clear-eyed quantitative risk assessments. Climate risk is no longer something that is hypothetical or special. Instead, we quantify and manage it in the same way in that we would treat any other financial risk.

That said, incorporating climate considerations into monetary policy operations is not straightforward. Central banks operate under different mandates, pursue different policy objectives and work within very different operational frameworks. There is no single model that can simply be copied from one jurisdiction to another. Success depends on clearly identifying objectives, selecting tools that are consistent with those objectives, and developing the analytical capabilities needed to turn increasingly rich “raw” climate data into decision-useful insights.

The NGFS has played a central role in overcoming these challenges. By bringing together central banks with diverse mandates, operating frameworks and experiences, it has created a forum in which practical lessons can be shared and new ideas can be tested. As climate-related risks continue to evolve and as central banks’ operating frameworks change over time, that collaborative approach will remain invaluable and help us build on the progress we have seen so far.

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