

Climate Risks and Monetary Policy: From Blind Spots to Mandate Preservation

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ABSTRACT

Climate change has emerged as a systemic macroeconomic risk with direct implications for monetary policy. This paper argues that climate risks – whether physical, transition, or social – propagate through output, labor markets, inflation, fiscal balances, trade, financial stability and distribution. Yet, standard macroeconomic models continue to treat climate shocks as temporary supply disturbances. This creates three blind spots – the persistence of inflationary pressures, structural effects on potential output and neutral interest rate, and impaired policy transmission through stressed financial intermediaries. To address these gaps, we propose integrating climate risk into monetary policy through the three pillars – mandates, models and instruments. Building on recent literature on green quantitative easing, credit guidance, macroprudential overlaps, and systemic risk warnings, we argue that integration is not mission creep but mandate preservation. The future credibility of monetary policy will depend on central banks' climate competence: their ability to safeguard stability in a warming world.

Keywords: Climate Risk, Macroeconomy, Central Banks, Monetary Policy

1. INTRODUCTION

Climate change has emerged as a systemic macroeconomic threat, extending far beyond the environmental domain. Its impacts are wide-ranging and inter-connected, with a potential to create a domino effect across societal, financial and economic systems. For example, heat waves reduce agricultural yields, fueling food inflation, while floods and storms can disrupt supply chains, raising the costs of goods and energy. These shocks do not remain contained within the environment; they directly affect inflation, economic growth, employment and financial stability – the core variables monitored by central banks.

Traditionally, monetary policy and climate policy have been treated as distinct domains. Monetary policy has centered on price stability, sustainable economic growth, and the stability of financial and banking systems, while climate policy has primarily been the remit of governments through fiscal and environmental instruments. However, the growing influence of climate risks on prices and financial stability makes this separation increasingly untenable. Both physical risks, such as extreme weather events, and transition risks, arising from the shift to green energy systems - create new and persistent macroeconomic pressures that central banks cannot ignore (NGFS, 2019; Batten, 2018; ECB, 2021).

This paper builds on and extends a growing body of literature at the intersection of climate economics and monetary policy. Dafermos, Nikolaidi, and Galanis (2018) and Zou et al.(2015) highlight the potential of “green quantitative easing” and climate-tilted collateral frameworks to reduce systemic risk. Campiglio (2016) emphasizes the role of credit guidance in channeling finance toward sustainable sectors, while Bak (2017) explores macroprudential overlaps between monetary policy and climate regulation. Saha and Viney (2020) warn that failure to integrate climate considerations could trigger systemic crises, underscoring the urgency of action.

This paper contributes by synthesizing these insights into a comprehensive framework that (i) identifies the channels through which physical, transition, and social risks propagate into the seven macroeconomic buckets most relevant for central banks; (ii) diagnoses three blind spots in current monetary policy thinking - persistence, structural effects, and transmission impairment; and (iii) proposes a roadmap for integration across mandates, models, and instruments. In doing so, it bridges existing strands of research and highlights how climate competence is essential for mandate preservation rather than mission creep.

2. CLIMATE RISK AND CHANNELS OF TRANSMISSION INTO THE ECONOMY

Climate change introduces a set of risks that propagate through the economy in complex ways. These risks are broadly categorized into Physical Risks, Transition Risks and Social Risks, a classification that’s finding increased acceptance in Central Bank and supervisory literature. Each of these risks are transmitted into the economy via identifiable macroeconomic channels.

1. **Physical risks:** These arise from climate-driven hazards and trends - more frequent or severe storms, floods, wildfires, heatwaves, sea-level rise, droughts, and shifting precipitation patterns. The transmission channel is largely through destruction of productive capacity and infrastructure, in turn disrupting supply chains and reducing how much the economy can produce in the long run. Over time, repeated damage wears down buildings, roads and equipment, which can permanently reduce output potential.
2. **Transition risks:** These are risks associated with the process of shifting toward a low-

carbon economy. Policy measures (e.g. carbon pricing, emissions regulation), can increase energy and input prices, while technological shifts (e.g. renewables, electric mobility) may make some oil, gas, or coal investments lose value. These shifts can drive higher energy and transport costs, which can in turn drive higher inflation. In addition, these can drive a depreciation in carbon-intensive firms.

3. **Social / health risks:** These capture indirect effects from climate change on human systems: e.g. heat stress on labor, disease burdens, migration pressures, inequality, and strain on healthcare and social infrastructure. These risks show up in population changes and in who bears the costs: lower labor supply, shifts in regional employment and increased inequality. The aggregate impact is slower GDP growth and increased fiscal pressures as governments absorb higher healthcare and social protection costs.

3. CLIMATE RISK AND MACROECONOMIC VARIABLES

Having outlined the key channels through which climate risks transmit into the economy, the next step is to map the transmission pathways into key macroeconomic variables that anchor monetary policy frameworks. To ensure a mutually exclusive and completely exhaustive list of variables, the following seven macroeconomic buckets can be delineated:

1. Output and Growth.

Climate risks manifest most directly in the real economy by lowering productivity and reducing long-term growth potential. Physical shocks such as floods and storms destroy capital stock, reduce business investment and disrupt supply chains (Burke, Hsiang, & Miguel, 2015; Dell, Jones, & Olken, 2012). Transition risks, through costly shifts in energy systems, may further constrain investment.

2. Labor Market.

Heat stress, health shocks, and climate-induced migration directly impact the supply of labor and productivity. Studies by the International Labour Organization (2019) estimate that by 2030, climate change could reduce total working hours globally by over 2%, equivalent to 80 million full-time jobs worldwide. Sectoral unemployment emerges as agriculture and fossil-fuel sectors shrink, while service sectors adapt more gradually. Thus, employment levels, labor force participation, and productivity per worker are core labor variables through which climate risks are transmitted.

3. Prices and Inflation.

The most immediate channel to monetary policy is through inflation and inflation expectations. Climate risks affect food and energy prices via harvest volatility and carbon pricing, respectively. Persistent shocks may generate “climateflation” (ECB, 2021), where recurrent climate disruptions lead to a structurally higher inflation path. Crucially, second-round effects such as wage-price spirals triggered by food inflation can anchor inflation expectations at higher levels, complicating monetary policy (Batten, 2018).

4. Public Finance.

Climate shocks impose significant fiscal costs. Physical disasters necessitate emergency spending on relief and reconstruction, while transition policies (e.g., green subsidies, carbon tax rebates) reshape government balance sheets. Simultaneously, slower growth erodes the tax base. This combination raises budget deficits, debt-to-GDP ratios, and fiscal stress indicators, with implications for sovereign bond spreads i.e. the extra interest governments must pay on their debt (Kahn et al., 2019). Small open economies with weak fiscal buffers are particularly vulnerable.

5. Trade and External Sector.

Climate risks disrupt global trade flows through port closures, supply chain interruptions, and shifts in comparative advantage. Exporters of carbon-intensive goods face deteriorating demand, while resource importers experience terms-of-trade shocks as energy and food prices fluctuate (NGFS, 2021). The relevant macro variables include current account balances, trade volumes, and exchange rates, all of which can become more volatile as climate risks grow.

6. Financial Stability.

Financial systems transmit and amplify climate shocks. Transition risks drive the repricing of carbon-intensive assets, potentially stranding trillions in fossil-fuel-related capital (Battiston et al., 2017). Physical risks increase default probabilities as firms and households suffer uninsured losses. The relevant variables here include asset valuations, share of loans that are not being paid on time (NPLs), bank capital adequacy, and insurance sector solvency. Given their systemic nature, these risks underscore why the BIS (2021) refers to climate as a “green swan” - a source of nonlinear systemic crises.

7. Demographics and Distribution.

Finally, climate change reshapes demographics and distributional dynamics. Rising temperatures and sea-level rise accelerate migration flows, while health burdens reduce working-age populations in vulnerable regions. Simultaneously, with climate risks low-income households bear disproportionate welfare losses, intensifying income inequality and regional disparities

(Stern, 2006). For central banks, these factors complicate assessments of aggregate demand and increase the public and political pressures on central banks.

EXHIBIT 1: Mapping Climate Risks with Transmission Channels and Macroeconomic Buckets

Climate Risk Type	Transmission Channel	Macroeconomic variable buckets affected	Representative Macroeconomic variables
Physical Risks (storms, floods, droughts, wildfires, sea-level rise)	Infrastructure disruption, supply chain shocks	Output and Growth	GDP, Output gap
	Food and Energy price shocks	Prices and Inflation	CPI, Inflation expectations
	Ports/logistics disruption	Trade and External Sector	Current Account, Exports, Imports
	Property/ asset losses	Financial Stability	Bank NPLs, Insurance payouts
	Population displacement	Demographics and Distribution	Inequality, Migration flows
Transition Risks (carbon pricing, regulation, technology shifts, consumer preferences)	Higher energy/ input costs (via carbon pricing)	Prices and Inflation	CPI, PPI
	Stranded Assets	Financial Stability	NPLs; equity valuations and bond spreads
	Industry re-allocations	Labor Market	Unemployment, Job reallocation
	Carbon Tax revenues, Subsidies	Public Finance	Fiscal Balance, Tax Revenues, Debt-to-GDP
Social/Health Risks (heat stress, migration, inequality, health burdens)	Heat Stress, Health incidences	Labor Market	Hours worked, Labor Productivity

	Healthcare Costs	Public Finance	Health spending, Transfers
	Household vulnerability via unemployment	Financial Stability	Non-performing Loans

This mapping underscores that climate shocks are not just confined to environmental domains – in fact they transmit across multiple macroeconomic indicators that central banks and finance ministries closely monitor. For example, a flood may depress output (GDP), drive higher food prices (Inflation), raise defaults (Financial Stability), drive higher healthcare costs (Public Finance), quite simultaneously.

Applying this framework across a recent climate event in America: LA Wildfires (2025)

Exhibit 2: Assessing the impact of 2025 Los Angeles County Wildfires across the 7 Macroeconomic buckets

Macro Bucket	Impact
Output and Growth	LAEDC estimated \$28- \$54 bn in property losses ¹ ; UCLA Anderson forecast a 0.5% drop in county GDP ² .
Labor Market	Wage losses of ~\$300mn from disruptions in tourism and services ³
Prices and Inflation	Local rent and insurance premiums surged ⁴ ; insurance affordability flagged as a crisis ⁵
Public Finance	~\$1bn budget shortfall from lost tax revenues and higher recovery costs. ⁶
Trade and External Sector	Port disruptions slowed regional trade and logistics. ⁷
Financial Stability	\$2.3bn in insurer losses (per Lloyds) along with billions in reinsurer payouts. ⁸
Demographics and Distribution	200,000 people needed evacuation, with disproportionate impact across on lower-income households. ⁹

¹ <https://laedc.org/wpcms/wp-content/uploads/2025/02/LAEDC-2025-LA-Wildfires-Study.pdf>

² <https://www.anderson.ucla.edu/news-and-events/pr-economic-impact-los-angeles-wildfires>

³ <https://www.anderson.ucla.edu/about/centers/ucla-anderson-forecast/economic-impact-los-angeles-wildfires>

⁴ <https://www.anderson.ucla.edu/news-and-events/pr-economic-impact-los-angeles-wildfires>

⁵ <https://hbr.org/2025/01/the-la-fires-could-change-the-insurance-industry>

⁶ <https://laedc.org/laedc-fire-impact-press-release/>

⁷ <https://www.profreight.us/wildfires-disrupt-los-angeles-ports-a-freight-forwarding-nightmare/>

⁸ <https://www.theguardian.com/business/2025/mar/10/lloyds-of-london-expects-losses-california-wildfires>

⁹ <https://www.census.gov/topics/preparedness/events/wildfires/2025-los-angeles.html>

4. THE CURRENT ROLE OF MONETARY POLICY IN ADDRESSING CLIMATE RISK

4.1 Traditional Mandates

The core mandates of most central banks center on price stability, maximum employment and financial stability. Historically, the working assumption has been that shocks are cyclical and temporary, and that monetary policy is best used to stabilize inflation around target while smoothing output fluctuations. Climate risk complicates this approach because it generates persistent supply-side shocks, recurrent cost-push pressures, and balance-sheet fragilities that can impair monetary transmission itself. As Patrick Honohan (2020) notes, even secondary or implicit mandates justify central bank attention to climate change, though central bankers remain cautious about mandate drift and the risk of compromising independence.

4.2 Current Practices across key Central Banks

- **ECB and Bank of England:** The most advanced among major central banks, ECB has tilted corporate bond reinvestments toward greener issuers and applied stricter collateral disclosure standards. The BoE has run climate biennial exploratory scenarios (CBES) to stress test bank and insurer exposures under physical and transition risk.
- **Federal Reserve:** Still cautious, the Fed has launched supervisory climate scenario analysis (CSA) pilots with large banks and issued supervisory guidance on climate risk management, but insists that climate mitigation lies outside its statutory remit.
- **Emerging Markets:** Ironically, many emerging economies are more exposed to climate risk - via agriculture, commodity dependence, or natural disasters, yet face weaker institutional capacity. Central banks such as those in Brazil and India have begun exploratory steps (green taxonomy alignment, risk disclosure requirements), but limited analytical tools and fiscal constraints reduce their ability to embed climate risks directly in policy frameworks.

4.3 Why the current practices fall short and how they weaken Central Banks' ability to fulfil their core mandates

A key limitation is that standard macroeconomic models treat climate shocks as temporary, exogenous supply disturbances. This creates 3 blind spots – Persistence, Structural Effects and Monetary Policy Transmission Impairment. Each of these weaken central banks' ability to fulfil their core mandates of price stability, employment/ output stabilization and financial stability:

1. Persistence, undermines Price Stability:

- Climate shocks are recurrent. IMF (2024) shows that weather anomalies cause persistent supply-chain pressures and inflation, not transitory blips.
- Implication: Central banks that look through climate shocks risk losing inflation anchor credibility, as climate-driven food and energy shocks recur.

2. Structural Effects – weaken Output and Employment mandates

- Climate change lowers potential output, shifting sectoral productivity and altering the neutral real interest rate (NGFS, 2024).
- Implication: Central banks miscalculate the true output gaps, leading to policy errors that destabilize growth and employment.

3. Monetary Policy Transmission Impairment – threatens Financial Stability:

- Climate risk undermines financial intermediation. For example, when banks face higher NPL scenarios, the credit channel weakens, blunting monetary pass-through (Dafermos et al., 2018, ECB, 2023).
- Implication: Central banks may set the right policy rate, but it does not transmit to the real economy, eroding effectiveness and in turn driving financial instability risks.

Exhibit 3: Climate Risk Blind Spots: Implications for Central Bank mandates and Macroeconomic buckets

Blind Spot	Policy mandate most affected	Macroeconomic Buckets affected	How climate risk weakens mandates and macroeconomic buckets
Persistence	Price Stability	Prices and Inflation, Trade and External Sector	Recurrent climate events cause persistent food and energy inflation making it hard to anchor inflation expectations.
Structural effects	Employment/ Output stabilization	Output and Growth, Labor Market, Public Finance	Climate change lowers GDP and shifts sector productivity; mis-measured output gaps cause policy errors.

Transmission impairment	Financial Stability	Financial Stability, Demographics and Distribution	Rising non-performing loans and insurance losses weaken bank and credit flows, blunting monetary policy pass-through.
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5. NEED TO INTEGRATE CLIMATE RISKS WITH MONETARY POLICY

The diagnosis above makes clear that climate risks are not transitory supply disturbances but persistent, structural, and systemic forces. They permeate the seven macroeconomic buckets - lowering output, distorting labor markets, embedding inflation, straining public finances, disrupting trade, destabilizing finance, and exacerbating inequality. This in turn weakens central banks' ability to deliver on their core mandates of price stability, employment and output stabilization and financial stability. This section sets out why integration is necessary, and how it can be achieved.

5.1 Why integration is necessary

Three considerations compel stronger action:

- **Credibility of Monetary Policy:** By “looking through” climate shocks, central banks risk underestimating inflation persistence, mis-measuring the output gap, and mis-gauging the neutral policy stance. Over time, this erodes credibility and weakens inflation expectations anchoring.
- **Systemic Risk:** Saha and Viney (2020) warn that failure to integrate climate risks into financial governance could even spark the next financial crisis. They highlight that mispriced carbon-intensive assets, repeated natural disasters, and fragile insurance coverage together pose systemic threats. The absence of the U.S. in some global initiatives, they argue, constrains progress, underscoring the importance of coordinated action.
- **Mandate consistency:** Even where climate is not an explicit statutory objective, it falls squarely within existing mandates. Persistent food and energy shocks threaten price stability; structural productivity losses undermine growth and employment; and asset repricing risks destabilize the financial system. Patrick Honohan (2020) emphasizes that even secondary or implicit mandates justify climate attention, though some central bankers fear a loss of independence.

5.2 Roadmap for integration

Integrating climate risks into central bank policy hinges on three key pillars – Mandates, which establish the justification for action; Models, which provide the analytical framework through which the climate shocks are interpreted; and instruments which constitute the operational levers of implementation.

Mandates

Even when climate change is not named explicitly in central bank laws, it falls squarely within existing mandates. Persistent food and energy shocks endanger price stability; climate-related disasters threaten financial stability; and long-run productivity losses weaken employment. Patrick Honohan (2020) argues that even secondary mandates justify attention to climate, though some policymakers remain cautious. In practice, the European Central Bank (ECB) and Bank of England (BoE) have begun integrating climate risks into their balance-sheet and supervisory policies, while the U.S. Federal Reserve has been more cautious, limiting its role mainly to bank supervision. Emerging-market central banks, as Campiglio (2016) notes, sometimes have broader developmental mandates, giving them more flexibility to steer credit flows toward sustainable sectors.

Models

Monetary policy rests on models that shape how central banks interpret shocks. Standard models still treat climate events as temporary disturbances, creating blind spots around persistence, structural shifts, and weakened transmission. To overcome this, central banks are experimenting with climate scenario analysis and stress testing. The ECB and BoE, for example, have piloted climate stress tests, while emerging markets often fold weather shocks directly into inflation and output forecasts. Updating models to account for persistent climate risks is essential to setting the right policy stance and maintaining credibility.

Instruments

- **Balance-Sheet Operations.** Zou et al. (2015) propose aligning quantitative easing with climate goals by restricting purchases to green bonds or low-carbon issuers, while Dafermos, Nikolaidi, and Galanis (2018) argue that such “green QE” could reduce climate-financial risks by channeling capital into low-carbon sectors.
- **Collateral Frameworks.** Zou et al. (2015) further suggest conditioning collateral eligibility on environmental standards, incentivizing banks to lend to greener firms.
- **Credit Tools.** Emerging market central banks can steer financing via targeted refinancing

lines, differentiated reserve requirements, or priority-sector lending— tools that Campiglio (2016) argues are more feasible in less market-dominated financial systems.

- **Macroprudential Tools.** Céline Bak (2017) highlights how macroprudential regulation can reinforce monetary policy, for example by adjusting capital requirements or imposing exposure limits for carbon-intensive assets.
- **Coordination.** Bak (2017) calls for a G20 platform chaired by finance ministries and central banks to harmonize standards and scale up green finance globally, reflecting the transnational nature of climate shocks.
- **Communication.** Explicit recognition of climate persistence in inflation reports and monetary statements would strengthen credibility and prepare markets for policy adjustments.

Risks and Counterarguments

Critics warn of “mission creep” and threats to independence. But as Honohan (2020) notes, integration is not about central banks becoming climate activists. It is about mandate preservation: ensuring that price stability, financial stability, and employment remain achievable in an era where climate change is no longer a background risk but a central driver of macroeconomic outcomes.

6. CONCLUSION

Climate change is no longer a distant challenge; it is already reshaping economies. Physical, transition, and social risks flow through well-defined channels, destabilizing the seven macroeconomic buckets—output, labor, prices, public finance, trade, financial stability, and distribution. These dynamics directly weaken central banks’ ability to deliver on their three core mandates: price stability, employment stabilization, and financial stability.

Yet most monetary policy frameworks still treat climate events as if they were temporary shocks. This creates blind spots: inflationary pressures that persist longer than expected, structural changes that lower potential output and alter the neutral interest rate, and financial stresses that impair monetary transmission. Left unaddressed, these blind spots undermine the credibility of central banks themselves.

The emerging literature offers solutions. Zou et al. (2015) and Dafermos, Nikolaidi, and Galanis (2018) show how green quantitative easing and climate-conditioned collateral frameworks can reduce systemic risk. Campiglio (2016) highlights the scope for targeted credit in emerging markets. Bak (2017) emphasizes international coordination, while Saha and Viney (2020) warn

that failing to act could spark a financial crisis. Honohan (2020) reminds us that even secondary mandates justify climate integration.

The lesson is clear: climate risk is not exogenous noise, but a central driver of macroeconomic outcomes. Ignoring it erodes monetary credibility while integrating it strengthens mandates. The true test of monetary policy in the twenty-first century will be whether central banks achieve not just market neutrality, but climate competence.

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